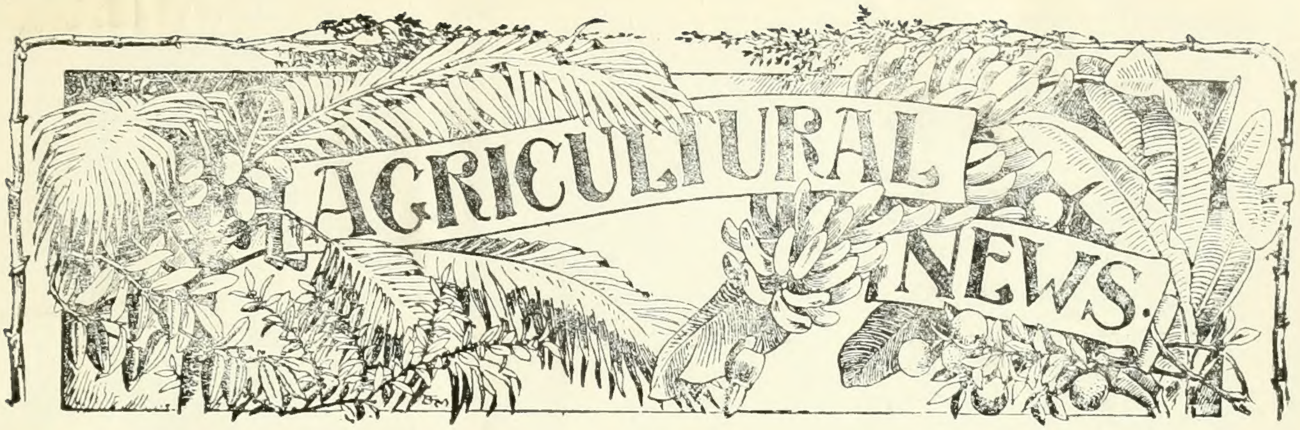

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOLUME VIII.

JANUARY TO DECEMBER 1909.

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ERRATA IN VOLUME VIII.

Page 93, column 2, for *Anastrephas* read '*Anastrepha*'.

„ 138, „ „ line 7, for Vol. IV, read 'Vol. VI'.

„ 168, „ „ paragraphs 4 and 5, for *Gliricida* read '*Gliricidia*'.

„ 299, „ „ last paragraph, for Vol. II, p. 32, read 'Vol. II, p. 232'.

„ „ „ „ „ „ for Vol. X, p. 42, read 'Vol. V, p. 42'.

„ 405, „ „ for *Mimusops Shimperi*, read '*Mimusops Schimperi*'.

AGRICULTURAL NEWS

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Sir Daniel Morris, K.C.M.G.,
M.A., D.Sc., D.C.L.

AGRICULTURAL NEWS

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CONTENTS.

Sir Daniel Morris, K C.M G.

SIR Daniel Morris, K.C.M.G., retired from the office of Commissioner of the Imperial Department of Agriculture for the West Indies on November 30 of last year, after occupying that post for a period of ten years. The announcement of his resignation has been received with the greatest regret both by the entire agricultural population of the West Indies, and by the staff which have had the privilege of working under his direction

After a distinguished career as Assistant Director of the Royal Botanic Gardens, Ceylon, from 1877 to 1879; as Director of Public Gardens at Jamaica from 1879 to 1886, Dr. Morris was appointed, in the latter year, Assistant Director of the Royal Gardens, Kew. Amongst the many important official missions undertaken by him in various parts of the empire during that period, there is none more important than that which he filled in relation to the West Indian Royal Commission of 1897, to which he was appointed Scientific Adviser: and of the many important publications contributed by him, to which we are here unable even to allude, there is none of greater importance than Appendix A of the Royal Commission Report, which deals at considerable length with the agricultural resources and requirements of British Guiana and the West India islands. That contribution was one of the most valuable parts of the report, and was recognized at once as the most authoritative synopsis of the subject with which it dealt.

One of the recommendations of the Royal Commission was the establishment of the West Indian Imperial Department of Agriculture for the Windward and Leeward Islands, and Barbados. This recommendation was carried into effect in 1898, and in September of that year Dr. Morris returned to the West Indies as Commissioner of the Department. With characteristic energy he proceeded at once, in consultation with the Governments of the Windward and Leeward Islands, and Barbados, to organize the new department, and in the short space of a single year it was found possible to summon the first Conference of the officers of the Department at Barbados, and to secure the attendance, not only of scientific representatives from Jamaica, British Guiana, and Trinidad, but also representatives from the Agricultural Societies and Education Departments of all the West Indian Colonies. From that time onwards, the record of the Department has been one of unbroken activity, and that activity has spread itself in every direction in which the welfare of agriculture in the West Indies might be directly or indirectly affected.

The first task was, while utilizing existing Botanic Departments and their staffs, to remould them in a more agricultural form, and to institute agricultural experiment stations where every tropical product with any promise of value might be subjected to careful trial cultivation. Sugar was, and is still, the mainstay of a large part of the West Indies, and the Commissioner accordingly devoted great attention to the reorganization of the sugar-cane experiments, which for many years had been carried on at Barbados and Antigua. Large grants were made for the provision of adequate staffs and expenses, and extensive series of experiments were begun for the raising and testing of seedling varieties, and for testing the effect of various manures and methods of tillage upon the growth and yield of the sugar-cane. A number of other matters bearing upon the same subject were carefully investigated, and in recent years the production of hybrids of known parentage, and the investigation of hybridization of the sugar-cane on Mendelian lines have formed part of the work of the Department. As a result of ten years' work, while such valuable varieties as B. 147, B. 208, and B. 376 have been brought into prominence and thoroughly tested, some 30,000 new varieties of cane have been raised in Barbados as seedlings, and are being tested agriculturally and chemically; and there is good reason to hope that some of them will prove a material advance on the older varieties, not only in their yields of cane and sugar, but also in other valuable properties, especially in their power of resisting the various diseases that in the past have caused so much loss to the industry.

The revival of the cotton industry will be alluded to later, but the large number of tropical products and subjects connected with them, which have received attention and investigation at the hands of the Commissioner of Agriculture and his staff, will be realized by a perusal of the list of 'Pamphlets' published during the past ten years. These pamphlets, each of which is a *multum in parvo* on the subject of which it treats, amount to some fifty-four in number, and include pamphlets on Sugar-cane Experiments, Treatment of Insect Pests, 'Plain Talk to Small Owners,' Treatment of Fungoid Pests, Onion Cultivation, Ground Nuts, Diseases of the Sugar-cane, Moth Borer in Sugar-cane, Manurial Experiments, Bee-keeping, Oranges, Tobacco, 'Hints to Settlers in Tobago,' Lime Cultivation, Fungus Diseases of Cacao, Millions and Mosquitos, 'A B C of Cotton Cultivation,' and other subjects.

Agricultural Education received attention from the first. Grants were made for instruction in Agricultural Science, and for the provision of exhibitions at Harrison College, Barbados, and at the Grammar School, Antigua. Courses of lectures were given to primary school teachers in various islands, grants were made to assist in providing agricultural instruction in the primary schools, and Industrial Agricultural schools were founded at St. Vincent, St. Lucia, and Dominica, where the sons of small proprietors are provided free with education, board, lodging and clothing, and receive a three- or four-years' course of instruction in the theory and practice of Agriculture, adapted to the needs of the overseer and small proprietor. The peasant proprietor and small plantation-tenant shows, inaugurated by Sir Daniel Morris and regularly held every year by the Department, must also rank as among his important educational efforts.

Recognizing that an efficient means of circulating the information gathered by the Department was all important, great attention was devoted to publications. The first number of the *West Indian Bulletin*, a scientific review of the work of the Department, appeared in July 1899, and has since been issued at quarterly intervals. The large reports of the Sugar-cane experiments at Barbados, and the Leeward Islands, as well as the annual pamphlets which give a popular summary of the same work, and the annual reports of the Botanic and Agricultural Stations and Agricultural Schools of the various islands, are well known. Then there is the long pamphlet series on various subjects already alluded to. Last and not least, there is the *Agricultural News*, a popular fortnightly review of the work of the Imperial Department of Agriculture, which first appeared in April 1902, and has enjoyed a steady and rapidly increasing circulation ever since.

The broad view that was taken by Sir Daniel Morris, who received the honour of knighthood in 1903, as to the scope of his work for the West Indies, is nowhere more clearly shown than in his efforts to improve the trade relations between the West Indies and Canada, which resulted in a Conference of Representatives in 1908, and the appointment by the Dominion of a special Trade Commissioner. The full fruit of this movement has yet to be gathered.

While Sir Daniel brought together and co-ordinated the work of the scientific officers already existing in the West Indies, he also introduced and trained a number of young University science graduates in the Department. It is safe to say that the experience they gained under the Commissioner has had much to do with the success they have achieved after leaving the Department for wider fields, and that their training has been a service of more than West Indian bearing.

The Imperial Department of Agriculture under Sir Daniel Morris will probably be more especially associated with two important agricultural achievements. The first is the inauguration and holding of annual or biennial Conferences, and the second is the re-establishment of the Cotton Industry, which had been almost extinct in the West Indies for about one hundred years.

The West Indian Agricultural Conferences have been held at Barbados, Trinidad, and Jamaica, and have served to bring together the scientific officers of all the West Indian Colonies, as well as representatives of the Agricultural Societies and of the Education Departments. It would be difficult to overestimate the effect of these interchanges of views. On the one hand, they have served to bring home to the scientific worker the needs of the practical agriculturist, and on the other they have inspired the practical worker with confidence in his scientific advisers. The Presidential Addresses of Sir Daniel Morris, which cover the whole range of West Indian agriculture, and the discussions which have followed, form a valuable part of the proceedings.

Owing to the dearth of the supplies of raw cotton in England, Sir Daniel Morris in 1902 took up the subject of cotton growing. After preliminary investigations, he paid a visit to the Sea Islands and there carefully studied the methods of seed selection, cultivation, and treatment of insect pests of cotton, as well as cotton ginning and other subjects connected with the manufacture. He clinched the matter by purchasing a large quantity of the best Sea Island cotton seed, a step the wisdom of which became apparent when it was afterwards ascertained that further supplies of seed could not be obtained from the Sea Islands. This seed, so obtained, has formed the nucleus from which all the best seed of the West Indies has been subsequently derived. Sir Daniel Morris, with assistance rendered by the British Cotton-growing Association, in co-operation with officers connected with the Department, organized the establishment of ginneries in various islands, and compiled and published the well-known pamphlet entitled the 'A B C of Cotton Planting;' and since then the Department has been unremitting in its work on the selection and cultivation of cotton, in the study of insect and fungoid diseases, and in the information and assistance afforded by the staff to cotton planters.

In 1898, when Sir Daniel Morris came to the West Indies, these islands were a source of great anxiety. To-day there is everywhere encouraging evidence of progress and security, and such islands as St. Vincent, Tobago, Montserrat, and even areas of larger islands that seemed likely to run to waste, are now under a prosperous cultivation. Many factors have certainly been at work, amongst which, very important, was the abolition of sugar bounties. But among the factors that have been at work to improve agriculture and increase the prosperity of these islands, there has been none more important than the unremitting efforts of the Department of Agriculture under the late Commissioner. Sir Daniel Morris brought to the West Indies unbounded confidence in the future, and in the resources of these islands, a wide experience of Agriculture, and unflagging effort not to be discouraged by the difficulties of the task. All will bear testimony to the results which he has achieved.

Although the immediate connexion of Sir Daniel Morris with the West Indies has been severed, there is reason to hope that his mature experience and wise counsel will still remain at the disposal of the empire. It is the wish of his colleagues, as well as of the West Indies, that he may long enjoy the measure of rest to which his lengthy and unremitting labours entitle him.

ARBOR DAY AT ANTIGUA.

Under the auspices of a strong Central Committee (of which Dr. Francis Watts, C.M.G., is Chairman), and with sub-Committees in the several parishes, the seventh annual celebration of Arbor Day took place at Antigua on November 9 last.

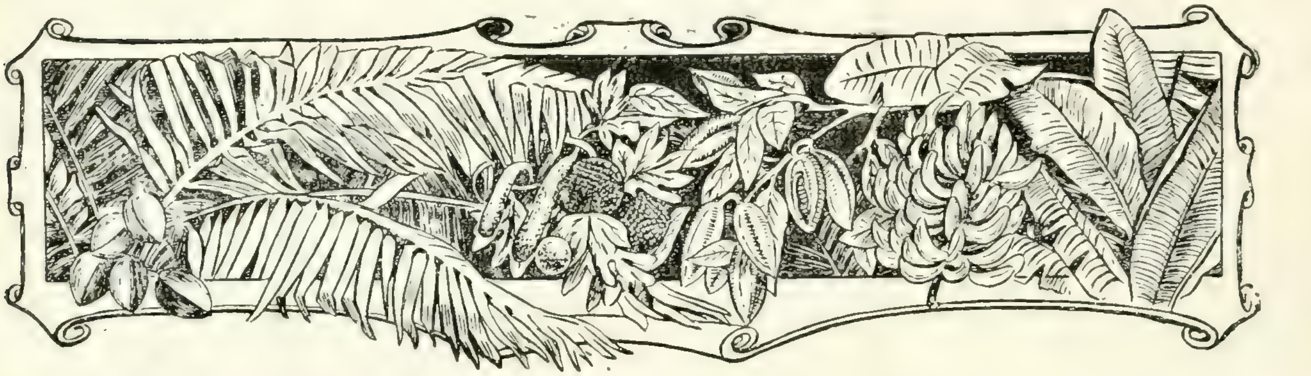
At St. John's the proceedings commenced with an inspection of the local forces by his Excellency the Governor of the Leeward Islands (Sir Bickham Sweet-Escott, K.C.M.G.). The objects of Arbor Day movement and the scope of the work at Antigua were briefly explained by Dr. Watts, and after a short speech from the Governor, a tree was planted by his Excellency at the north-east corner of Country Road. Five Royal Palms were also planted along the Country Road by the St. John's City Commissioners.

Children from the elementary schools planted twenty-four mahogany trees in the road leading to the hospital, thus completing the elementary schools' avenue begun in 1902.

Trees were also planted by the nursing staff at the Hospital, representatives of the Girls' High School, and students of Spring Gardens Training College, and the Buxton Grove Seminary.

Arbor Day was similarly observed in a number of other parishes of the island, the total number of trees planted at Antigua on November 9 being 222. The trees were in main part, mahogany and palms of various kinds (chiefly date and royal palms), together with smaller numbers of whitewood, Saman, etc.

The expenses incurred on the occasion amounted altogether to £4 12*s*. 11*d*.



WEST INDIAN FRUIT.

THE 'KING' ORANGE.

An orange of superior quality, known as the 'King' variety, the first plants of which were imported directly from Cochin China some twenty-eight years ago, has lately attracted attention in the citrus fruit districts of the United States, and an account of its characteristics, etc. (with illustrations), is given in the course of an article entitled 'Promising New Fruits,' which appears in the latest *Yearbook* of the United States Department of Agriculture.

It is mentioned that this orange (which is also known by the name of 'King of Siam') is the first citrus fruit of high quality which has reached the United States by direct importation from Eastern Asia, the usual course being a slow migration through Western Asia, and the orange-growing districts of the Mediterranean.

The 'King' orange was at first classed with the mandarins and tangerines, but further experience with the variety has shown that it is so distinct in the character of the tree, the fruit, and the time of ripening that it appears worthy of recognition as a distinct horticultural group, if not a subspecies.

Specimens of the fruit of this orange were first obtained from Eastern Asia by a Dr. S. R. Magee, of Riverside, California, in 1880, through the efforts of the United States Minister at Tokio. From the seeds of these fruits Dr. Magee raised a number of young plants, and in the following year twenty-five plants of the variety were imported direct from Cochin China. Budded trees appear to have been produced both from the seedlings and the imported plants, and this probably accounts for the rather wide range in habit of growth, thorniness of wood, and quality of fruit found on trees of the 'King' variety at the present time.

The 'King' orange first fruited in the United States in 1885, and specimens were received by the Department of Agriculture for the first time in 1887. The variety has been disseminated both in California and Florida, and in this propagation work consistent efforts have been made, by careful bud selection, to reduce the original thorniness of the variety.

This variety of orange has up to the present done much better in Florida than in California. In certain localities of the latter State it has attained high perfection, and when well grown, the fruit, placed on the market late in spring, has brought higher prices in the northern market than any other variety of orange grown in Florida. The first box of fruit of this kind placed on the New York market is reported to have sold for $7·00.

The 'King' orange is described as being medium to large in size, dark reddish-orange in colour, the rind moderately thick, rather soft, and possessing a distinctive and agreeable aroma and flavour, flesh loose and soft in texture, juice abundant, and with a peculiarly rich, sweet flavour. The general quality of the fruit is reported to be very good; in fact, it is stated that it ranks with the very finest kinds, and therefore is worthy of the attention of growers for special markets which will pay for fruit of extra quality. This fruit appears to be more suited for tropical than for sub-tropical cultivation, since it is mentioned that it is more sensitive to climatic changes than most varieties of oranges.

COLONIAL FRUIT SHOW.

The twelfth show of colonial fruit and preserves held under the auspices of the Royal Horticultural Society took place in London from November 26 to 30 last. Excellent displays of West Indian produce were on view, those from Dominica and Trinidad being especially noteworthy. Jamaica, Montserrat, and Antigua also participated.

Some idea of the display made by the several colonies may be gained from the interesting illustrations of the show, which appeared in the *West India Committee Circular* of December 8 last. The same journal mentions that the honours of the exhibition undoubtedly fell to Dominica. The fruit from that island was in nice condition, of good colour, and also free from any signs of blight. The advance in quality made by Dominica fruit, as compared with the collections sent over some four years ago, is alluded to, since it indicates that much more attention is paid now than formerly to the essential matters of selection, grading, and packing. The excellence of individual exhibits is indicated by the fact that Dominica was awarded no fewer than five medals. The exhibit from Trinidad was not so good as might have been expected, taking into account the resources of the island. A case of fruiting pine-apples, in fine condition, attracted a considerable amount of attention, however. The bottled fruits from all the colonies were good and showed great improvement on those of past years.

The following may be mentioned among the awards for fruits: Silver gilt Knightian medals to Dominica Botanic Station for citrus fruits and to Hon. A. Alford Nicholls, C.M.G., for limes and lime products; silver Knightian medals to Hon. J. Cox Fillan and Mr. A. R. C. Lockhart, both of Dominica, for limes; and silver Banksian medals to the Permanent Exhibition Committee of Trinidad for their general exhibit of citrus fruit, bananas, papaws, growing pine-apples, etc., and to the Agricultural School, Dominica.

SUGAR INDUSTRY.

Sugar-cane Experiments at Barbados.

At a meeting of the Barbados Agricultural Society held on December 11 last, Professor d'Albuquerque and Mr. John R. Bovell presented a summary of the chief results obtained in connexion with the sugar cane seedling and manurial experiments, carried on at Barbados under the direction of the Imperial Department of Agriculture, during the crop season 1906-8.

These experiments have now been in progress for a long period, and during the past ten years no less than 33,000 varieties of cane have been raised from seed, and their qualities studied before planting out in the field, and in many cases, in the chemical laboratory also, for the purpose of selecting and propagating the kinds that possess the most desirable agricultural and chemical characters. An account of the methods followed in raising new seedling canes was given by Professor d'Albuquerque, who also referred to the introduction of the process of artificial hybridization into the work, by the help of which it is hoped to obtain more certain results in a shorter time than if the work was carried on solely with varieties of cane, the parentage of which was not completely controlled.

Selected varieties of seedling canes were, in the crop season 1906-8, grown on twelve black-soil estates and three red-soil estates, which represent every variety of soil and climate in sugar cultivation in the island. The plots of land on which the selected varieties were grown were in every case cultivated in the same manner as the rest of the canes on the estate.

The weather conditions, on the whole, were not favourable, the season being very dry, so that the growth made was poor, and root disease was more prevalent than usual.

Of the selected varieties grown in comparison with the White Transparent on black-soil estates at Barbados, Sealy Seedling, B. 3,412, B. 208, B. 3,747, and B. 147 did best, coming in the order given. While White Transparent yielded 4,809 lb. of muscavado sugar per acre, B. 208 gave 5,410 lb., or an increased value of $10·88 per acre compared with the standard variety. B. 3,412 yielded 5,780 lb., and Sealy Seedling 6,184 lb., these being increased values of $17·57 and $24·89 per acre respectively, compared with the return from White Transparent under similar circumstances.

The superior returns given by the seedling varieties are still more apparent when the figures for the red-soil estates are considered. Taking first the results for plant canes only, the list is headed by cane B. 1,521, which gave 7,446 lb. of muscovado sugar per acre, as compared with 4,710 lb. yielded by White Transparent, the increased value of the return from the seedling being $49·50 per acre. A number of other canes also gave excellent results on red soils in comparison with the standard variety. The chief of these are: B. 3,405, yielding 7,165 lb. of muscovado sugar per acre, with a value of $44·44 per acre in excess of that given by the White Transparent; B. 3,390, yielding 6,920 lb. of sugar per acre, and an increased value of $40; B. 1,386, yielding 6,888 lb. of sugar, with an increased value of $39·42; B. 1,566, yielding 6,608 lb. of sugar, with an increased value of $34·35; and B. 3,412, which gave 6,570 lb. of muscovado sugar per acre, and a value of $33·67 over and above that yielded by the White Transparent cane. B. 376, B. 1,753, and D. 95 grown as plant canes on red soils also gave returns valued at $29·57, $25·61, and $21·25 per acre respectively, in excess of the crop yielded by White Transparent.

Taking next the average returns from a crop of plant canes and a crop of first ratoons grown on red-soil estates (plant canes reaped in 1907 and ratoons in 1908), it is seen that cane B. 1,386 comes out first, with a total yield of 13,944 lb. of muscovado sugar for the two crops. This represents a value of $73·27 per acre in excess of the return (9,896 lb.) given by White Transparent during the two seasons. Canes B. 3,390 and B. 3,405 gave returns valued at $65·45 and $59·86 per acre respectively (for the two reapings) over and above the value of the sugar crop from White Transparent, while the yields from B. 376, B. 1,566, and B. 3,412 were only slightly less in value. Following these, come D. 95, and B. 208, with crop yields for the two years of 11,977 lb. and 10,890 lb respectively, of muscovado sugar. These yields were worth $37·65 and $17·99 per acre more than the yields from White Transparent under similar circumstances.

Considering now the results obtained every year since 1900, it is seen that six seedlings have, on the average of the seasons, done better than White Transparent as plant canes on black soils. B. 3,696 comes first among these, with an average return, for the nine years, of 6,112 lb. of muscovado sugar per acre. The average yield given by White Transparent was 5,211 lb. per acre, the value of this return being $16·31 less than the seedling. B. 1,529 takes second place, with an average return of 5,762 lb., the value of which is $9·97 per acre better than the crop from White Transparent. B. 208 and B. 147 are third and fourth as plant canes on black soils, their average crop yields since 1900 being 5,697 lb and 5,627 lb. of muscovado sugar per acre with increased values of $8·80 and $7·53, respectively, compared with White Trensparent.

Coming next to the red-soil estates, the superior crop-yielding powers of many of the seedlings, compared with White Transparent, is as evident over the whole period 1900-8, as in the season 1906-8 alone. Taking the results from plant canes alone, White Transparent has given an average return of 4,515 lb. of muscovado sugar per acre during the nine years. This yield has been exceeded by nine seedlings, of which B. 3,405 comes first, with an average annual return of 7,802 lb. of muscovado sugar, valued at $59·50, in excess of the yield from White Transparent. B. 3,412 is second on the list, with an average return of 7,467 lb., worth $53·43 per acre more than the crop from the standard cane. The other seedlings which surpassed White Transparent in yield as plant canes on red soils are: B. 3,390, average return 7,388 lb. of muscovado sugar per acre; B. 1,566, average return 6,894 lb.; B. 1,529, average return 5,470 lb.; B. 376, average return 5,457 lb.; B. 1,521, average return 5,446 lb.; B. 208, average return 5,353 lb.; and D. 95, average return 5,116 lb. per acre.

Taking the average results both for plant canes and ratoons on red soils during the past nine years, the returns from White Transparent have been excelled by those from four seedlings. The average yield for two crops (plant canes and 1st ratoons) from White Transparent has been 9,012 lb. Under the same circumstances, B. 208 gave an average (two-year) crop of 9,724 lb. of sugar per acre; D. 95 yielded 10,403 lb.; the average (two-year) crop from B. 376 was 10,778 lb.;, while B. 1,566 did best of all, giving an average yield, over the two years, of 12,244 lb., worth $58·50 per acre more than the return from White Transparent.

Some notes on new seedlings and on the manurial experiments with sugar-cane in progress at different stations in the island will be given in the next issue.

WEST INDIAN COTTON

Messrs. Wolstenholme & Holland, of Liverpool, write as follows, under date December 22, with reference to the sales of West Indian Sea Island cotton:—

Since our last report only 40 bales of West Indian Sea Islands have been sold; of these about 20 bales were Grenada at $9\frac{1}{2}d.$, 10 St. Kitt's at $14\frac{1}{2}d.$, a few bales of superfine Barbados at $17d.$, the remainder being stains at $4\frac{3}{4}d.$

Holders of Carolina Sea Islands are more eager to sell, fine quality cotton being quoted at $12\frac{1}{4}d.$, and fully fine at $13\frac{1}{4}d.$ The stock of superfine planters' crop lots in that market is very considerable (about 6,000 bales), and lots which were held for $19d.$ to $20d.$, two or three months since, are now offering at $14d.$ without finding buyers.

Spinners of Sea Islands cannot sell the finer qualities of yarn, and are therefore spinning Georgias and Floridas, which are selling at $10d.$ to $11d.$ per ℔.; the outlook is therefore not very encouraging.

NOTES FOR COTTON GROWERS.

Cotton picking has been in active progress for some time on most estates where the crop is grown. In many cases the first picking has already been completed, and in Barbados and other islands, where the leaf blister-mite does not exist, planters will shortly be turning their attention to preparation for the second crop.

In view of the frequent and heavy showers of rain that have been experienced in one or two of the islands of late, it should be generally understood that it is not wise to pick the cotton until it has had a chance of drying thoroughly. For the same reason picking should not be started in the morning until the sun has been up sufficiently long to dry up the dew that has fallen in the night.

The advantage of a picking bag which enables stained cotton to be separated from the clean product at the time of gathering has been pointed out on more than one occasion in the *Agricultural News*. A bag about 2 feet deep by 18 inches wide, with a pocket on the outside, half the size of the bag (1 foot deep and 18 inches wide), is very convenient. The pocket is for the reception of the stained cotton.

In sorting or grading seed-cotton, light, round trays, of about 30 inches in diameter, have been found useful on many cotton estates. From St. Vincent it has been reported that a tray the centre of which is composed of a meshwork of fine woven cane, with a diameter of wood, has been adopted in some cases. These trays are made locally at a small price. The tray is held on the knee, and on it the seed-cotton, as it comes from the field, is thrown and spread out. In this way it is easy to separate all stained and undesirable cotton.

It has already been mentioned that cotton should not be picked when damp This is because it is impossible to properly gin seed-cotton which is not thoroughly dry, and naturally the price obtained for the resulting lint is not so high as would have been the case if ginning had been properly carried out. The advisability of thoroughly sunning the cotton before sending to the ginnery is therefore at once apparent.

The provision of due space between the cotton plants is always an important matter, but it may be pointed out that wide spacing and plenty of room are more important when a second crop of cotton is expected than when only one crop is to be gathered. At the time of the first yield, the plant is normally erect, with short lateral branches given off from the primary shoot on which the cotton bolls are borne; after this first crop has been gathered, large, spreading, lateral branches grow out from the bottom of the primary stem, and these must have plenty of room to develop if a good secondary yield is to be expected. On no account, therefore, should the plants be crowded. There should be a space of from 5 to 6 feet between the rows, and if the plants are too crowded in the rows, so that the secondary branches interfere with each other, occasional plants should be pulled out.

The growth for the second picking has to take place in the months of January, February, and March, which are usually very dry. Since the plants need as much moisture as they can get, in order to give the best results, it is important that the land be kept in such a condition that the supply of soil moisture is conserved as much as possible. Frequent hoeings should therefore be given, in order to prevent the upper layer from caking, and to provide a mulch of loose soil e surface.

BREAD-FRUITS OF THE TROPICS.

Under the above title the *Tropical Agriculturist* of November last contains an article which deals with the bread-fruit (*Artocarpus incisa*) so well known in the West Indies, and other species of Artocarpus, the fruits of which are used for food in different parts of the world. Reference is also made to a number of other tropical plants, to the produce (fruits, stems, and tubers) of which the term 'bread' has been applied by the inhabitants of the country in which they grow. Among these plants are *Treculia africana*, found in Tropical Africa (and which belongs to the same natural order—the Urticaceae—as the genus Artocarpus), *Pandanus Seram*, a species of screw-pine with huge, globular, pendant fruits, found in the Nicobar Islands, and the 'bread-fruits' of Northern Australia (*Gardenia edulis*), together with several others. Undoubtedly the most valuable kind of all is the 'bread-fruit' of Malaya and the South Sea Islands, which flourishes so well in the West Indies. The following extracts dealing with the species of Artocarpus are taken from the article in question :—

Artocarpus incisa, the bread fruit proper, known also as the 'Tahiti bread-fruit,' is, in regard to foliage, one of the handsomest of tropical trees. Growing to a height of 40 to 50 feet, it bears very large shining leaves, which are deeply cut into lobes. The fruit is oval or round in shape, and about the size of a musk-melon. The fruit of the best varieties contains no seed, the whole interior consisting of a solid mass of fleshy pulp. This, when sliced and roasted, somewhat resembles the crumb of a new loaf. It is much esteemed in Ceylon as a vegetable for curries, and may also be prepared and used in various other ways. It can therefore be understood why it forms the principal diet of the natives of the South Sea Islands. The fruit should be picked for use when it is full-grown and has not commenced to ripen, the latter state being indicated by a softness of the pulp. The green colour of the fruit is constant. The tree thrives up to 1,500 feet in the moist, hot districts of Ceylon, more especially in proximity to the sea. It is propagated by suckers from the roots, and also by layering.

Artocarpus integrifolia, or the jack-fruit, is a common but useful tree, and the produce is a standard article of food with the working classes in the Eastern tropics. Though met with in a naturalized state in Ceylon, it is not indigenous, having been originally brought from Southern India. That it has now been introduced and established in almost all tropical countries is only what is to be expected. The enormous fruit, which may weigh anything up to 112 ℔., is borne on the trunk and older branches, sometimes at the base of the trunk, or even under the ground surface. it is usually oblong and irregular in shape, though sometimes almost perfectly round or oval. The jack-fruit is a familiar object in the moist low country of Ceylon. The pulp forms an important article of food with the natives, whilst Europeans also relish it when cooked in curries. When ripe, the whole fruit has an overpowering odour, and, unfortunately, the stronger the smell the better the quality of the fruit. To those who relish the latter, however, the odour is not objectionable. The edible pulp which fills the interior consists of a solid mass of white or cream-coloured flaky substance, which is cooked and prepared in various ways, and sometimes eaten raw. It is sold in pieces at a few cents each. The seeds, which are of the size and form of dates, are roasted and utilized in the preparation of curries, etc. They are both tasty and nutritious. There are numerous varieties of jack-tree, differing chiefly in the shape and flavour of the fruit.

Artocarpus Lakoocha, known in India as the 'Monkey-jack,' is an erect tree with oblong, entire dark-green leaves, which are about 8 inches long and 4 inches broad. It is a native of Bengal, and though not a staple article of diet, its fruit is said to be sometimes eaten and relished. The fruit is roundish or oblong in shape, of the size of an orange. The tree flourishes at Peradeniya, and in Southern India up to 4,000 feet.

Artocarpus nobilis.—This is the indigenous bread-fruit of Ceylon. It is a handsome tree, usually growing to a height of about 50 feet, but sometimes to a much greater height. It has a spreading habit, with a round head, and bears large leathery leaves which are wavy at the margin. The fruit is like a thick cone, 6 to 8 inches long; it is commonly eaten by the natives, being cooked and used as a vegetable for curries, etc. It contains several round white seeds, of the form of large peas, which are roasted and eaten. The tree is confined to Ceylon, and grows in the moist low country up to 2,000 feet. It is readily propagated by seed, and is well worth cultivating as a handsome shade or timber tree.

BARBADOS INDUSTRIAL EXHIBITION.

The annual Agricultural and Industrial Exhibition was held at Barbados on December 22 last. The heavy showers of rain which fell at periodic intervals throughout the day prevented the attendance from being so large as usual, but it is estimated that the number of persons visiting the show was about 1,400.

In view of the prolonged drought experienced at Barbados during 1908, the exhibits of agricultural produce were remarkably good. An excellent collection of plant and ratoon canes was on view, the first prize for plant canes being taken by a stool of B. 376 from Turner's Hall estate. The second prize in this class was awarded to a clump of B. 208 from Welches, St. Thomas. For ratoon canes, Turner's Hall estate again won first prize, with B. 208.

The fruit and vegetable sections were filled with a good display of produce, and the prize-winning shaddocks, grape-fruit and bananas were of fine quality. The good effect of the recent showers of rain were evident in the excellent collection of vegetables—bonavist and other beans, peas, cabbages, tomatos, cucumbers, etc.

Although one or two fine animals were noticeable at the Exhibition, the show of stock was, on the whole, poor as compared with many previous years. In the horse class, a gelding 'Ivan,' shown by Mr. S. S. Robinson, gained a prize of \$6. A similar prize was awarded to Mr. Robert Arthur for a bay horse, aged 32 months.

There were only five or six cattle on view, and the goats also were below the usual standard. Among the sheep, however, there was one animal, shown by Mr. Eyare King, of very good quality.

In the poultry class there were some really fine birds, and a pen of Plymouth Rocks, which gained a first prize of \$2·50, may be especially mentioned. The best birds among the Wyandottes and Leghorns were also of very good type. Ducks were well represented, and there was an excellent collection of pigeons.

DEPARTMENT NEWS.

The Hon. Francis Watts, C.M.G., D.Sc., Analytical and Agricultural Chemist, and Superintendent of Agriculture for the Leeward Islands, has been appointed Imperial Commissioner of Agriculture for the West Indies, in succession to Sir Daniel Morris, K.C.M.G. Dr. Watts assumed the duties of the post on January 6.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, left Barbados on January 5 by the R. M. S. 'Esk,' for Antigua, to make investigations in connexion with the attack of the flower-bud maggot of cotton, recently experienced in some parts of that island.

Mr. Joseph Jones, Curator of the Botanic Station, Dominica, returned from England by the R. M. S. 'Tagus' on December 22 last, after five months' leave of absence.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Messrs. Bowen & Sons, Bridgetown, Barbados. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W., and The West India Committee, 15, Seething Lane, E.C. A complete list of Agents will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The work of Sir Daniel Morris, K.C.M.G., during his tenure of the office of Imperial Commissioner of Agriculture for the West Indies (1898-1908), is reviewed in the editorial of the present issue. A picture of the ex-Commissioner is given as a loose supplement with this number.

A new variety of orange, known as the 'King,' is reported from Florida as yielding fruit of exceptional quality. An excellent display of West Indian produce was on view at the recent Colonial Fruit Show in London (page 4).

A summary of the chief results obtained in the Barbados sugar-cane experiments during the season 1906-8 will be found on page 5.

Cotton picking, and the preparation for a second crop are briefly discussed on page 6. The market prices for Sea Island cotton continue low.

An article containing particulars of the various 'bread-fruits' of the tropics is given on pp. 6 and 7.

An account with illustrations of the insect responsible for the flower-bud dropping of cotton at Antigua appears under Insects Note (page 10).

Ceara rubber has given very promising results in Hawaii (page 11).

Notes on the establishment of agricultural banks will be found on page 13; while some recent views on insurance against hurricane damage in the West Indies are summarized in a lengthy article on page 15.

Agricultural News.

Seven volumes of the *Agricultural News* have now been completed, and the present issue forms the first number of Volume VIII.

The index and title-page of Volume VII are in active preparation, and will be issued as soon as possible.

Raphia Fibre and Wax.

Raphia fibre, produced from the leaves of the palm *Raphia Ruffia*, has in past years figured as a valuable item in the exports from Madagascar. The latest export returns of that island, however, show a considerable decline in the shipments of the fibre. While in 1905, the shipments were worth £95,113, in 1907 they had fallen to a value of £64,430. This is owing to lower prices obtained on the English market.

Raphia fibre consists of flat, straw-coloured strips, from 3 to 4 feet long. In Madagascar it is used in the manufacture of hats, mats, and as a material for wrapping up goods. In England it has been woven into superior matting and used instead of tapestry for covering walls.

The leaves of the Raphia palm also contain a wax (see *Agricultural News*, Vol. V, p. 373) of which samples have been prepared and put on the market. It fetched a price of only 1*s.* per lb., however, and since this was not regarded as a remunerative figure, no shipments have been made on a commercial scale.

St. Lucia Agricultural School.

It is intended to make a considerable extension of the area under cultivation at the St. Lucia Agricultural School, with the special object of planting more cacao and other permanent crops, and good progress was made with this work in 1907-8.

Three sections of land are being dealt with, of areas 8 acres, 10 acres, and 27 acres, respectively. These have been cleared of trees and undergrowth, enclosed with barbed-wire fencing, and the two smaller sections forked, drained, and prepared for cultivation. Temporary crops, such as bananas, provision crops, corn, cotton, pigeon peas, etc., have first been grown, but it is intended ultimately to convert the land into a cacao plantation, and young cacao has already been planted over the greater portion of these two smaller sections. Provision crops will be cultivated between the rows of cacao for a few years, and bananas have been planted for the purpose of providing shade for the young trees. The third section of land will be utilized for pasturage purposes.

This scheme was started with the object of establishing plantations of permanent crops, the returns from which will supply the revenue for the upkeep of the School, formerly provided by the Grant-in-Aid from Imperial funds which is now gradually diminishing, and will, it is hoped, be as successful as it deserves. This extended area of cultivation also provides a wider field of practical training for the pupils, and for future experiment work.

The late Hon. T. D. Foote, of Antigua.

The Hon. T. D. Foote, who for many years has been recognized as the senior planting Attorney in Antigua, died on December 9 last, at the age of 85 years. He had been connected with the 'Tudway' estates for sixty-nine years and last July completed fifty years as their attorney.

Mr. Foote during his life-time occupied many prominent positions with conspicuous ability and credit. He was a member of the Federal Councils of the Leeward Islands and of Antigua, and was formerly President both of the Antigua and the Federal Legislative Councils. He was also President of the Antigua Agricultural and Commercial Society from its formation up to the time of his death.

Dominica Agricultural School.

Prizes are awarded annually at the Dominica Agricultural School to the boy who is adjudged to have had the best kept private garden during the year, and to the boy who has done best in the field work in the same period. These awards are a stimulus to the boys, and promote a spirit of healthy rivalry, which undoubtedly has good results on the quality of the work. Mr. A. J. Brooks the Master-in-charge of the school, reports that in the past year the marks gained by each individual boy were much higher than on former occasions. The competition was so keen in the field work that it was difficult to allot the prize. The boy (George de Lachevotierre) to whom it was awarded, gained the whole 100 per cent. of the possible marks, while the four boys next in order of merit gained 99·8 per cent. of the total. In the competition for the private garden prize, F. Francis came first with 98·6 per cent. of the total marks possible.

Bath Springs at Nevis.

An analytical report on a sample of water from the Bath Springs, Nevis, supplied by Dr. John C. Thresh to Messrs. Gillespie, Bros. & Co., appeared in the *West India Committee Circular* of December 8 last. Dr. Thresh states that the water closely resembles that from the Wildbad thermal springs of Wurtemburg, which are extensively used for chronic rheumatism and gout. There is no constituent present which would render the water deleterious for drinking purposes. It is free from any signs of pollution. As the result of physical examination, it is mentioned that the water is clear and bright, and free from odour of any sort. A slight sediment of sand was deposited on standing. The total solids dissolved in the water amount to 63·7 parts per 100,000. These include a number of valuable saline constituents.

As pointed out by the *Circular*, these mineral springs are a valuable asset, and, if better known in Europe and America, should prove an additional source of attraction for invalids and their friends to the healthy and interesting island in which they exist.

Millions and Mosquitos.

The good work done by the small Barbados fish known as 'millions' in feeding upon mosquito larvae, as well as on the eggs and pupae of those insects, has frequently been referred to in the *Agricultural News* (see Vol. VI, page 138), and shipments of these fish have been made by the Imperial Department of Agriculture to several other of the West Indian islands, and also to more distant parts of the world.

While the two species of mosquito, *Culex fatigans* and *Stegomyia fasciata* are well known in Barbados, the *Anopheles* species, which are responsible for the transmission of malaria, are not found in the island, and the theory has been put forward that their absence is due to the presence of the 'millions' in the shallow streams and pools where these mosquitos would naturally breed. The *Culex* and *Stegomyia* mosquitos breed in small temporary collections of water such as those found on house-tops, and in rain-water tubs, etc.

In view of the interesting nature of this subject, a pamphlet entitled 'Millions and Mosquitos' has lately been prepared by Mr. H. A. Ballou, M. Sc., Entomologist on the staff of the Imperial Department of Agriculture, and issued by the Department. This pamphlet gives a brief account of these fish, their habits, their relation to the mosquitos, and a description of the manner in which they have been successfully transported. The price is 3*d*., post free for 3½*d*.

Analysis of Cotton Plant.

A sample cotton plant from which the cotton had already been removed, was lately submitted for analysis to the Government Laboratory, Barbados, by a planter of the island.

From Professor d'Albuquerque's statement of analysis, it appears that the total weight of the plants grown on an acre (1,556 holes) amounted to 6,224 lb., containing 4,207 lb. (67·6 per cent.) of organic or humus-forming material. The actual quantity of nitrogen in this weight of plants amounted to 113·9 lb.,—of phosphoric anhydride 26·1 lb., and of potash 51·0 lb. When the quantities of nitrogen, phosphoric acid, and potash contained in the cotton seed are taken into consideration, it will be seen that the cotton crop makes fairly extensive demands on the fertility of the soil, the amount of nitrogen withdrawn being especially noteworthy, in comparison with many crops.

It will be seen that the old cotton plants contain a very large proportion of organic matter, and although this is chiefly in the form of hard wood which takes some time to decay, the plants are undoubtedly well utilized if applied to the land for manurial purposes. When turned into the ground the incorporation of such a large bulk of material of this nature loosens the soil, and probably results at first in the loss of a certain amount of soil moisture, but decay rapidly proceeds, and the humus thus formed ultimately increases the water-holding capacity of the land.

INSECT NOTES.

Flower-bud dropping of cotton.

The insect pest of cotton known as the flower-bud maggot (*Contarinia gossypii*) has again made its appearance at Antigua, but no details are yet to hand as to the severity of the present attack. It will be remembered by readers of the *Agricultural News* that the Entomologist on the staff of the Imperial Department of Agriculture visited Antigua during February and March 1908 in connexion with the first outbreak of this insect. His report, which was published in the *Agricultural News* (see Vol. VII, p. 154), gave an account of the insect and its manner of attack on the cotton plant.

The following brief summary and the accompanying illustrations will serve to present the principal known facts in regard to this pest:—

The insect to which the name *Contarinia gossypii* has been given is a minute fly, the adult female being about 1 mm. ($\frac{1}{25}$ inch) in length. The antennae are about twice as long as the body, and the spread of wings is about 3 mm. ($\frac{1}{8}$ inch).

FIG. 1. *Contarinia gossypii*: female fly (enlarged).

The injury to the cotton is caused by the larva, a yellowish maggot, which is found in the flower bud. The female fly inserts her eggs into the tissues of the cotton flower bud and the maggots which hatch from the eggs feed inside the bud and cause it to fall to the ground.

FIG. 2. End of body of female fly, showing thread-like ovipositor (enlarged).

Buds which have fallen to the ground very rarely have maggots in them. This is because the maggots leave the buds to go into the ground for the purpose of pupating and developing into the adult winged insect.

Infested cotton flower buds can generally be recognized on the plant, because the bracts surrounding the bud always 'flare,' that is, instead of retaining their normal position close around the bud, they are turned back so as to fully expose the bud.

The attack in 1907-8 was very severe. Cotton in all parts of Antigua suffered severely. Wild cotton was found to be infested, but whether this is the natural food plant from which the flower-bud maggot has spread to the cultivated cotton is not yet known. The maggot in the bud is attacked by parasitic insects which probably exert a great influence in checking the outbreak of this pest.

FIG. 3. *Contarinia gossypii*: larva or maggot (enlarged).

It was noticed that the first attack of this pest appeared in December 1907, that early planted cotton escaped with much less injury than the late planted, and that the loss was greater also on the heavy damp soils, and in fields where there was a tendency to a rapid growth of weeds.

No remedial measures have given any definite results. The attack subsided naturally during March and April.

Scale Insects at Dominica.

At a meeting of the Dominica Agricultural and Commercial Society, held on November 30 last, under the presidency of Dr. H. A. Alford Nicholls, C.M.G., an address was given by Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, on the subject of scale insects attacking lime and other citrus fruit trees at Dominica.

Mr. Ballou referred to the severe attack of scale insect 'blight' which the lime growers of the island had experienced in 1902-3 (see *Agricultural News*, Vol. II, p. 232), and mentioned that the two scale insects which were chiefly responsible for the damage were the Mussel Shell or Purple scale (*Mytilaspis citricola*), and the Orange Snow scale (*Chionaspis citri*). Two other scales, very much alike, which were also found on the fruit trees, were the Green Shield scale (*Lecanium viride*) and the soft shield scale (*Lecanium hesperidum*). These two insects were soft greenish scales, most usually found on the undersides of the leaves and on the young twigs. They are dangerous pests, and every effort should be made by planters to get rid of them.

Particulars were given as to the manner in which these insects are hatched, and distributed from place to place, and also as to their manner of life and the way in which they feed.

The so-called 'black blight' was usually evident on trees infested with scale insects. This of itself does little harm to the tree, as the fungus lives on the excretion of the scales, and not on the juices of the leaves. All trees showing the presence of black blight should be sprayed with one of the various washes recommended by the Imperial Department of Agriculture. The dry season was the best time for carrying out spraying operations.

CEARA RUBBER IN HAWAII.

The characteristics of the Ceara rubber tree (*Manihot Glaziovii*), the best methods of cultivation and tapping, the preparation of the produce, and the results so far achieved in Hawaii, are discussed in *Bulletin 16*, issued by the Hawaiian Agricultural Experiment Station. The natural home of this rubber tree is in the dry districts of Brazil. It has been introduced into Jamaica, Trinidad and other West Indian islands, as well as into British Guiana, but is regarded as a much less valuable kind than the Para and Castilloa varieties. In Hawaii, however, it is reported to grow even better than in its native Brazilian habitat, and to have shown remarkably good results. About 360,000 trees of this species had been planted in the Hawaiian Islands up to a year ago.

In the experiments described, the young Ceara plants were raised in a nursery bed, situated in a dry and sunny district. Dealing with this stage of the work, it is mentioned that seeds of *Manihot Glaziovii* from six to eighteen months old usually germinate better than seeds fresh from the tree. The seeds usually retain their vitality from two to three years. In consequence of the thickness of the seed-coat, it is advisable, in order to hasten germination, to file the edges of the coat.

The seedlings are transferred to pots about a week after germination. Later on, the young plants are set out in the fields in holes about 2 feet across, and as deep as practicable. A good time of transplanting to the fields is at the beginning of the rainy season. Close planting is recommended, such as 10 feet by 10 feet, or 12 feet by 12 feet.

Rubber has so far been planted without admixture with any other crop in Hawaii. It is believed, however, that such crops as pine-apples, tobacco, soy beans, cassava, and garden vegetables might profitably be grown between the rubber trees for the first two or three years. In this way an early return will be obtained from the land, and the rubber trees will benefit from the cultivation given to the under crops. The mulching of rubber trees with leaves, grass, weeds, etc., is also highly recommended.

The Ceara tree frequently sheds its bark and rapidly forms a new growth. It is recommended that the entire outer bark be removed without injuring the living bark beneath, before beginning to tap the tree. The 'vertical cut' system has been found to be the best method of tapping Ceara rubber. In this, from one to six vertical cuts, with or without oblique laterals, are made. The Hawaiian officials state that a number of vertical cuts, from 3 to 6 inches apart, without oblique laterals except at the base, gives the heaviest yield of rubber and the least waste. The cuts should be very shallow, so as to avoid injury to the young bark. It is believed that daily tappings for a period of two to four weeks or more will yield much better results than tapping on alternate days, or at longer intervals over a period of several months. The recovery of the tree, too, is more rapid under the former conditions.

The best time for tapping appears to be in the night, or very early in the morning. Ceara latex coagulates very rapidly under ordinary circumstances, and as a result the flow of latex tends to stop within a very short time after tapping. By trickling a stream of water, made alkaline with ammonia, over the wound, the flow may be continued for so long as from thirty to forty minutes. This is effected by fastening a cloth bag containing water to the tree, just above the cuts made in tapping. Coagulation is brought about by the addition of a boiling concentrated solution of ammonium sulphate. The temperature of the liquid, however, should not be allowed to go above 170° F., or the elasticity of the rubber will be injured. Washing and drying follow, and after this the rubber is ready for shipment.

As already mentioned, the Ceara rubber tree flourishes very well in Hawaii, and many trees are reported to show a growth of from 10 to 15 feet in a single season, with girth measurements in proportion. The results so far achieved indicate that the first returns of rubber may be obtained at the end of five years.

GRENADA BOARD OF EDUCATION AND AGRICULTURAL INSTRUCTION.

At a meeting of the Grenada Board of Education, held in November last, the Board expressed its sympathy with the scheme of reading courses, and examinations in theoretical and practical agriculture lately established by the Imperial Department of Agriculture, and the Inspector of Schools for the colony was directed to consider in what way the Board could assist in furthering the aims and views of the Department in this matter. The Inspector of Schools has lately issued a circular letter to school managers and teachers in Grenada, in which he suggests that the examinations in agriculture at present held in the elementary schools of the colony be replaced by the Preliminary Examination in the syllabus of the Imperial Department of Agriculture, which may in some cases be taken by pupils before leaving school.

In view of this suggestion, which the Inspector of Schools has recommended shall be adopted by the Board of Education, it is seen that the scheme may probably in future be of considerable value in the educational system of the colony. The following extracts dealing with the examinations are taken from the circular letter above-mentioned:—

It is intended by the Imperial Department of Agriculture to exact a high standard of proficiency, especially on the practical side; and as it is most desirable for the older boys who think of taking up agriculture as a profession on leaving school, to have the benefits and objects of the scheme put before them early, a great deal of methodical work which cannot fail to be remunerative, can thus be conveniently achieved by the teaching body.

It is my intention to recommend to the Board of Education that in place of the examination in Agriculture hitherto conducted by the Inspectors at the annual examinations of schools, those now proposed to be held for the issue of certificates of proficiency should be substituted. One very great advantage of this proposal is that Primary School pupils who propose sitting for the Imperial Department's certificates would have, in addition to the teaching received at school, the benefit of such lectures, advice and demonstrations, as might from time to time be given and carried out in the several districts by the Department's officers. The payment of a fixed lump sum to teachers for every certificate gained at the respective examinations would, I feel sure, be sufficient incentive to them to devote their best services to the furtherance of this scheme which has been designed for no particular class, but with the object of benefiting the entire community.

GLEANINGS.

A manager is required for the Antigua Cotton Factory. Applications should be addressed to the Secretary.

The cane-reaping season in Java was lately completed, and the sugar crop for the past year is estimated at 1,180,000 tons, as compared with 1,156,477 tons in 1907.

The Ayshire bull 'Duke of Truro,' lately advertized for sale from the Stock Farm, Agricultural School, St. Vincent, has been sold to a purchaser in that island.

The number of rice mills in British Guiana increased from forty-four in 1906-7 to fifty-six in 1907-8. Many of these mills, however, are small and reported to be but poorly equipped.

The output of coffee is largely on the increase in Mexico. While the crop of last season was 33,000,000 lb., that for 1908-9 is estimated at 81,000,000 lb. (*Board of Trade Journal.*)

A resolution has been passed by the Trinidad Chamber of Agriculture inviting the agriculturists of the island to plant all their waste land with timber trees in view of the rapid destruction of forest land and the growing scarcity of lumber.

The past December has been a remarkably rainy month at Barbados, heavy showers having fallen on practically every day during the fortnight previous to Christmas. A total of 8 inches of rain was registered at Hastings from December 14 to 24.

At a meeting of shareholders of the Barbados Cotton Factory, held on December 18 last, a resolution 'that the capital of the company be increased from £9,000 to £10,906 10*s*. by the creation of 3,813 new shares of 10*s*. each' was carried by a large majority.

The present season's cotton crop in the Virgin Islands is reported to be a very good one, and will, it is thought, be three times as valuable as the crop of 1907-8. On December 11 and 12 last, seed-cotton to the value of $860 was shipped from Tortola. (*Lighthourn's Mail Notes.*)

Messrs. Sandbach, Parker & Co. report that the wet weather experienced during the fortnight before Christmas seriously hampered rice milling operations in British Guiana. Shipments of rice to the West India islands in the fortnight ended December 24 amounted to about 1,500 bags. Prices r[illegible] steady.

In connexion with the offer of the Trinidad Board of Agriculture to pay $1·00 for each 100 moths of the 'cane sucker' (*Castnia licus*) sent in by school children (see last issue of *Agricultural News*, p. 409), it may be mentioned that for the three weeks ending December 16 last, a total of 3,082 moths, collected on the Caroni estate, were received.

The agent of Messrs. Henry Head & Co., insurance brokers, in a letter to the *Dominica Guardian*, states that while the value of the property in Dominica insured against damage by hurricanes and earthquakes was a little over £16,000 in 1907, it had advanced to about £33,000 at the end of 1908.

In accordance with the resolution lately adopted by the British Guiana Court of Policy (see *Agricultural News* of November 28 last, p. 383), his Excellency the Governor, Sir Frederic Hodgson, K.C.M.G., has appointed a Commission, of which the Hon. B. Howell Jones is Chairman, to enquire into, and report upon the question of establishing an Agricultural School in the colony.

A total of $646 was awarded in prizes at the Savannah Grande peasant show held under the auspices of the Trinidad Agricultural Society at Princes' Town on December 22 last. Of this amount, $279 were granted by the Society and $367 collected locally. There were 147 entries from cane farmers in the Savannah Grande district, and the sum of $220 was awarded as prizes in the class for cane cultivations.

Following the example of Great Britain, Germany has, in recent years, made efforts to establish a cotton-growing industry in her colonial dependencies. The cotton exports from Togoland were 857 bales in 1905-6, and 1,200 bales in 1906-7. The cultivation of the crop has also been promoted in German East Africa, and the Cameroons. (*U. S. Consular Reports.*)

The *Straits Times* refers to the excellent quality of some specimens of banana fibre exhibited at a recent agricultural show at Agri, Federated Malay States. Fibre has on many occasions, it is said, been extracted and prepared from banana and plantain stems in the Malay States. This fibre is sufficiently strong for rope-making purposes, and may also be utilized in the manufacture of carpets, rugs, and window screens.

Reports from British Guiana state that the American syndicate which has purchased land in West Coast, Berbice, for rice growing, intend for the present, to limit their operations to 200 acres. The latest mechanical processes that are in use in the Southern States of America will be adopted in British Guiana, and it is stated that the necessary machinery has now been ordered, and experienced hands are being engaged to introduce the American system of cultivation.

A note appeared in the last issue of the *Agricultural News* (p. 408) dealing with experiments in molasses feeding. A quantity of 10 lb. of molasses per day was mentioned as the maximum amount given daily to horses in Germany. It may be noted, however, that the editor of the *Louisiana Planter* (October 17 last) mentions 15 lb. of molasses as the average quantity usually given per mule in Louisiana. A complete ration for a mule consists of 15 lb. molasses, 15 lb. chaffed hay, and 2 lb. cotton-seed meal, well mixed together.

AGRICULTURAL CO-OPERATION.

Encouragement of Movement in Great Britain.

With the object of promoting the principles of co-operation among small holders in England and Wales, the Board of Agriculture and Fisheries has lately made a grant of £1,200 per annum, for a period of three years, to the Agricultural Organization Society, which exists for the purpose of encouraging and assisting the practice of co-operation among agriculturists.

The chief conditions under which this grant is made, are :—

(1) That the work of the Society shall be confined to organization and auditing only. By the term 'organization' is understood : the advocacy of the adoption of co-operative methods by the agricultural classes for their benefit, the giving of advice and instruction as to the application of the principles of co-operation to industries for the benefit of the rural population, and the giving of advice and assistance to co-operative societies in the conduct of their affairs.

(2) The Society shall appoint at least three organizers for the promotion of co-operation in connexion with the cultivation of small holdings and allotments, of whom one shall be conversant with the organization of co-operative societies for the production and sale of poultry and eggs.

AGRICULTURAL BANKS.

The great assistance that the peasant agricultural class of these colonies might derive from the institution of agricultural banks in the several islands has frequently been urged by a number of advocates, although little has so far been done to demonstrate in a practical way, by the establishment of such banks, the actual value of these institutions. The subject has on several occasions of late been brought forward in Trinidad, and not long ago the Chamber of Commerce passed a resolution, asking the Government seriously to consider the question of the establishment of an agricultural bank in the colony, for the benefit of the peasant proprietor class.

The *Port-of-Spain Gazette* strongly supports this proposal, and points to the fact that the number of peasant proprietors in the colony is on the increase, and with the encouragement afforded by an agricultural bank, would tend to be a still more valuable asset in the prosperity of the island. It is mentioned that several estate proprietors in Trinidad, recognizing the fact that a peasant proprietary class ensures the existence of a steady and regular supply of labour in the district in which they have their holdings, have themselves been in the habit of making money advances to small holders, on the security of the crops cultivated by the latter.

The article in the *Gazette* concludes as follows :—

What is really required is that there should be established—in the form of a Government guarantee at least, and possibly at first even as a Government institution—a means whereby the small proprietor can secure at a reasonable rate of interest, and without fear of risking his small property by seeking advances from money lenders, the comparatively small advances he needs for his cultivation, and whereby at the same time there may be no practical risk of loss of the money to the corporation by whom it is lent. Whether here in Trinidad, as in some other countries, such an institution ought to be a purely Government scheme, the profits from which go to the State, or whether it should be merely the business of State to provide all the needful encouragements and safeguards to induce a private corporation to take up the movement is, no doubt, a matter for consideration ; but we think it cannot now be denied that such a bank is urgently wanted in this colony.

There are a number of systems under which agricultural banks or credit societies have been established in different countries of the world. Probably the most successful, however, especially among small holders and peasant proprietors, as opposed to agriculturists on a larger scale, is the 'Raiffeisen' system.

The main features of banks of the Raiffeisen type are (1) that no shares are issued, the necessary capital for making advances being raised by means of entrance fees, subscriptions and deposits, and loans bearing a fixed rate of interest : (2) that the liability of the members is unlimited, every member being jointly and severally responsible for any losses that may be incurred by the society ; and (3) that the loans advanced are for reproductive purposes only, i.e., that the object to which the money is applied is one that affords a reasonable security for the loan.

Under the encouragement of the Department of Agriculture and Technical Instruction, banks of the above class have been established in all parts of Ireland, and in 1907 there were no less than 246 in existence in that country. With similar encouragement and assistance at the start, there is no apparent reason why such societies may not be established with success in Trinidad.

It will be remembered that a pamphlet (No. 35) entitled 'Information in regard to Agricultural Banks,' containing papers on the subject by Mr. Wm. Fawcett, late Director of Public Gardens at Jamaica, and others, has been issued by the Imperial Department of Agriculture. The price of this pamphlet is 4*d.*; post free 5*d.*

AGRICULTURAL BANKS IN BENGAL.

The progress of the Agricultural credit movement and the increase in the number of small agricultural banks among small holders of land in Bengal are reported to be most encouraging.

In 1907, according to the *Quarterly Journal* of the Bengal Department of Agriculture, there were in existence in the province 165 registered rural societies with a membership of 6,903. The loans issued by these societies during 1906-7, amounted to 90,085 rupees (over £6,000). A year later (June 30, 1908) the number of rural societies had more than doubled, no less than 333 being then registered.

The greater number of these societies are of the Raiffeisen type, and experience shows that this kind of co-operation is peculiarly suited to a poor agricultural population, like that of India. The agricultural banks are not only of valuable service by advancing cheap loans, but by their methods of organization, they serve as a means of teaching thrifty and business-like habits.

What is known as 'grain banks' also exist in Bengal. These advance supplies of seed to small holders, which are afterwards returned in kind, with a small extra amount added as interest for the accommodation.

ANTIGUA AGRICULTURAL AND COMMERCIAL SOCIETY.

At a meeting of the above society held on November 20 last, Mr. H. A. Tempany, B. Sc., (acting Hon. Secretary), read a paper briefly outlining the results achieved during the past year in the work of cotton seed selection in Antigua.

At the same meeting the Hon. Dr. F. Watts, C.M.G., drew attention to the prevalance of eelworms attacking crops in the Presidency, and pointed out that attacks of this pest on sugar-cane roots were by no means unknown. He further stated that, in the case of the sugar-cane, the diagnosis of the pest from external characters would probably be a matter of some difficulty, since it would appear likely that the swellings characteristic of its presence when attacking dicotyledonous plants would not be developed on the sugar-cane.

Microscopic preparations were exhibited showing the appearance of the pest when attacking okras (*Hibiscus esculentus*).

A meeting of the Society was also held on December 18 last, under the presidency of Dr. Francis Watts, C.M.G.

A resolution, proposed by Mr. A. P. Cowley, and seconded by Mr. J. D. Harper, was carried unanimously, by which the Society placed on record its deep sense of regret at the death of the Hon. T. D. Foote, senior planting attorney of the island, and Chairman of the Antigua Agricultural and Commercial Society since its inception.

A second resolution, proposed by Mr. A. G. Spooner, seconded by Mr. S. L. Cranstoun, and also carried unanimously, was in regard to the retirement of Sir Daniel Morris, K.C.M.G. In this resolution the Society expressed its appreciation of the energy and ability of the Commissioner, and the valuable work carried out by him in the West Indies during the past ten years.

Several members spoke in support of the above resolution, among them being Mr. A. P. Cowley. Mr. Cowley mentioned that he was a delegate to the second West Indian Agricultural Conference held at Barbados in 1900, at which he was requested to advocate the appointment of a Science Master for the Antigua Grammar School. Thanks to the Imperial Department of Agriculture, a Science Master had been provided. Another matter he might mention in which Antigua had benefited through the Department was that a regular supply of good onion seed had been obtained for the island, and Antigua now produced splendid crops of onions.

On putting the matter before the Society, it was decided to hold an Agricultural Show towards the end of 1909. The Secretary was instructed to apply for the usual financial help for this purpose from the Colonial Secretary at Antigua, and from the Imperial Department of Agriculture.

Dr. Francis Watts brought before the notice of the meeting the fact that the 'flower-bud maggot' (see *Agricultural News*, Vol. VII, page 151), which was responsible for considerable destruction on some cotton estates at Antigua last year, had again made its appearance. Dr. Watts pointed out that while in the case of early planted cotton, which had already set its bolls, little apprehension need be entertained, in the case of late planted cotton, the flowers of which were but then forming, the consequence of the attack might be very serious indeed.

EAST INDIAN IMMIGRANTS IN BRITISH GUIANA.

Some interesting particulars in relation to the immigration of East Indians into British Guiana, and the conditions of labour in that colony are contained in the report for 1907-8 of the Immigration Agent General at Georgetown.

During the year ended March 31, 1908, a total of 1,855 immigrants from Calcutta arrived in the colony. Of these, seventy-two had previously resided in British Guiana, and four in other colonies.

The total East Indian population of British Guiana is returned as 132,850. Of these, 69,149 are resident on estates, 9,784 being indentured.

The following notes are quoted from the report:—

Work generally has been plentiful during the period under review, and the rates of payment have been very fair. It is satisfactory to note that in view of the increasing inclination of the labourer to cultivate rice on his own account, and of the fact that the crop time for rice and for sugar-cane takes place at the same time, planters are endeavouring to obviate the difficulty by re-arranging their times of grinding, and trying to avail themselves of that part of the year now known as the 'slack season.' In this way it is hoped to make the employment of labour more even throughout the year.

The District Immigration Agent at Berbice [whose report is similar in substance to those of agents in several other districts] states that in his area there has been plenty of work, and no complaints have been made to him of inability to obtain employment. The rates paid for the different kinds of work appear to have been fair throughout the district. Some of the estate managers experienced great difficulty in obtaining labour during the grinding season. This may be attributed to the fact that the harvesting and milling of the rice takes place during the same months as the cane grinding operations are in progress, and unless a change of the seasons can be brought about, the present state of affairs is almost sure to continue. The immigrants resident in the villages prefer working in the rice fields, as they allege that they can earn higher wages in this way than when employed on sugar estates.

Dealing with the characteristics of the coolie immigrants, and their value as settlers in the colony, the Agent General writes:—

Originally introduced to satisfy the requirements of the planting body, these immigrants and their descendants have gradually spread themselves over the country, reclaiming places formerly lying waste, and opening up new tracts of land on the creeks and rivers from the Corentyne to the North-West District. With their thrifty, industrious habits and unflagging perseverance in the face of loss by drought and flood, they form the very ideal of settlers for a tropical country such as British Guiana. In view of this, it seems a pity that the proportion of the immigrants who return to India should continue to be so large. I do not think it too much to say that with some slight encouragement, greater numbers might easily be induced to settle down in the colony. This seems the more probable, seeing that during the past twelve months, no less than 101 individuals voluntarily gave up their right to the return passage to India, which appears to indicate that they do not now value the privilege of repatriation so highly as they once did.

INSURANCE OF CROPS AND BUILDINGS AGAINST HURRICANE DAMAGE.

The system of insurance started a few years ago for the purpose of providing West Indian planters with a means of safe-guarding their cultivated crops, and also their buildings against damage by hurricane, lately formed the subject of a lengthy article in the London *Times* (see *Agricultural News*, Nov. 14 last, page 357). The question has been further followed up by Mr. E. A. Agar, of Dominica, who contributed a letter to the *Times* on October 30 last, dealing with this matter of insurance from the point of view of the planter.

Mr. Agar points out that, although there can be no doubt as to the value of this kind of insurance, yet the system has not so far been the success it deserves to be in the West Indies, owing to the fact that the scope of insurance is too narrow, and especially that the rates are too high.

Carefully collected statistics show that the actual damage suffered in Dominica during the last century as the result of hurricanes was about one-sixtieth of 1 per cent. per annum. Yet the annual premium of insurance asked for cacao and limes is 2 per cent. If the adoption of insurance became general, however, the receipts would be largely increased, in proportion to the cost of administration, and premiums would probably be placed at a lower figure.

The difficulty of properly assessing the actual damage done to permanent cultivations such as cacao by a hurricane, when the chief effects noticeable are twisted branches, broken bark, etc., partial destruction of a wind-break, is referred to, and the need of a systematic basis on which a workable system of insurance may properly be established is pointed out.

Mr. Agar puts forward the suggestion that since the actual path of a hurricane is known exactly, and is afterwards charted by the United States Weather Bureau, the chart thus issued should serve as the basis for deciding the amounts that should be paid for damage. On this system it is proposed that estates which lie within 15 miles of the line followed by the centre of the hurricane be paid 100 per cent. of the value of their crops, estates outside 15 miles but within 25 miles, 80 per cent.; within 40 miles, 50 per cent.; within 60 miles, 20 per cent.; while nothing be paid in the case of estates lying outside a radius of 60 miles.

In the case of limes, the greater proportion (about 80 per cent.) is gathered during the six months from July to December, viz., 15 per cent. of the crop in July, 30 per cent. in August, 30 per cent. in September, 7 per cent. in October, 6 per cent. in November, and 12 per cent. in December. If a hurricane occurred at any time during this period, the portion of the lime crop that had been already gathered would in justice be first eliminated from the claim, i. e., should the hurricane be experienced in July, damage would be claimed (on the system suggested above) over the whole crop; but if in August, over only 85 per cent. (15 per cent. of the fruit having been already reaped), in September 55 per cent., and so on. According to these proposals, a lime crop insured for £1,000, would be entitled to receive, if the estate were situated 40 miles distant from the line followed by a hurricane occurring in September, 55 per cent. of 50 per cent. of the amount of the policy, or £275.

With cacao the whole of the Christmas crop would be affected by a hurricane, and claims would be based merely on the distance of estates from the centre of the storm.

In further reference to this question, the following brief article, dealing with the extension of the movement for insurance against hurricane damage in the West Indies, which appeared in the *West India Committee Circular* of November 24 last, should also be of interest to planters:—

During the course of the present year a largely increased business in hurricane insurance has been transacted. This has been particularly noticeable in the case of Barbados, where the demand for this form of insurance during the hurricane season was so great that Messrs. Henry Head & Co. were at some difficulty in placing the risks, owing to the fact that underwriters at Lloyd's still look upon the business as somewhat experimental. Steps, however, have been taken to give Messrs. Lynch & Co., their local representatives, to whose energy the increase of business is very largely due, greatly increased authority for next year. There has also been a steady, though not so marked, increase of business in the other islands, and especially in Porto Rico, where several of the large modern equipped sugar factories have been covered. Messrs. Henry Head & Co. have had claims for damage to about 50 acres of cotton in Nevis, and some 15 acres in Montserrat from the blow on September 25 last. This would only be described as a mild hurricane, but it was sufficient to do a considerable amount of damage to the growing cotton. The premium paid amounted to 3*s.* per acre with a return of 6*d.* per acre in the event of no claim being made at the end of the season, and the owners have been paid £3 10*s.* for each acre damaged to such an extent as to require re-planting. Had, however, the damage been done in October, they would have received compensation at the rate of £6 per acre. This somewhat arbitrary scale of compensation does not seem entirely satisfactory, and it is suggested that in future it be somewhat elaborated. For instance, there seems no reason why the scale of compensation should not be increased for each fortnight of the season. The question of the insurance of canes has been receiving the careful attention of this same firm, but although they have obtained a considerable amount of further information, they have not yet been able to devise a satisfactory method of assessing the damage. They state that they would welcome any suggestions from practical planters. The position is this : that while the insurers are ready to indemnify planters for the actual loss they have suffered, they wish particularly to avoid paying more than this loss, as if they do so, it will inevitably mean that the premium will have to be a high one, and that the honest planter will in consequence have to suffer. On the whole, it is felt that probably the best scheme would be a somewhat similar one to that of the cotton insurance, i.e., a fixed scale of compensation varying in accordance with the period at which the hurricane occurs and the different classes of canes.

Lime Honey from Dominica. In mentioning that the Dominica Agricultural School was awarded a silver Banksian medal at the recent Colonial Fruit Show for oranges and lime honey, the *West India Committee Circular* refers to the novelty of the latter product. Messrs. Travers & Sons, Ltd., reported upon the honey, and stated that it is very suitable for the English market. Honey is generally sent over to England from the West Indies in casks containing about 3 cwt., and shipped both in the set and liquid condition. As near as could be judged, West Indian lime honey would at present be worth about 23*s.* to 25*s.* delivered in London. Shipments of honey from Jamaica to England commence each year about March, and continue until late in the autumn.

MARKET REPORTS.

London,—December 22, 1908, The West India Committee Circular; Messrs. Kearton Piper & Co., December 22, 1908.

Arrowroot—No quotations.
Balata—Sheet, 2/1 to 2/5; block, 1/7½ to 1/8 per lb.
Bees'-wax—£7 5s. to £7 12s. 6d. for fair to good.
Cacao—Trinidad, 57/- to 70/- per cwt.; Grenada, 50/- to 59/- per cwt.
Coffee—Santos, 26s. 7½d. per cwt.; Jamaica, no quotations.
Copra—West Indian, £18 10s. to £19 per ton.
Cotton—St. Vincent, no quotations; Barbados Superfine, 17d.; West Indian Sea Island, good medium to medium fine, 12½d. to 13½d.
Fruit—
Bananas—Jamaica, 4/6 to 6/- per bunch.
Limes—Not wanted.
Pine-apples—St. Michael, 3/- to 6/-.
Grape Fruit—5/- to 8/- per box.
Oranges—Jamaica, 4/- to 7/- per box.
Fustic—£3 to £4 per ton.
Ginger—Steady, but quiet.
Honey—21s. to 31s. for darkish to palish.
Isinglass—West India lump, 1/10 to 2/- per lb.
Lime Juice—Raw, 11d. to 1/2 per gallon; concentrated, £16 5s. per cask of 108 gallons; distilled oil, 1/8 to 1/9 per lb.; hand-pressed, 5/- to 5/6 per lb.
Logwood—£3 to £4 5s. per ton; roots, £2 to £3 per ton.
Mace—Quiet.
Nutmegs—Quiet.
Pimento—Quiet.
Rubber—Para, fine hard, 5s. 1d. per lb. on the spot.
Rum—Jamaica, 3/3; Demerara, 1/6 to 1/8, proof.
Sugar—Crystals, 14/9 to 16/- per cwt.; Muscovado, no quotations; Syrup, 14/6; Molasses, no quotations.

New York,—December 11, 1908.—Messrs. Gillespie, Bros. & Co.

Cacao—Caracas, 12½c. to 14c.; Grenada, 12c. to 12½c.; Trinidad, 12½c. to 13c.; Jamaica, 9½c. to 11½c. per lb.
Cocoa-nuts—Jamaica, select, $22·00 to $23·00; culls, $13·00 to $14·00; Trinidad, $21·00 to $23·00; culls, $12·00 to $13·00 per M.
Coffee—Jamaica, ordinary, 7c. to 7½c.; good ordinary, 8½c.; washed, 9c. to 11½c. per lb.
Ginger—9½c. to 13c. per lb.
Goat Skins—Jamaica, 54c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
Grape Fruit—Florida, $2·50 to $3·50 per barrel.
Limes—No quotations. Market overstocked.
Mace—29c. to 33c. per lb.
Nutmegs—110's, 10¼c. to 10½c. per lb.
Oranges—Jamaica, $2·00 to $3·60 per barrel; $1·00 to $1·50 per box.
Pimento—4c. per lb.
Sugar—Centrifugals, 96°, 3·86c.; Muscovados, 89°, 3·36c.; Molasses, 89°, 3·11c. per lb., duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Jas. A. Lynch & Co., December 28, 1908; Messrs. T. S. Garraway & Co., January 4, 1909.

Arrowroot—St. Vincent, $4·00 to $4·50 per 100 lb.
Cacao—Dominica and St. Lucia, $10·00 per 100 lb.
Cocoa-nuts—$13·00 for unhusked nuts.
Coffee—Jamaica and ordinary Rio, $8·50 to $10·50 per 100 lb.
Hay—$1·25 per 100 lb.
Manures—Nitrate of soda, $62·00 to $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $72·00 to $75·00; Sulphate of potash, $67·00 per ton.
Molasses—No quotations.
Onions—Strings, $2·00; loose, $1·20 per 100 lb.
Potatos—Nova Scotia, $1·30 to $1·60 per 160 lb.
Peas—Split, $6·75 per bag of 210 lb.; Canada, $3·40 per bag of 120 lb.
Rice—Ballam, $5·75 (180 lb.); Patna, $3·50; Rangoon, $3·10 per 100 lb.
Sugar—No quotations.

British Guiana,—Messrs. Wieting & Richter, December 26, 1908; Messrs. Sandbach, Parker & Co., December 26, 1908.

Arrowroot—St. Vincent, $9·00 per 200 lb.
Balata—Venezuela block, 32c.; Demerara sheet, 48c. per lb.
Cacao—Native, 16c. to 18c. per lb.
Cassava—60c.
Cassava Starch—$5·00 to $6·00 per barrel of 196 lb.
Cocoa-nuts—$12·00 to $16·00 per M.
Coffee—Creole, 12c. to 13c.; Jamaica, 11c. to 12c. per lb., slow.
Dhal—$4·75 per bag of 168 lb.
Eddos—$1·56 per barrel.
Molasses—No quotations.
Onions—Madeira, 2¼c. to 2½c. per lb.
Plantains—8c. to 24c. per bunch, plentiful.
Potatos—Nova Scotia, $2·50 per 100 lb.
Potatos—Sweet, Barbados, $1·68 per bag.
Rice—Ballam, $5·80; Creole, $4·50 to $4·60; Seeta, $6·00.
Split Peas—$6·40 to $6·50 per bag (210 lb.); Marseilles, $4·50 to $5·00.
Tannias—$1·92 per bag.
Yams—White, $2·88; Buck, $2·16 per bag.
Sugar—Dark crystals, $2·20 to $2·35; Yellow, $2·60 to $3·10; White, $3·60 to $3·80; Molasses, $2·00 to $2·10 per 100 lb. (retail).
Timber—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—$3·75 to $5·75 per M.
— Cordwood—$2·40 to $2·64 per ton.

Trinidad,—December 26, 1908.—Messrs. Gordon, Grant & Co.

Cacao—Venezuelan, $11·75 to $12·50 per fanega; Trinidad, $11·50 to $12·25.
Cocoa-nuts—No quotations.
Cocoa-nut Oil—63c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8½c. to 9½c. per lb.
Copra—$3·00 to $3·10 per 100 lb.
Dhal—$4·60 to $4·75 per 2-bushel bag.
Onions—$2·00 to $2·25 per 100 lb. (retail).
Potatos—English, 90c. to $1·10 per 100 lb.
Rice—Yellow, $5·40 to $5·60; White, $4·50 to $4·80 per bag.
Split Peas—$5·75 to $6·00 per bag.
Sugar—American crushed, $5·00 to $5·10 per 100 lb.

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CONTENTS.

Live Stock in the West Indies.

THE nature and quality of the live stock of a country generally form a sure indication of the degree to which agricultural progress has advanced in the community, since among the first points recognized by those anxious to improve the conditions of agriculture are the importance of introducing or developing the most valuable qualities in the various kinds of stock kept, and of breeding only from the best.

The West Indies can scarcely be regarded as a stock-raising country, since agricultural pursuits form the chief industry. Yet, as animals are required in fairly large numbers for (1) labour, (2) meat, and (3) milk, the matter of their breeding and rearing is an important consideration, and should receive every attention compatible with the possibilities of these colonies in that direction. The large number of animals imported every year indicate that there is abundant scope for home production, and the raising of stock should certainly form a more considerable feature in the economy of many estates than it does at present. A secondary reason which may be mentioned in favour of this policy is the value of the pen manure produced.

It is obvious that a good deal more yet remains to be done in levelling up the general character of West Indian stock, and further that, under present conditions, the full returns that might be possible from meat and milk production are now realized in a few cases only. Among the chief reasons for this state of affairs are : (1) want of care in selection and breeding, by which is meant not only the use of male animals of inferior character, but also that, in many cases, insufficient attention has been given to the selection of those particular breeds which are best adapted to West Indian conditions ; (2) imperfect realization of the fact, in the case of cattle, that the various breeds may be regarded as specially adapted either for beef production, or for milk production, but that it is useless to expect both qualities in a high degree in the same breed ; and (3) the inadequate nature of the food supply on many estates, which frequently is insufficient for keeping any number of live stock throughout the year. There is a distinct need in most of the islands for the improvement of existing pastures, and for more attention to be paid to the provision of drought-resisting fodder crops in greater quantity and variety. In this connexion, it is satisfactory to note that a number of experiments in the growth of fodder crops of various kinds have, during the past few years, been carried out at Dominica, Antigua, St. Vincent, and Grenada. Crops of special value in this direction are Guinea grass, sorghum, imphee, teosinte, reana, Para grass, cowpeas, etc.

In many of the West Indian islands, the small-holdings class form a prominent section of the agricultural community, and the prosperity of these people would undoubtedly be much enhanced if each possessed one or more cows, goats, sheep, or pigs, in proportion to the extent of their holdings, and understood how to manage the animals to the best advantage, and to feed them properly. In some of the islands, Barbados for instance, it cannot be asserted that the peasantry wilfully neglect the keeping of small stock. Almost every holder has his cow, sheep, goat, or pig; unfortunately, however, in too many cases, the inferior character of these animals, and the fact that they are insufficiently fed are only too obvious. Further, it may be pointed out, that the method of management very commonly adopted with cows is not one likely to induce the maximum return of milk. Only too often these animals eke out their existence, tethered by a short rope, on a bare pasture, unprotected from sun or the attacks of flies, and with an insufficient supply of water.

Small holders, however, have not the knowledge nor the means for stock improvement, and cannot be expected to take any initiative in the matter. In England, the improvement of the various breeds has been largely brought about by private enterprise, such as that of big landowners, with the encouragement of Agricultural Societies ; and these efforts have made English live stock famous for their excellence all over the world. As regards the West Indies, the responsibility of introducing improvements must be with Departments of Agriculture and Agricultural Societies. Under the conditions which exist in these colonies, little can be expected from private enterprise, although the result of efforts made by individual estate owners, both towards breeding superior animals, and in the culture of forage crops, are, in a way, a lesson to all in the neighbourhood.

It may fairly be claimed that much good work has been done in this direction by the Imperial Department of Agriculture during the past ten years. Male animals of superior type—stallion horses and donkeys, bulls, rams (sheep and goats), and boars, all of improved breeds—have been purchased for the West Indies, and these animals have been stationed in various islands and moved about from place to place as occasion required. Their services have in all cases been available to small holders at very low fees. Previous to the establishment of the Imperial Department of Agriculture, a Government Stock Farm was already in existence at Skerrett's, Antigua, and this served a very useful purpose in that colony. At Trinidad, too the Government Farm is a valuable institution, since is not only sets a standard of quality for stock owners, but is the means through which new blood is introduced into the colony, and also provides facilities for the purchase, by private estate owners, of animals of various breeds, and superior type. The Barbados Agricultural Society has lately taken a step in the same direction. As already mentioned in the *Agricultural News*, the Society has recently imported a Catalonian jack donkey of superior character, for the purpose of encouraging mule breeding in the island.

As practical demonstrations of the possibilities of stock improvement are thus brought before the general agricultural public, there should be an increased tendency for more care to be exercised in breeding, and the progress made will, in all probability, be more rapid and noticeable.

It is probable that few agriculturists without considerable practical experience in rearing animals realize how profoundly the character of a given breed may be modified, even in the course of a few generations, if the work is carried out with care and skill. In order to attain the best results, it is important that too much is not attempted at once. In the case of cattle, since some breeds are adapted for laying on flesh, and others for milk production, or, it may be, of special value for purposes of labour, it is useless to attempt to develop two of these qualities to a high degree in the same breed. If the highest success in breeding is to be reached, the stock raiser must decide which characteristic he desires to encourage, select the breed which seems best adapted for his purpose, and concentrate his skill on the development of their primary quality alone. General purpose animals are seldom very satisfactory. If milk is required, such breeds as the Hereford should be avoided, and full advantage taken of the natural qualities of the Jersey, Guernsey, and Ayrshire, while if stock raising for the butcher is the primary motive, an opposite policy in the choice of breeds will naturally be followed.

SUGAR INDUSTRY.

Sugar-cane Experiments at Barbados.

Some further details of the experiments with seedling and other canes, as well as of manurial experiments with sugar-cane, carried out at Barbados in the season 1906-8, under the direction of the Imperial Department of Agriculture, are given below, in order to complete the particulars contained in the last issue of the *Agricultural News*:—

In addition to the smaller plots, on which the seedling canes are first tested, the plan has been adopted, with the co-operation of estate owners, of growing some of the more promising varieties, on areas of from ½-acre upwards, under ordinary estate conditions. In this way a number of different varieties can be raised in the same field, and the plots are large enough for the canes produced to be separately crushed at the estate mill, the juice being measured and analysed. Data is thus available for ascertaining the sugar yield and other qualities of a given cane, when grown under practical conditions.

In the year 1907-8, opportunities have been afforded on a number of estates, of comparing the yields of some of the best known seedling varieties with the White Transparent on areas varying in extent from ½-acre to 7 acres. The average results in the case of some of these varieties have been as follows:—

Cane.	Yield of muscovado sugar in pounds per acre.	Increase in value per acre compared with White Transparent.
White Transparent	4,319	...
B. 1,719	4,456	$ 2·48
B. 1,753	4,563	4·42
B. 208	4,637	5·76
B. 376	4,946	11·35
B. 147	5,256	16·96

The returns given by B. 208 and B. 376 are especially satisfactory, and account for the increasing popularity of these seedlings at Barbados.

In that portion of the report on these experiments dealing with the production of new seedlings, it is mentioned that of the 219 seedling canes planted for the first time in 1906, twenty-two passed the standard as regards their field characters and the richness and purity of the juice. They were replanted in 1907, and will also be again grown and tested in the present season.

At the end of 1907, no less than 6,690 new seedlings were obtained, of which twelve were the result of artificial hybridization. About two-thirds of the above seedlings were transplanted in the field, and will be tested in the reaping season of 1909.

In 1902, fourteen seedlings were obtained from B.208 and D.95, planted in chess-board fashion. On the crop returns of the past two seasons from the small experiment plots, the yields given by five of these (B. 8,660, B. 8,600, B. 8,651, B. 8,520, and B. 8,609, in the order mentioned) have exceeded the return from White Transparent.

Manurial experiments with sugar-cane were carried out during the season at Dodds Botanic Station, and on five sugar estates situated in different parts of the island. With one exception—Hopewell—all the estates are in the black-soil districts. At Dodds plantation the manurial trials have been in progress for eight successive years in Lower Bay Tree field, and for seven successive years in Summervale field, and during each season, the same manure in kind and amount, has been applied to each plot. From the results obtained in the manurial experiments, over a period of thirteen seasons, the following general conclusions have been drawn, as regards the effect of manuring on the yield of sugar from plant canes, under the conditions of soil, rainfall, and agricultural treatment existing at Dodds:—

1. The application of nitrogen in the form either of sulphate of ammonia, nitrate of soda, or dried blood leads to large and profitable increases of yield.

2. Sulphate of ammonia is superior to nitrate of soda.

3. Under some circumstances (a very heavy clay soil?) organic forms of nitrogen, like dried blood, persistently applied, may equal sulphate of ammonia.

4. The most favourable application of nitrogen is 40 to 60 ℔., equal to about 200 to 300 ℔. of sulphate of ammonia. In some cases this may best be applied all in June, in others it had best be applied partly in January and partly in June.

5. Application of superphosphate appears to diminish the yield of sugar. It is possible that this may be due to a premature ripening of the cane whereby the period of growth is diminished. Or it may be due to a prejudicial effect upon the nitrogenous materials of the farmyard manure, caused indirectly through the organisms of nitrification and denitrification. The latter effect might be removed by applying the phosphate at a different time.

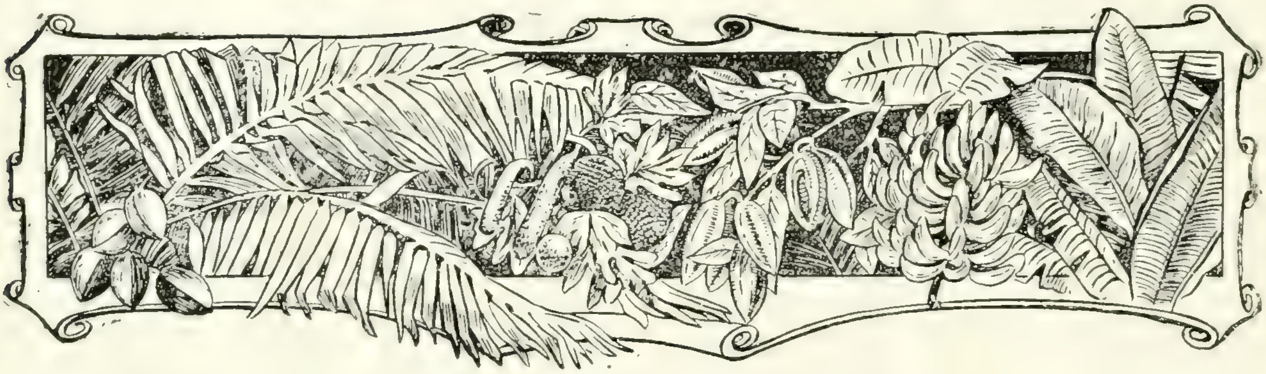
6. The increase of yield in two recent seasons produced by the application of superphosphate requires further experiment. It may be due to the beginning of exhaustion of phosphate in the no-phosphate plot. It may, however, be accidental and due to causes not connected with the application of phosphate.

7. Where basic slag has produced increase of yield, it appears probable that it may be due rather to the presence of the lime in the slag than to the presence of phosphate, in which case it might be replaced by an application of slaked lime.

8. The application of potash leads to profitable increase of yield, and 60 ℔. of potash (contained in 120 ℔. of sulphate of potash) applied all in January, or partly in January and partly in June, give the best results.

DEPARTMENT NEWS.

Mr. Alleyne G. Howell, Chief Clerk at the Head Office of the Imperial Department of Agriculture, Barbados, returned from England by the R.M.S. 'Nile,' on January 18 last, after six months' leave of absence.



WEST INDIAN FRUIT.

SHIPMENT OF IMMATURE CITRUS FRUIT.

To no agriculturist does the temptation to occasionally ship green or immature produce present itself more strongly than to the grower of citrus fruit. This is on account of the varying rate of market prices, the perishable nature of the produce, and the natural anxiety of the grower to dispose of as much of his crop return as possible when the supply is lowest, and prices are at a favourable figure. The unwise and short-sighted nature of such a policy, from the point of view of Jamaica orange growers, was lately referred to in the *West India Committee Circular*, and in the *Porto Rico Horticultural News* (November 1908) the same question is briefly but forcibly discussed.

New York fruit salesmen have frequently had occasion to complain of the receipt of inferior and unripe oranges and grapefruit from Cuba, and now, it is asserted, a considerable quantity of immature fruit is also being sent forward from Porto Rico.

The bad effects that result on the industry at large, and more particularly on the demand for produce from the particular district, are clearly set forth in the article to which reference has been made.

When green and immature oranges are placed on the market, they have to be ripened with artificial heat, or in many cases artificially coloured before a sale can be effected. Such produce is not likely to be of first-rate flavour, and instead of tending to increase consumption and extend the market of that fruit, is more likely to result in transferring the demand to some other kind of fruit.

It is obvious, too, that the shipper who sends poor fruit is sacrificing a long future for a short present. Good prices are obtained at first, because the small supply—assuming, as is generally the case, that the poor fruit is sent in early in the season, in order to get first place on the market—leaves the buyer no choice. With increased supplies, however, the shipper of inferior fruit is deserted. Furthermore, it has been noticed that even when he sends good produce he has trouble in obtaining adequate prices, since buyers are chary of him, and judge his fruit by past experience.

The result of personal experience is brought forward as evidence of the injury in reputation done to the fruit of a particular locality in consequence of one or two shipments of poor quality, and the need for properly grading the fruit, and packing it in an attractive manner. The writer mentions that being in New York last year, at a time when Porto Rico oranges were shipped in large quantity to that market, he visited retail fruit shops to ascertain the prices obtained for produce from the island in which he was interested. In numbers of shops, however, Porto Rico fruit was not on sale ; and when enquiry was made as to the reason for this, one of the following replies was always forthcoming : 'The fruit was not up to the standard ;' 'It was poorly graded;' 'The grades were not uniform or reliable ;' 'It was not attractively or well packed;' or 'It did not keep well.'

RIPENING OF TROPICAL FRUITS.

Some interesting investigations, by Mr. H. C. Prinsen Geerligs, dealing with the chemical changes that take place during the ripening of some tropical fruits of Java, are reported upon in a paper lately published in the *International Sugar Journal*. The fruits dealt with included the banana, mango, tamarind, and sapodilla.

Bunches of bananas, as is well known, are generally cut from the tree in an immature state, and when the fruit is hard, tasteless, and unfit for food. After a few days the edible matter becomes tender, sweet, and well-flavoured, but again a few days later the fruit is unpalatable, owing to over-ripeness and decay. Some of the changes that go on in these stages were investigated by Mr. Geerligs.

A notable feature was the loss of weight that takes place during ripening. Twenty green bananas, kept in a cool place, were found to have lost an average weight of 8 grammes each at the end of seven days. In another case, ten green bananas of a smaller variety, weighing originally 502·5 grammes, lost 15·5 grammes in four days, and by suitable means it was shown that of this loss, 2·3 grammes were given off as carbon dioxide.

From a bunch of bananas, cut in the immature state, a single fruit was analysed daily for a week, so that the changes in progress might be observed. At the end of the week the remaining bananas were in a stage of over-ripeness.

The most prominent feature of the ripening process in the case of the banana was the rapid transformation of starch into sucrose or cane-sugar. At the first analysis of the unripe fruit, the percentage of starch in the banana pulp was 30·98, and of sucrose 0·86 per cent. Two days later, the starch had decreased to 24·98 per cent. while the sucrose present was 4·43 per cent. On the fifth day from the first analysis, the banana (almost ripe) contained 13·89 per cent. of starch, and 10·5 of sucrose, while on the following day there were present in the fully ripe fruit only 9·59 per cent. of starch, but 13·68 per cent. of sucrose. The percentages of glucose and fructose also increase during ripening, and in the fully ripe fruit

In the over-ripe bananas, the proportion of sucrose shows a falling off (10·36 per cent.), which is explained by the fact that inversion of the sucrose into glucose and fructose takes place. The latter two products also undergo further breaking up, which probably accounts in part for the large amount of carbon dioxide formed in after-ripening.

Mangos also are usually picked when unripe. At that time they are hard, acid, and flavourless, but the after-ripening process renders them tender and full-flavoured in a few days.

The chief features of the ripening process with the mango are changes in the proportions of starch, sucrose, and citric acid, together with a loss in weight. Five mangos, which originally weighed 1,139·3 grammes, lost 18 grammes in weight, when kept for three days in a cool place. Of this loss, 4·558 grammes consisted of carbon dioxide. As in the case of the bananas, a mango fruit from a parcel having practically the same initial maturity was daily analysed. As a result, it was observed that the proportion of starch present declined from 8·53 in the unripe mangos to nil in the ripe fruit, while on the other hand, during the same period, the sucrose increased from 2·57 to 12·27 per cent. Later on the sucrose becomes hydrolysed and split up into glucose and fructose. Citric acid, which is the only acid found present in the mango, diminished from 1·31 per cent. in the unripe stage, to 0·10 in the ripe fruit. The acid is not neutralized in any way during the ripening process, but is destroyed as the result of the respiratory process, and given off chiefly as carbon dioxide.

Tamarinds were also dealt with, and the composition of the pulp of these fruits, in several stages of ripeness, extending over a period of more than two months, is given by Mr. Geerligs. Starch was present in green tamarinds to the extent of 3·33 per cent., but five weeks later all the starch had been transformed—not into sucrose—but into a mixture of glucose and fructose. During the ripening process, the proportion of these two sugars present increased from 0·40 and 0·33 per cent. to 20·4 and 11·6 per cent. respectively. The acid of the tamarind is tartaric acid; of this, the total proportion present in the green fruit is 4·85 per cent., and in the ripe fruit, 16·4 per cent. In ripening, too, a large amount of water is evaporated, causing the fruit to shrink considerably within the pod. A good deal of acid is consumed by respiration after the tamarind has reached the stage of ripeness.

Another tropical fruit, the ripening of which was investigated, is the sapodilla. Sapodillas are plucked tree ripe, in which state they are green and hard, and contain gutta-percha and tannin dissolved in the sap, which render the fruit unfit for eating. After keeping for a short while, however, the gutta-percha and tannin become insoluble, and the fruit becomes full-flavoured and palatable. In the ripe sapodilla, the coagulated gutta-percha may be seen as a series of white threads, while the tannin is deposited as insoluble matter in certain cells.

These changes constitute the whole phenomena of ripening in the case of the sapodilla. There is no transformation of starch into sugar, since no starch whatever exists in the fruit at any stage of the ripening process. Further the amount of sugar present before and after full ripening is the same.

It may be added that from the result of experiments described in detail, Mr. Geerligs comes to the conclusion that, in the case of the banana and the mango, the rapid transformation of starch into sugar is one of the vital processes of these fruits, and not a consequence of the action of some enzyme or soluble ferment.

PIPE CALABASH AT GRENADA.

In reference to the note on the Pipe Calabash at St. Lucia, which was given in the *Agricultural News* of December 12 last (page 389), Mr. R. D. Anstead, Agricultural Superintendent of Grenada, writes as follows, under date of December 28 last:—

It will be of interest to you to know that the seed of *Lagenaria vulgaris* received here at the end of June last from St. Lucia grew readily, and that a number of plants were raised from it. These fruited freely, and the fruits are now ripening off.

The plants were allowed to climb, so that none of the fruits developed curved necks naturally. Experiments were, however, conducted with a view of producing the curve by making the fruits press against fixed supports, stakes, etc. Some success was obtained, and the experience gained will, I think, enable us to obtain gourds of the required shape from the next crop.

SOIL SURVEY WORK.

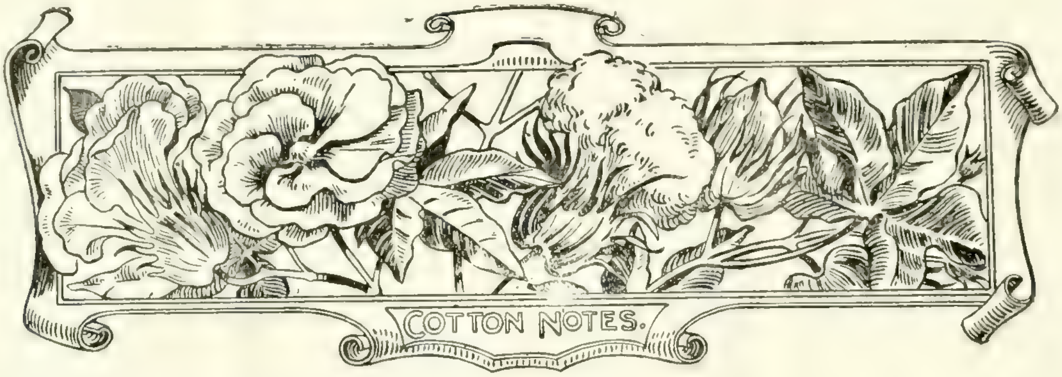
A work of great value to agriculturists in the United States, more especially to those who propose to enter upon the cultivation of land in new districts, has been carried on by the Soil Survey of the Bureau of Soils during the last ten years. The character of a good deal of the land surveyed is unknown, and the work aims at showing the suitability and capacity of this land for new crops and industries, the information thus provided supplying in great part the local experience of agriculturists which is available in older countries.

Soils are examined to determine (1) their texture, or the relative amounts of coarse and fine particles of which they consist; (2) their structure, or the relationship of these particles; (3) the proportion of organic matter present, and (4) their natural drainage and topography. Soils which are closely similar in all these respects are said to belong to the same soil type, and under similar climatic conditions the type is capable of producing similar crops. At present nearly five hundred types of soil are recognized. Several soil types in a given region differ only in texture, and are similar in other respects. Such a group of soils is called a series.

In the reports of the Soil Survey officials, the characteristic appearances of the various soil types, together with the uses to which they are put, and the agricultural methods adopted, are described in detail. The value of these reports is increased, since they contain, in every case, an account of the crops raised in other areas where the same type of soil has been met with, and suggestions are made as to new crops or new methods.

From these reports the individual farmer may learn the relationship of the soil upon his own holding, not only to the other soils in the immediate neighbourhood, but also to soils of the same character in widely separated regions. He may thus observe the results obtained by other farmers upon such soils, and apply their experience to his conditions.

According to the *Yearbook* of the U.S. Department of Agriculture, the area surveyed and mapped in 1906-7 was 13,158,400 acres, and there have been completed to June 30, 1907, surveys covering a total of 89,118,080 acres. The work has been so distributed as to include every large representative district in the United States, and has given a knowledge of the soil resources of the colony far beyond what was ever conceived of before.



WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, writing under date of January 4 last, report as follows on the sales of West Indian Sea Island cotton :—

West Indian Sea Island cotton has been neglected since our last report, only 15 bales from St. Kitt's having been sold, at 14*d.* per lb.

The pressure to sell Carolina Sea Islands still continues, and to-day's quotations are : $11\frac{3}{4}d.$ per lb. for 'fine' quality, $12\frac{3}{4}d.$ for 'fully fine,' and $13\frac{1}{2}d.$ for 'extra fine,' but buyers are not disposed to purchase. In the meanwhile there are several thousand bales in Charleston.

COTTON GROWING IN UGANDA.

AGRICULTURAL INSTRUCTOR WANTED.

In connexion with the developing cotton-growing industry of Uganda, the services of a junior Agricultural Instructor are now required in the Protectorate. The engagement is to be for three years with passage paid both ways, and the salary attached to the appointment is from £250 to £300 per annum, depending on age and qualifications. A good knowledge of, and practical experience in cotton growing is essential. Applications to be sent to the Imperial Commissioner of Agriculture, Barbados.

According to the report of the British Cotton-growing Association for 1907, the prospects of the cotton industry in Uganda are most promising. While in 1906 the shipments of lint were 800 bales of 400 lb. each, in 1907 no less than 3,000 bales were exported.

The cotton grown in Uganda consists of Upland varieties, and the better grades are worth 2*d.* per lb. over 'middling' American lint.

The following is quoted from the *Annual Report* referred to :—

Unfortunately there has been no expert to superintend and advise on the work, and a large proportion of the Uganda cotton is most inferior. Several varieties of seed have been given out indiscriminately, with the result that the cotton is much mixed. A great deal of the lint is also badly stained, which is probably due to careless cultivation.

In this connexion it should be noted that it is extremely difficult to find agricultural experts with the necessary scientific training, and sufficient knowledge of cotton to direct and control the establishment of the industry in a new country. The Council of the Association have strongly urged the Government to inaugurate Agricultural Scholarships, to enable young men who have had a practical and scientific training at home to spend two or three years in studying the cultivation of cotton and other tropical products in the West Indies, Ceylon, or Egypt.

ANTIGUA SUGAR AND COTTON IN LIVERPOOL.

Reports on the samples of sugar and cotton from Antigua that were sent to the late Colonial Products Exhibition at Liverpool were published in the *West India Committee Circular* of December 22 last. Messrs. Bushby, Son & Beazley, of Liverpool, to whom the Antigua sugar exhibits were submitted, wrote as follows :—

The sugars are excellent in quality and eminently suitable for manufacture, refining, or direct consumption, according to grade. Taking the samples according to number, the muscovado sugar from various estates range from dark to light brown, evidently of good strength, and would be used chiefly by refiners, who would more particularly monopolize the darker shades, the light colour qualities finding their way to the Baltic, where there is often a ready sale for moderate quantities Samples Nos. 9 to 15, good, brown, refining centrifugals, ranging through several shades, and from various factories, are carefully made, and would find a ready market in any quantity, and at all times with our refiners Samples 16 to 18 are grey-white crystals, which in their present state might be expected to go directly into consumption through the grocers ; and the same remarks apply in a still greater degree to Nos. 19, 20, and 21, since sugars of such bright complexion meet with a very ready market and good prices from grocers here. The samples of molasses are of good quality, and useful for feeding and distilling purposes.

Messrs. Wolstenholme & Holland, of Liverpool, report on the Antigua cotton as follows :—

We have carefully examined samples of Antigua exhibit. No. 56—seed—is sound, and worth £6 15*s.* to £7 per ton. Samples 52, 53, and 54—ginned cotton—are all rather soft and slightly stained, value 13*d* to $13\frac{1}{2}d.$, sample 53 being the best, and worth the latter price. No. 55 seed-cotton—is rather stained, but fair staple, value about 13*d.* when ginned. All these cottons are rather too soft in staple, and not equal to previous crops from Antigua. We should recommend planting a seed from another island, producing a more robust fibre, for there is no doubt that the Antigua crop has suffered either from bad weather or insect pests during last season, and we are rather afraid that the seed, though quite sound from a crushing point of view, may have suffered with the lint.

WEST AFRICAN RAMS.

The accompanying pictures of three of the four West African rams imported from Lagos by the Imperial Commissioner of Agriculture in September 1907, will give an idea of the size and character of these animals.

The rams in question are of a type which received high commendation at an Agricultural Show held at Lagos early in 1907, and the introduction of such animals into the West Indies appeared to be the best means of improving the breed of woolless sheep, also probably of African origin, which are so common in these colonies.

Fig. 4. White Chief.

Of the four rams, two still remain the property of the Imperial Department of Agriculture, and two have been sold to estate owners. The two retained by the Department are 'White Chief' (Fig. 4), and 'Egba.' White Chief is stationed at the Lunatic Asylum Farm, Barbados, while Egba

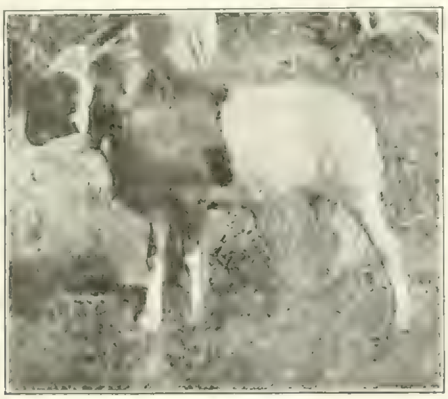


Fig. 5. Alaki.

has been sent to the Stock Farm at the Agricultural School, St. Lucia. The fee for service in the case of each animal is 2*s*. It may be mentioned that Egba weighs about 140 lb., and stands 33 inches high at the shoulder.

The ram 'Alaki' (Fig. 5) has lately been sold to a stock owner at Barbados, while 'Yourba' (Fig. 6) was early in 1908 purchased for breeding purposes at St Vincent.

Fig. 6. Yoruba.

As already mentioned in the *Agricultural News* (Vol. VII, pp. 73 and 408), the lambs resulting from a cross between these rams and the woolless sheep of the West Indies show superior characteristics, and the male lambs have been in frequent demand by stock raisers in several of the islands.

MILK ADULTERATION IN TRINIDAD.

Milk adulteration has been on the increase of late in Trinidad, and the Board of Health of the colony recently appointed a Committee of its members to consider what further steps could be taken to secure to the public a purer supply of milk.

Milk vendors in Trinidad have to take out a licence, and also to wear a distinctive badge. The fact that these licences have sometimes been taken away from retailers who have been convicted on several occasions of watering their milk, has apparently not been successful in stopping adulteration, since the dishonest vendor is usually able to induce someone else to take out a licence for him in another name, and thus the law is evaded. This point is one of the chief matters to be discussed by the Committee.

The present system of surveillance, and the punishment meted out to offendors do not appear to be sufficiently stringent, and stronger measures are advocated by the *Port-of-Spain Gazette*. It is suggested that there should be gradually instituted a system of requiring all milk not sold at fixed shops or stands to be subjected to examination of some kind before being offered for public sale, and further, that the penalty for milk adulteration (which is now 2*s*. per part of added water for the first offence, and double that for the second) should be increased to a minimum of 5*s*. for the first offence, and £10 for the second, with peremptory imprisonment for further infringement of the law.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Messrs. Bowen & Sons, Bridgetown, Barbados. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W., and The West India Committee, 15, Seething Lane, E.C. A complete list of Agents will be found on page 3 of the cover.

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Agricultural News

VOL VIII. SATURDAY, JANUARY 23, 1909. No. 176.

NOTES AND COMMENTS.

Contents of Present Issue.

The general conditions associated with the breeding and rearing of live stock in the West Indies, together with the possibilities of improvement in this direction, are discussed in the editorial.

Notes on experiments with seedling and other canes, as well as manurial experiments, carried out at Barbados in the season 1906-8, will be found on page 19.

Interesting investigations on the chemical changes which go on during the ripening of some tropical fruits have lately been made in Java. The results are summarized on page 20.

Expert reports on samples of sugar and cotton from Antigua that were recently exhibited in Liverpool are given on page 22. Photographs and notes on West African rams in the West Indies appear on the following page.

The question of mechanical tillage and improved sugar-cane machinery is attracting increased attention in British Guiana. (page 26.)

The reports, for the year 1907-8, on the Botanic Stations at Antigua and in British Honduras are reviewed on page 27.

Investigations carried out in England have shown that the cost of preparing the well-known Bordeaux mixture may be reduced by three-fifths, without diminishing its effectiveness (page 29).

Rice in British Honduras.

Rice is grown on small areas in British Honduras, and the Superintendent of the Botanic Station makes one or two references to this crop in his latest *Annual Report* About 1 acre of rice was grown at the new Station in 1907, the seed being dibbled into the ground in rows in the month of June. A fairly good crop was produced. An area of 30 acres was also planted with the cereal at Boltons Bank estate, and made excellent growth. The variety grown is a large full-grained kind, and if produced in greater quantity should find a good market. A small rice-hulling machine was introduced into the colony for the first time in 1907, by a private firm at Belize, and a fairly large quantity of rice was prepared by its means during the year. In view of the large areas of suitable land that exist, the enterprising rice grower would find abundant scope in British Honduras.

Woodlands and Rainfall.

The growing scarcity and increasing price of the best kinds of timber are now frequently urged as strong reasons for preserving, and, wherever possible, extending wooded areas. Another reason for tree planting which should commend itself to agriculturists in countries that not infrequently suffer from drought, is the beneficial influence of woodlands upon rainfall and the flow of springs. This question is discussed at considerable length in the *Indian Forester* (1908, No. 2), and from the data brought forward the conclusion is drawn that the moisture content and the chances of rainfall are much greater in districts where forests or plantations of considerable area exist than over bare lands. Observations made in different localities, it is stated, have shown that woodlands increase the rainfall from 8 to 15 per cent. above the normal. Their neighbourhood also exerts a beneficial influence in maintaining a more uniform flow of springs.

Foot-and-Mouth Disease.

Foot-and-mouth disease is an excessively contagious malady, chiefly affecting cattle, sheep, goats, and swine. Horses, dogs, cats, and even poultry have also been victims of infection, the last three classes being particularly dangerous as carriers of infection. The death rate from this disease is low, but since, in practically all cases of attack, it runs through the whole herd, numbers of animals are seriously damaged. Cattle are the chief sufferers. The disease is characterized by the eruption of blisters about the mouth and feet, this being accompanied by constitutional disturbance. The appetite is lost, and, in the case of cows, the milk flow stops.

In a letter on this subject from the Bureau of Animal Industry, U. S. Department of Agriculture, to the *Cuba Review*, attention is drawn to the fact that foot-and-mouth disease has been known to occur in tropical countries, having caused the loss of 10,400 cattle in Madras Province in 1894-5. Subtropical lands have also suffered severely at different times.

French Colonial School.

Further details relating to the French colonial school at Havre, recently mentioned in this journal (see *Agricultural News* of Dec 26, last, p. 402), have lately come to hand, from which it appears that its establishment (by the French Cotton-growing Association) is one of the results of the efforts now being made to develop cotton growing in French colonies, the main object of the school being to give a practical training to young men seeking employment on colonial cotton plantations.

The institution has been equipped with modern machinery sufficient to ensure adequate instruction in cotton ginning and baling, and oil-crushing methods. It has been arranged that pupils shall go through a ten-months' course of study, which will include instruction in the methods of cultivating and handling cotton and other colonial products, and the preparation of these articles for export.

The establishment of this school is, at the least, an interesting experiment, and may have far-reaching results on the development of cotton growing in French colonies.

Agricultural Banks in Western Australia.

Among the many systems of agricultural banks which have of late years been established in various countries, none appear to be more beneficial to the small settler than the system lately adopted in Western Australia. The Agricultural Banks of that colony are Government institutions, but are self-supporting, and have been in existence but a few years. Advances are made on the security of the land for clearing, fencing, draining, and stock breeding, and that these institutions are for small cultivators only is indicated by the fact that loans to any one person must not exceed a certain sum. The terms on which money is loaned are extremely reasonable: during the first five years, interest at 5 per cent. per annum is charged, and after that the principal is repayable by instalments over a period of twenty-five years, with interest on the portion still owing. These banks are already recognized as one of the greatest factors in the agricultural development of Western Australia.

Organization in the Cacao Industry.

The very considerable fluctuations that have taken place in the price of cacao in the past few years have led to a desire among producers to form an organization for the purpose of controlling the price of the product, and so arranging the supply that its market value shall not fall to an unduly low figure.

The United States Consul at Rio de Janeiro states that steps have already been taken in Ecuador, San Thomé, San Domingo, and Trinidad to form such an organization as that suggested, and the success of the movement must depend ultimately upon the line adopted in Brazil, which is the largest cacao-producing country in the world. A large proportion of the Brazilian cacao growers, however, are producers on only a small scale, somewhat similar to those of Grenada, and could not afford, without outside assistance, to hold their crops for any length of time, as may be required by the organization.

The promoters of this organization claim that their purpose is not one of speculation, but that their object is to resist the efforts of the speculators, who, they assert, have been responsible for the late violent fluctuations in the price of cacao.

It may be mentioned that while the total world's production of cacao is placed at about 340,000,000 lb. per annum, Brazil is at present responsible for an output of about 54,000,000 lb. per year.

Tobacco Growing in British Guiana.

The proposal was brought forward at the late annual meeting of the British Guiana Board of Agriculture that an effort should be made to develop tobacco growing in suitable districts, in the hope that it might later form one of the minor industries of the colony. Certain small areas on the West Coast of Berbice have, in the past, been devoted to this culture, and, it is stated, that leaves of a very satisfactory quality have been produced. It was mentioned at the meeting that Virginian tobacco grew very luxuriantly in the colony, but was subject to attack from a large number of insects. The matter was referred to a committee for consideration.

Tobacco could no doubt be grown satisfactorily in British Guiana, as in many of the West India islands, but the experience of the past in Trinidad, St. Kitt's and St. Vincent shows that unless an expert is imported, a good deal of investigation work as to methods of curing and fermentation is necessary before an article can be produced on a commercial scale, which will yield a remunerative return.

Hedges at Antigua.

Considerable pains have been taken to develop serviceable hedges around the Experiment Station at Skerrett's, Antigua, and the efforts made have met with such success that the hedges now established are an object-lesson to estate owners in the island, where, as a matter of fact, very few hedges are in existence.

The bread-and-cheese plant (*Pithecolobium Unguis-Cati*) makes a very ornamental fence. It has been found at Antigua that the easiest way to establish a bread-and-cheese hedge is by sowing seeds *in situ*. The Barbados cherry (*Malpighia glabra*) is a fast grower and makes a serviceable hedge. It is mentioned that a fence of cherry plants is best established by sowing seed in a nursery, and transplanting the seedlings when 8 inches to 1 foot high.

The logwood (*Haematoxylon campechianum*) is the most impenetrable of all the hedges, and thus the most serviceable. Like the bread-and-cheese fence, this is best established by sowing seed at the place where the hedge is to be grown.

INSECT NOTES.

Combating Mites and Lice on Poultry.

The accompanying notes, dealing with lice and mites on poultry and in poultry-houses, supplement the information given on this subject in a recent number of the *Agricultural News* (November 14 last, p. 362). These notes, with others, have lately been issued in leaflet form by the United States Department of Agriculture :—

There are several varieties of lice that attack poultry. They subsist mainly on the feathers, and perhaps on the epidermal scales. They are found largely on the head and neck, under the wings and about the vent, and when present in large numbers they cause the fowls much discomfort. Pyrethrum, or Persian insect powder, powdered sulphur, and some of the various preparations on the market, such as the louse powders, are good in combating these pests. The hens can be dusted with one of these powders after they have gone to roost. Have the powder in a box with a perforated cover, grasp the fowl by the legs, and shake the powder well among the feathers. Dust at least three times, at intervals of about a week, in order to catch the lice which hatch out after the first dusting. The mites subsist on the blood of the fowls, and are not usually found on the bodies of the bird, except when at roost or on the nest. During the day they inhabit cracks and crevices of the walls, roosts, and nests. Sitting hens are often so annoyed that they are compelled to leave the nest in order to relieve themselves of these parasites. The free use of kerosene about the nests and perches is useful in fighting the mites. The walls of the house may be sprayed with kerosene, the operation being repeated every three or four days for two weeks. Insect powders are of little avail.

The following method has proved excellent in ridding houses of mites and lice when the weather conditions are such as to permit the birds being kept outside the house for five or six hours : Close all the doors and windows, and see that there are no cracks or other openings to admit air. Get an iron vessel and set it on gravel or sand near the centre of the house; place a handful of shavings in the vessel, saturate this with kerosene oil, and then sprinkle on the top of the shavings a quantity of sulphur, estimated at the rate of 1 lb. to every 90 or 100 square feet of floor space. Instead of using the shavings and kerosene, the sulphur can be saturated with wood alcohol. When everything else is in readiness, light the material and hastily leave the house. There is very little danger of fire when proper precautions have been taken to have plenty of soil beneath the vessel. Allow the house to remain closed for three or four hours, at the end of which time one can safely conclude that there are no living beings inside. Now throw all the doors and windows wide open, so as to drive out the sulphur fumes thoroughly, and then the fowls may be allowed to enter. Let them in one by one, and as each enters catch it and dust it well with insect powder, which will destroy the pests on the birds.

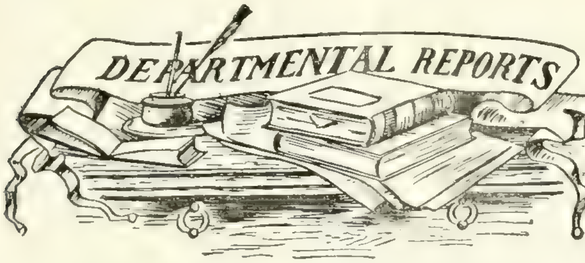
Tobacco dust is also good to use instead of insect powder. The birds and house will have been freed from vermin for a time, but the eggs of the insects have not been destroyed, and in a week another swarm will be hatched out. Therefore, it will be necessary to repeat the operation once or twice before the pests are exterminated. After this, care should be taken to see that no strange fowl be admitted to the house or yard without having been thoroughly rid of lice, as one affected hen will contaminate all the rest.

MECHANICAL TILLAGE AND SUGAR-CANE MACHINERY IN BRITISH GUIANA.

Owing to the prevailing scarcity of labour, the question of the economical introduction of mechanical tillage has naturally attracted more attention in British Guiana than in islands such as Barbados, where an abundant labour supply is available. In the course of its summary of agricultural conditions in the colony during 1908, the *Demerara Argosy* of January 2 last, refers to this subject, and mentions the chief difficulties in the way of a more extended adoption of mechanical implements and up-to-date machinery for dealing with the sugar-cane crop. The following is quoted from the article in question :—

Some further extension of mechanical tillage has taken place in connexion with cane growing, but in view of numerous failures attending efforts in this direction during past years, planters are chary of incurring large expenditure on implements, mules, and motors, until thorough experiment demonstrates the adaptability of improved methods of mechanical tillage to the conditions prevailing in this colony. The heavy rainfall experienced and the stiff nature of much of the soil under cultivation render the tillage problem a difficult one, especially in view of the open system of drainage that has to be adopted. It may be said, however, that the lighter and more porous soils can be efficiently tilled by means of light implements, similar to those in use in Louisiana. The greatest demand for labour occurs during the reaping seasons, more particularly in connexion with cane cutting, and it is improbable that a machine will be designed capable of reaping canes. A large number of labourers have to be found employment when reaping is not in progress, that is during about thirty-six weeks each year, so that they may be on the spot ready to assist with harvest operations. In Louisiana the harvest hands required are drawn from the neighbouring cotton States and given employment during about three months of the year. The reaping of the cotton crop is finished before the Louisiana cane harvest begins.

It is fully recognized that cane unloaders for feeding canes to mills are of considerable value as labour-saving appliances, and although their installation is costly, every owner of a large plantation has their erection in view as suitable opportunity offers. Crushers to prepare canes for mills, now that large quantities of seedling canes have to be milled, are a necessary adjunct to a crushing plant, and they are being largely adopted. The majority of the crushing plants in this colony can be improved upon. The possibility that the Naudet process might prove successful and render it unnecessary to improve and add to the crushing power of mills, had some effect in delaying outlay in this direction. It does not seem likely however, that the Naudet process will ever supersede heavy crushing plants. As regards boilers, evaporators, etc., the majority of the factories in this colony are fairly well equipped.



ANTIGUA: BOTANIC STATION, EXPERIMENT PLOTS, AND AGRICULTURAL EDUCATION, 1907-8.

During the year 1907-8 the total expenditure on the Antigua Botanic Station and Experiment Plots amounted to £514 14*s.* 9*d.* while a sum of £106 1*s.* 7½*d.* was realized from the services of animals, sale of plants, seeds, etc.

The increase in the number of economic plants distributed from the Station has been very marked. While in 1906-7 only 2,880 plants were sent out, the number advanced to 14,522 in 1907-8. These include 8,800 lime plants.

Trial cultivations of fodder and other crops were made on the experiment plots attached to the Station. The results of experiments in the distillation of essential oils from lemon grass and citronella are included in the report.

Useful experimental work with different crops have been continued at Skerrett's and Scott's Hill. This work includes trials of different varieties of cassava, sweet potatos, yams, onions, ground nuts, citrus fruits, etc., as well as some important experiments with cotton. Increasing attention has been given to the growth of green dressing crops. As the result of the continuous care given to the hedges around Skerrett's Station, they have now developed into very strong and ornamental fences.

The rainfall at the Botanic Station for the year under review was 50·95 inches. This is 7·79 inches less than the fall experienced in 1906-7, but 3·21 inches in excess of the average of the past five years.

The cotton area of Antigua in 1907-8 was 2,508 acres, being an increase of 683 acres on the area planted in 1906-7. Attacks from insect pests were unusually prevalent during the year, and, in many cases, occasioned serious loss to cotton planters. From the above area, a total of 189,318 lb. of cotton was shipped up to March 31, 1908.

As in past years, the work of the Agricultural and Science Master comprised a course of instruction in chemistry, agriculture, and animal physiology at the Girls' High School, and lectures to students at the Female Training College.

The work in the school garden continues to be generally satisfactory. The number of boys receiving instruction has been seventeen, including seven agricultural scholars.

BRITISH HONDURAS: REPORT ON BOTANIC STATION, 1907. By E. J. F. Campbell, F.R.H.S., Superintendent.

As mentioned in last year's report, a new Botanic Station for British Honduras, covering an area of about 20 acres, is being prepared on a suitable site near Belize. During 1907, the work of clearing the land, providing for drainage, preparing roads, and getting the soil into condition for cultivation, has naturally demanded first attention from the staff. This work has been pushed forward as far as possible, but a good deal yet remains to be done.

A considerable number of useful crops, including potatos, yams, cassava, beans, peas, rice, corn, cotton, plantains, pine-apples, etc., have been grown on the area already cleared, to test the nature and capacity of the soil. Practically all these crops gave very good returns. Small plantings of fruit trees, e.g., mango, mangosteen, loquat plum, and of Para rubber plants have also been made.

About 4 acres of the cleared land have been laid out as an ornamental and recreation ground attached to the Station. A number of beds were prepared, in which have been set out about 1,400 ornamental plants, including crotons, bougainvilleas, ixoras, hibiscus, lagerstroemias, etc. All these plants are reported to have grown well.

Practically all the shrubs, plants, and nursery stock have now been removed from the Belize Garden—which was formerly the chief Botanic Station of the colony—to the new Station.

Subsidiary nurseries exist at Stann Creek and Corosal. Para rubber, cacao, nutmegs, and vanilla have all done well at the former Station in the year under review. Congo coffee trees (*Coffea robusta*) also gave an excellent crop. The plants at Corosal suffered much from drought.

It is mentioned that there is but a small demand for economic plants in the colony. Planters give their chief attention to bananas, sugar-cane, and maize. The total number of plants distributed in 1907 was 8,061. Of these, no less than 7,600 were logwood plants.

The receipts for the year were $192·14.

METHOD OF TAPPING ASSAM RUBBER.

The *Experiment Station Record* (No. 11, 1908) furnishes the following account of an improved method of tapping Assam rubber (*Ficus elastica*), together with the results of some tapping experiments carried out in India, in which this method was used:—

The tapping instrument consists of an ordinary carpenter's chisel from ½-inch to ¾-inch wide. This is driven into the bark vertically in a series of cuts, each the width of the chisel, across the direction of the trunk or branch being tapped, and with at least ½-inch space between each incision. The rows of incisions are made about 6 inches apart on the stems and branches of the tree. Thin strips of lead are secured to the stem underneath each row, by which the latex is conducted into cups. By this method of tapping about two-thirds of the latex is said to find its way into the cups, while one-third coagulates on the cuts.

In 1905, eight trees planted in 1882, were tapped in this manner, and gave an average return of 6 lb. of rubber per tree. The same trees were again tapped in 1906, and the yield for individual trees varied from 2½ lb. to 10 lb. Four trees, planted in 1889 and 1890, were tapped in a similar manner during the same years. In 1905-6 the estimated yield per tree was about 2 lb. of rubber, and in 1906-7 the yield per individual tree varied from 1¼ lb. to 3¼ lb. With this method of tapping, the cuts made in the previous year appeared to heal well and to be hardly noticeable, and it is thought probable that the Assam rubber trees may be tapped more frequently than by the older methods of tapping in which the bark is seriously injured.

The latex coagulating on the cuts is said to require no further treatment. That gathered from the cups is mixed with a 2-per cent. solution of formalin, poured into clean bamboo troughs and covered from the direct rays of the sun. The coagulation is said to be complete within a day's time. After the strips of rubber have dried they are rolled into balls.

GLEANINGS.

Coffee growers and merchants in Porto Rico have combined to request the United States Government to impose an import duty of 6c. per ℔. on foreign coffee.

The sugar exports from Demerara in 1908 amounted to 110,657 tons, as against 99,207 tons in 1907. Rum was shipped last year to the extent of 2,188,336 gallons, compared with 2,107,129 gallons in 1907.

Increasing areas of Crown lands in Trinidad and Tobago were taken up in 1907-8. While in 1906-7, the total grants issued were 991, amounting to 8,004 acres; in the following year, grants to the number of 1,157 were made, the total area taken up being 9,494 acres. (*Annual Report.*)

It will be seen from the advertisement which appears on the last page of the cover of this issue, that the English thorough-bred stallion 'Beau II,' now stationed at St. Vincent, is offered for sale. The price of the animal is £80, or next best offer.

The Jamaica Agricultural Society have come to the conclusion that the results obtained in cotton growing in that island have not yet justified the appointment of an expert as Instructor, but they recommend that experiments be carried out under the supervision of the present Instructors.

From the latest *Annual Report* on Barbados, it is seen that in the year 1907-8, the total exports from the island to Canada increased by 31 per cent., compared with the previous year, while the exports to the United States decreased by 66½ per cent. in the same period.

The Secretary of the British Guiana Board of Agriculture is inviting orders for the purchase of 25,000 Para rubber plants (*Hevea brasiliensis*) at present in the nursery of the Botanic Gardens. The plants will be ready for delivery from February 1 next. (*Demerara Argosy.*)

Cassava is mentioned by the Superintendent of the British Honduras Botanic Station as a crop which might profitably be cultivated on a fairly large scale in the colony. The tuber forms the chief food of the Caribs in the Stan Creek districts, while cassava starch is sold at from 12c. to 15c. per quart in Belize.

Reports from Jamaica state that cane reaping commenced in the earliest districts towards the end of November, and in the beginning of December. The sugar industry appears to be in a very satisfactory condition at present; a good crop is anticipated on all hands, and in the past year a good deal of money has been spent on improvements, especially in the purchase of better machinery.

In the last five years the importation of molasses into Great Britain has increased by 164 per cent., reaching 84,000 tons in 1908. The greater portion of this quantity is used for distillation, but the demand for molasses as a cattle food in England has also shown a large increase in recent years.

Banana and plantain flours appear to be increasingly utilized in the preparation of various food-stuffs in England. It may be mentioned that Messrs. Huntley & Palmer, the well-known biscuit makers of Reading, are now including 'banana biscuits' (prepared from dried and powdered bananas) in their list of products.

Bee keeping is very generally carried on in the country districts of Cuba, although the hiving and other arrangements are of a very primitive character. The Italian bees thrive especially well in the island. In 1906, there were exported from Cuba no less than 6,712,533 ℔. of honey, together with 1,383,464 ℔. of bee's-wax. Of this, about 50 per cent. was shipped to Germany. (*Louisiana Planter.*)

The Permanent Exhibition Committee of Dominica is continuing its efforts to popularize West Indian limes in England. Every mail a crate of the fruit is sent to the Secretary of the West India Committee for free distribution, and many hundreds of boxes have been given away, together with suitable literature. The awards that have regularly been made to Dominica limes at the Colonial Fruit Shows should also go far to make the merits of the fruit known in Great Britain.

The rubber industry attracted a good deal of attention in Madagascar a few years ago, but owing to the late fall in prices, little or no planting is now being done, according to the latest British *Consular Report.* In 1906, the export of rubber from Madagascar was valued at £301,518, but in 1907 it fell to £209,705. Plantations of from 700,000 to 800,000 trees in the northern part of the island have practically been abandoned.

An experiment in the culture of maize was started at the Antigua Botanic Station in 1907-8, with the object of improving the grade of corn grown in the island. A return of 112 ℔. of unshelled corn was obtained from a plot $\frac{1}{10}$ acre in area. From this, seed selection, on the lines laid down by the U. S. Department of Agriculture, will be carried on, and it is hoped a higher grade of corn will be evolved.

The varieties of cotton grown last year at the Botanic Station, British Honduras, comprised Sea Island, King's Improved, Russell Big Boll, and Peterkin. Owing to lack of labour, it was found difficult to give full attention to the cultivation, and the Curator mentions that of the four varieties, Sea Island cotton suffered most from want of attention. King's Improved and Russell Big Boll appeared to be more hardy, and yielded a good crop.

White ants are proving such a pest in the Federated Malay States, that the States Government and the Malay Planters' Association have joined to offer a reward of £5,000 to any person who can devise 'a simple method of extermination.' It has also been arranged that the Government Entomologist shall give special attention for several years to the question of white ants and various methods for their destruction.

STUDENTS' CORNER.

Seasonal Notes.

JANUARY.

1st Fortnight.

Planters will now be replacing cuttings that have failed to grow in the fields of young canes, with, so far as possible, top plants. Note the difference in growth of top plants and pieces of cane at this period, as compared with the time when first planted. Planters will be putting finishing touches to fields in which young canes are growing. In the heavier fields drains will be made to allow the water to run off when the rains come. The later made farmyard manure will also be applied.

As fast as the cotton ripens it will have to be picked, care being taken to keep the various qualities separate, and any cotton that is at all damp should be sunned and sufficiently dried before being sent to the factory. Damp cotton, ginned in that condition, usually causes what is known in the trade as 'gin-cut cotton.'

The bulk of the lime crop has now been harvested, and attention must be paid to the condition of the soil. Now is the time to apply pen manure so as to strengthen the trees for the flowering period.

Observe methods of gathering cacao. What are the reasons for burying cacao shells? Study changes which take place during fermentation of beans, and note difference between cacao fermented for several days, and that washed and dried at once, the latter being the practice adopted by the peasantry.

2nd Fortnight.

On sugar-cane estates, similar work to that carried out in the first fortnight of the month will still be in progress. Early cane manure will be appplied towards the end of the month. Where planters have field trash to spare, they will, in many instances, use it to mulch thinner portions of the fields.

Branches of cotton plants that have been attacked by the red maggot should be cut off and destroyed. Those planters who have already gathered their first picking of cotton will prune off any dead wood on the plants.

In the case of lime trees, note date of appearance of first blossoms. Observe the time taken from opening of flower to falling of fruit. Commence to remove dead wood.

Students on cacao estates should make themselves thoroughly acquainted with the construction and working of artificial driers, both 'hot houses,' and the Gordon cacao drier.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the principal elements of plant food, and how does the plant obtain them?

(2) What are the principal troublesome weeds in the fields in your neighbourhood? How do weeds injure crops?

(3) Have you observed any connexion between the kinds of soil, and the kinds of weeds which grow on them? Give some facts.

INTERMEDIATE QUESTIONS.

(1) Describe the principal manures useful as providing potash.

(2) What manures are used for plant canes and ratoon canes respectively? How are they applied?

(3) Describe the curing of cacao, and discuss the value of fermentation in producing a well-cured sample.

BORDEAUX MIXTURE.

The eighth report on the work of the Woburn Experiment Fruit Farm, England, deals entirely with insecticides and fungicides, their preparation and uses. Among the investigations carried out at the Station, the results of enquiry into the chemistry of the well-known fungicide Bordeaux mixture has shown how the cost of that substance may be reduced by three-fifths without in any way diminishing its effectiveness. The following is an extract from the report dealing with this subject:—

The investigation into the nature of the compounds formed by the action of lime on copper sulphate has shown that as many as six different substances may be present in Bordeaux mixture. The substance which is present when the mixture is made in the ordinary way, by adding excess of lime in the form of milk to copper sulphate, is a double basic sulphate of copper and calcium. The carbonic acid of the air acts on this, forming carbonates and sulphates of the metals, and it is owing to the gradual re-formation of sulphate of copper in this way that the mixture possesses fungicidal properties. But the basic sulphate of calcium present is first decomposed before the basic sulphate of copper is attacked, so that a certain time always elapses before the mixture begins to behave as a fungicide. This is a great disadvantage, but can be obviated by using only just sufficient lime to precipitate all the copper in the first instance, for, in that case, a precipitate is formed which contains none of the basic calcium sulphate. There is, further, a great advantage in thus reducing the lime used, for the basic copper sulphate precipitated is a less basic compound than that in ordinary Bordeaux mixture, and it liberates two and a half times as much copper sulphate by the subsequent action of the air; so that a mixture as efficient as the ordinary one may be obtained, with the use of only two-fifths of the quantity of copper sulphate.

To make this mixture, clear lime-water instead of milk of lime, must be used; 6lb. 6½ oz. of copper sulphate are dissolved in water in a wooden pail, and into another large tub of water 2 or 3 lb. of fresh lime are put. After being stirred several times, and allowed to settle, 86 gallons of the clear lime-water are tapped off, and mixed with the copper sulphate, the whole being made up to 100 gallons by the addition of soft water.

The mixture must always be tested to make sure that all the copper has been precipitated, and if this is not so, a little more lime-water must be added, and the testing repeated. If the liquid gives no red colour with potassium ferrocyanide it is in a proper condition for use. The stain produced on a steel knife is often recommended as a test for unprecipitated copper, but it is neither delicate nor safe. Any excess of lime added above the minimum required for the complete precipitation of the copper weakens the mixture, and represents a direct loss of money. The scorching of foliage sometimes noticed after the application of Bordeaux mixture may be caused by the same substance (the copper sulphate liberated) as that which gives it its fungicidal properties, and if so, such scorching is inevitable; it is certainly a fallacy to suppose that it can be avoided by using excess of lime: indeed, it is very probable that the scorching often observed is due to the large excess of lime used.

The mixture made with lime-water as above does not scorch foliage any more than the ordinary mixture, probably less, and has been in constant use in Italy for many years.

RICE CROP IN BRITISH GUIANA.

The fortnightly report, dated January 9, of Messrs. Sandbach, Parker & Co., of Georgetown, on the present conditions of the rice industry in British Guiana, contains the following notes :—

The weather for the past fortnight has been drier, but we have had several good showers, which should benefit the young crop. Milling has been pretty general, and cleaned rice has come to hand in larger quantities.

Prices continue firm, and some millers are holding for higher prices. Shipments to the West India islands, and to French and Dutch Guiana during the past fortnight amount to only 512 bags.

RUM MANUFACTURE IN BRITISH GUIANA.

The latest *Excise Report* of the Comptroller of Customs of British Guiana indicates that there has recently been a considerable decline in the amount of rum manufactured in the colony. There has also been a falling off in the number of distilleries at work.

The total number of licensed distilleries in British Guiana during 1907-8 was forty-two, while forty-eight were in existence in 1906-7. The districts in which the reductions have taken place are South Essequibo (2), Essequibo River (2), Georgetown (1), West Coast, Berbice (1).

The quantity of rum manufactured at the distilleries last year amounted altogether to 1,996,623 bulk gallons and 2,966,401 proof gallons, this being 559,723 bulk gallons and 809,821 proof gallons less than the quantity made in 1906-7. As compared with the average quantity manufactured in the preceding four years, last year's figures are less by 457,978 bulk gallons and 656,303 proof gallons.

The decrease in the output of rum has been spread over all the twelve Fiscal Districts, with the exception of North Essequibo, which alone showed an advance in the quantity manufactured.

During the four years from 1903-4 to 1906-7 inclusive, the largest quantity of rum was manufactured in the East Coast of Demerara, where 697,823 proof gallons were turned out in 1906-7. In 1907-8, however, the output in the East Coast District fell to 491,542 proof gallons, and the West Coast District of Demerara took the leading place, with a total of 574,872 proof gallons. The smallest amount of rum is made in the Essequibo River District.

The relative outputs of rum in the three counties of the colony in the past two years have been as follows : Demerara, 2,538,473 proof gallons in 1906-7, and 1,987,646 proof gallons in 1907-8 ; Berbice, 873,130 proof gallons in 1906-7, and 649,463 proof gallons in 1907-8 ; Essequibo, 364,618 proof gallons in 1906-7, and 329,292 proof gallons in 1907-8.

There has also naturally been a decline in the quantity of rum exported from British Guiana in the past few years. While the amount shipped abroad in 1905-6 was 3,536,784 proof gallons, valued at $584,300, the export in 1907-8 had fallen to 2,640,988 proof gallons, worth $464,928. Compared with the average of the previous four years, the rum exports of 1907-8 show a decrease of 734,299 proof gallons in quantity, and of $8,859 in value.

POULTRY NOTES.

British Egg-laying Competition.

An egg-laying competition, organized by the Utility Poultry Club, on somewhat similar lines to the one carried out in Australia in 1907-8, the results of which were reported in the *Agricultural News* of November 14 last (page 362) was lately completed in England. It must be said, however, that, taking the average returns, the Australian birds far surpassed in laying power those taking part in the British competition.

The awards were made, not on the basis of results from individual birds, but on the value of the eggs laid by pens of six young birds of the same breed. Each pen had a separate house, together with an area of grass land on which they could take necessary exercise.

In feeding the birds, no attempt was made to obtain high egg averages by forcing, and only such food was given as every poultry-keeper is able to obtain. By conducting the competition in this way, its value is increased, since the ordinary poultry-keeper is furnished with an object-lesson as to the laying capacity of the different breeds under conditions such as he can arrange on his own holding. The competition extended over a year, and it may be mentioned that two meals only were given during the summer weather. The morning food consisted of biscuit meal, granulated meat, barley meal, and pea and bean meal. It will be seen that this is a very nutritious, but not too fattening a ration. In the evening wheat or oats were fed. But little maize was given, and this only in cold weather. On account of its fattening properties maize, if given in any but small quantity, tends to diminish the yield of eggs. Flint grit and oyster shell were always available.

As already mentioned, the prizes were awarded on the basis of the value of eggs laid. By this means only was it possible to ensure that the most profitable, and therefore the most useful pen would win. Eggs under 2 oz. in weight were treated as second grade produce, and their value reduced by 10 per cent.

In the results, the White Wyandotte breed easily distanced all other competing breeds, pens of this variety gaining the first five places, together with the eighth, tenth and eleventh. The winning pen laid 994 eggs in the year, valued at £4 19*s.* 9*d.*, while the second pen was very little behind, with 991 eggs, worth £4 18*s.* 4*d.* In pen No. 3, 946 eggs were laid, value £4 11*s.* 1*d.*, and the fourth set of birds laid 922 eggs, also worth £4 11*s.* 1*d.*

Other breeds which gave good evidence of their laying power in this competition were Plymouth Rocks and White Leghorns.

If a laying competition similar to the above were organized by the Agricultural Societies of the several islands, interesting and useful results as to the egg-laying capacities of the different breeds under West Indian conditions would probably be elicited. It should throw some light, too, on the influence of West Indian feeding stuffs on the rate of egg production.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market during the month of November:—

The depression in trade that has been so general throughout the year shows little or no sign of improvement, but, on the contrary, with the seriously falling revenue, the close of the year seems to have become chronically gloomy. In the early weeks of December, the provision markets are mostly somewhat more busy than usual and the spice markets are naturally affected. In the following notes it will be seen that the dealings in West Indian produce were nothing more than normal, though the supplies were, in most cases, good.

GINGER.

At the first spice auction on the 4th of the month, the offerings of Jamaica amounted to 214 bags, but 7 only were sold at 53*s.* 6*d.* for good common. Over 400 packages of Cochin and Calicut were brought forward, and bought in at the following rates: 52*s.* to 53*s.* for small and medium native cut; 40*s.* for good brown Calicut; and 35*s.* to 36*s.* for fair washed Cochin. On the 11th, the demand continued very slow. There was no Jamaica offered, and the bulk of the Cochin and Calicut offered, amounting to about 580 packages, was bought in at similar rates to those of the previous week. On the 18th of the month, there was still no demand, though Jamaica was offered to the extent of some 80 packages. The whole was bought in at 52*s.* to 54*s.* for good common, and 46*s.* for ordinary common. There was no Cochin or Calicut offered. At the last auction on the 25th, though some 400 packages of Cochin and Calicut were offered, only very small sales were effected, the bulk being bought in at the following prices: Bold selected cut, 80*s.* to 85*s.*, and washed rough Cochin, 36*s.*

NUTMEGS, MACE AND PIMENTO.

The market in nutmegs has been a steady one throughout the month, without change in price. Mace has also been in slow demand. At the spice auction on the 11th of the month, a few cases of Java were sold, realizing 1*s.* 9*d.* for thin pale curly. About 30 cases of Penang were bought in at from 1*s.* 6*d.* to 1*s.* 8*d.* per lb. On the 18th, 63 packages of West Indian were offered, and for the most part disposed of at 1*s.* 8*d.* for fair pale; 1*s.* 5*d.* to 1*s.* 6*d.* for palish; 1*s.* 4*d.* for fair red, and 1*s.* 1*d.* for broken. Of Pimento, at the first sale on the 4th, fair quality was disposed of at $2\frac{1}{16}d.$, a few bags only being sold out of 90 offered. A week later, 186 bags were brought forward, and bought in at $2\frac{1}{8}d.$ On the 18th, 510 bags were offered, and bought in at $2\frac{1}{4}d.$ to $2\frac{1}{2}d.$; and at the last auction on the 25th, 260 bags were offered and again bought in at $2\frac{1}{8}d.$

ARROWROOT.

There have been good supplies during the month of this article, but comparatively little demand. At the first auction on the 4th, 140 barrels of St. Vincent were offered, the whole of which was bought in at from $2\frac{1}{8}d.$ to $2\frac{1}{4}d.$ per lb. for fair manufacturing. On the 18th, at auction, 20 bags of Natal were offered and sold at $3\frac{1}{2}d.$ per lb. No sales of St. Vincent were effected at auction, but it was reported that several hundred barrels had changed hands privately at 2*d.* per lb. At the last sale on the 25th, all the offerings, consisting of 196 barrels of St. Vincent, were bought in at the following prices: for good to fine manufacturing, $2\frac{3}{4}d.$ to $3\frac{3}{4}d.$; and for fair, $2\frac{1}{8}d.$ per lb.

SARSAPARILLA.

At the first drug auction on November 5, the offerings consisted of 19 bales of Lima-Jamaica, and 16 bales of native Jamaica, all of which were disposed of—the first at from 1*s.* 1*d.* to 1*s.* 3*d.* per lb. for mixed, partly chumpy, and coarse to fair rolls; the latter at from 1*s.* to 1*s.* 1*d.* for dull to fair red. At the second auction on the 19th, a dearer tone prevailed; only 12 bales of Lima were brought forward, and all sold at 1*s.* 3*d.* per lb. Three bales of Honduras character realized 1*s.* 3*d.* per lb., and 1*s.* per lb. was paid for 1 bale of pale red native Jamaica.

KOLA, LIME JUICE, AND OIL OF LIME.

At the first sale of the month, 26 packages of West Indian kola were offered and disposed of at from $1\frac{1}{2}d.$ to $1\frac{3}{4}d.$ per lb. for medium to bold dried, part bright. On the 19th, some packages of fair dried West Indian were sold without reserve at 1*d.* per lb., and 3 other packages of dried West Indian realized from 1*d.* to $1\frac{1}{2}d.$ per lb. A week later, at the spice sales, 7 bags of dried West Indian fetched from $1\frac{1}{2}d.$ to $1\frac{3}{4}d.$ per lb. At the first spice sale on the 4th, 2 pipes and 4 casks of raw St. Lucia lime juice were sold, fair palish brown realizing 1*s.* per gallon. The arrivals were said to include 269 packages from Dominica.

A consignment of some 52 packages of oil of limes was announced from Dominica in the middle of the month, 1*s.* 8*d.* to 2*s.* per lb. according to quality being the prices quoted.

PRICKLY PEAR AS A FORAGE CROP.

A number of species of prickly pear (Opuntia) are undoubtedly worthy of consideration as possible forage crops in districts of deficient rainfall. *Bulletin 124* of the Bureau of Plant Industry, U. S. Department of Agriculture, gives an account of experiments in the cultivation of this crop in dry districts of Texas, where the average annual rainfall for the past eighteen years has been but 28·4 inches.

As the result of these experiments it is estimated that the prickly pear under cultivation will produce 23 tons of rough fodder per acre. The increased yield given in response to cultivation was very good, eight times as much prickly pear having been produced on cultivated, as compared with uncultivated land. Under the conditions, cultivated prickly pear yielded six times as much rough fodder as sorghum.

At least twenty spineless varieties are under cultivation, of which *Opuntia Lindheimeri* is mentioned as one of the best.

It is believed that the cost of establishing a plantation of spineless prickly pear would not be more than $6·00 or $7·00 per acre, and an area once planted furnishes a supply of fodder for an indefinite period. In the experiments the plants grew well from single-joint cuttings placed 2 feet from each other, in rows 6 feet apart, and slightly covered with earth. Frequent shallow cultivation is needed to prevent weed growth, and excessive baking of the soil. A first harvest of forage can be taken about twenty months after setting out the plants.

The albuminoid ratio, i.e., the ratio of nitrogenous constituents to carbohydrates is very low, and the addition of small quantities of such a food as bean, or cotton-seed meal, is therefore necessary when the fodder is given to stock. Such a mixture increases the digestibility as well as the feeding value of the prickly pear.

MARKET REPORTS.

London,—January 5, 1909, THE WEST INDIA COMMITTEE CIRCULAR; Messrs. KEARTON PIPER & Co., January 5, 1909; Messrs. E. A. DE PASS & Co., December 24, 1908.

ARROWROOT—No quotations.
BALATA—Sheet, 2/1 to 2/4; block, no quotations.
BEES'-WAX—No sales reported.
CACAO—Trinidad, 57/- to 70/- per cwt.; Grenada, 50/- to 59/- per cwt.
COFFEE—Santos, 26*s.* 7½*d.* per cwt.; Jamaica, no quotations.
COPRA—West Indian, £18 10*s.* per ton.
COTTON—St. Kitt's, 14*d.*; Barbados, no quotations; Carolina Sea Islands, extra fine, 13½*d.*
FRUIT—
BANANAS—Jamaica, 4/6 to 6/- per bunch.
LIMES—Not wanted.
PINE-APPLES—St. Michael, 2/6 to 5/6.
GRAPE FRUIT—5/- to 8/- per box.
ORANGES—Jamaica, 4/- to 7/- per box.
FUSTIC—£3 to £4 per ton.
GINGER—No quotations.
HONEY—No quotations.
ISINGLASS—West India lump, 1/10 to 2/- per lb.
LIME JUICE—Raw, 11*d.* to 1/2 per gallon; concentrated, £16 10*s.* per cask of 108 gallons; distilled oil, 1/9 to 1/10 per lb.; hand-pressed, 5/6 to 5/9 per lb.
LOGWOOD—£3 to £4 5*s.* per ton; roots, no quotations.
MACE—Steady.
NUTMEGS—Slow.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5*s.* 2*d.* per lb., on the spot.
RUM—Jamaica, no quotations; Demerara, 1/6 to 1/8, proof.
SUGAR—Crystals, no quotations; Muscovado, no quotations; Syrup, 14/6; Molasses, no quotations.

New York, January 8, 1909.—Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 12¼c. to 21c.; Grenada, 11¾c. to 12c.; Trinidad, 12½c. to 13¾c.; Jamaica, 9½c. to 11½c. per lb.
COCOA-NUTS—Jamaica, select, $22·00 to $23·00; culls, $13·00 to $15·00; Trinidad, $21·00 to $22·00; culls, $13·00 to $15·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8¼c.; good ordinary, 9½c.; washed, 10¼c. to 11c. per lb.
GINGER—9c. to 12½c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
GRAPE FRUIT—Florida, $1·50 to $3·00 per box.
LIMES—No quotations. Market overstocked.
MACE—28c. to 32c. per lb.
NUTMEGS—110's, 10¾c. to 10⅞c. per lb.
ORANGES—Jamaica, $3·00 to $3·50 per barrel; $1·00 to $1·50 per box.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·67c.; Muscovados, 89°, 3·17c.; Molasses, 89°, 2·92c. per lb., duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., January 18, 1909; Messrs. T. S. GARRAWAY & Co., January 18, 1909.

ARROWROOT—St. Vincent, $4·00 to $4·50 per 100 lb.
CACAO—Dominica and St. Lucia, $10·00 per 100 lb.
COCOA-NUTS—$13·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, $8·50 to $11·50 per 100 lb.
HAY—$1·20 to $1·25 per 100 lb.
MANURES—Nitrate of soda, $62·00 to $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $72·00 to $75·00; Sulphate of potash, $67·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, $2·00; loose, $1·20 per 100 lb.
POTATOS—Nova Scotia, $1·30 to $1·60 per 160 lb.
PEAS—Split, $6·40 per bag of 210 lb.; Canada, $3·40 per bag of 120 lb.
RICE—Ballam, $5·30 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana,—Messrs. WIETING & RICHTER, January 9, 1909; Messrs. SANDBACH, PARKER & Co., January 9, 1909.

ARROWROOT—St. Vincent, $9·00 per 200 lb.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. per lb.
CACAO—Native, 16c. to 18c. per lb.
CASSAVA—60c.
CASSAVA STARCH—$5·00 to $6·00 per barrel of 196 lb.
COCOA-NUTS—$12·00 to $16·00 per M.
COFFEE—Creole, 12c. to 13c.; Jamaica, 11c. to 12c. per lb., slow.
DHAL—$4·75 per bag of 168 lb.
EDDOS—$1·56 per barrel.
MOLASSES—No quotations.
ONIONS—Madeira, 3c. per lb.
PLANTAINS—8c. to 24c. per bunch, plentiful.
POTATOS—Nova Scotia, $2·50 per 100 lb.
POTATOS—Sweet, Barbados, $1·68 per bag.
RICE—Ballam, $5·80; Creole, $4·60 to $4·75; Seeta, $6·00.
SPLIT PEAS—$6·25 to $6·40 per bag (210 lb.); Marseilles, $4·25 to $4·50.
TANNIAS—$1·92 per bag.
YAMS—White, $1·92; Buck, $2·16 per bag.
SUGAR—Dark crystals, $2·20; Yellow, $2·60 to $3·10; White, $3·60 to $3·80; Molasses, $2·00 to $2·10 per 100 lb. (retail.)
Timber—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—$3·75 to $5·75 per M.
———CORDWOOD—$2·40 to $2·64 per ton.

Trinidad,—January 9, 1909.—Messrs. GORDON, GRANT & Co.

CACAO—Venezuelan, $12·25 to $12·50 per fanega; Trinidad, $11·50 to $12·00.
COCOA-NUTS—No quotations.
COCOA-NUT OIL—61c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8¼c. to 8¾c. per lb.
COPRA—$3·00 to $3·10 per 100 lb.
DHAL—$4·50 to $4·60 per 2-bushel bag.
ONIONS—$2·00 to $2·25 per 100 lb. (retail).
POTATOS—English, 90c. to $1·10 per 100 lb.
RICE—Yellow, $5·40 to $5·60; White, $4·50 to $4·80 per bag.
SPLIT PEAS—$5·75 to $6·00 per bag.
SUGAR—American crushed, $5·00 to $5·10 per 100 lb.

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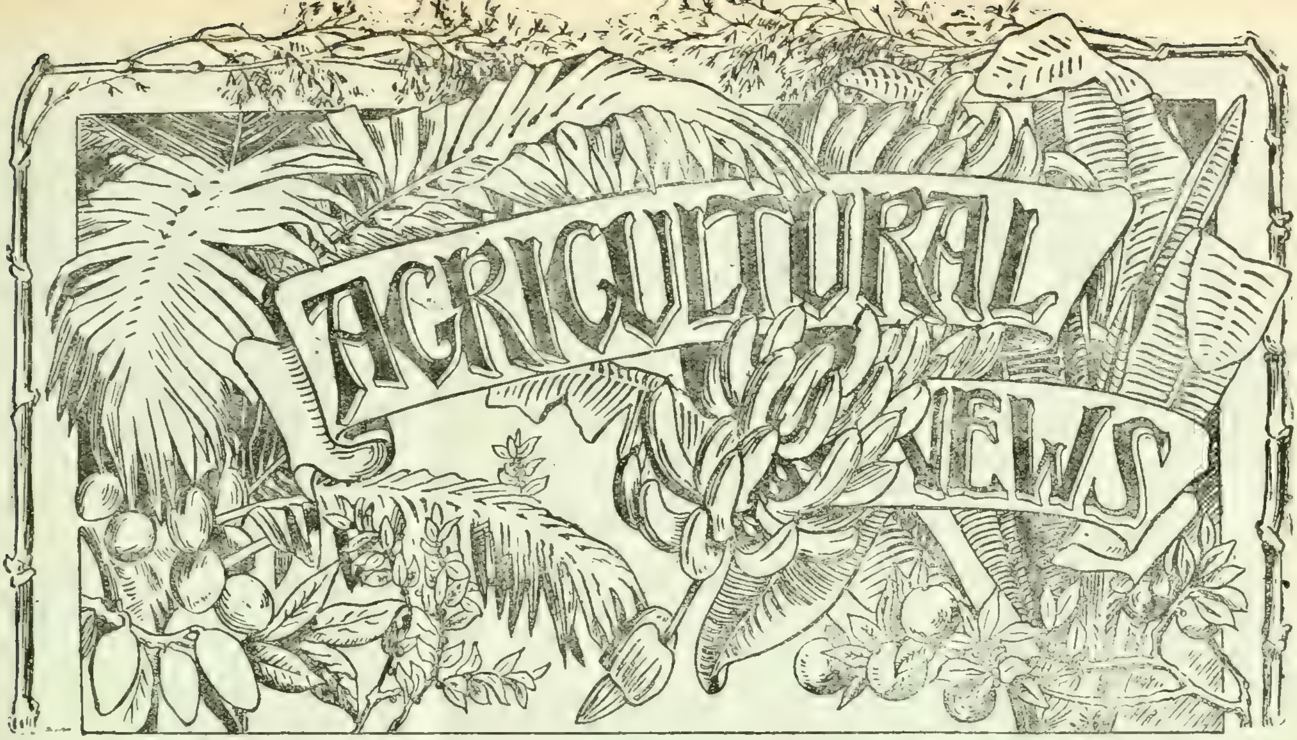

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CONTENTS.

Mendelism.

PART I.

THE question of breeding plants and animals so as to improve the type, and permanently to fix desirable characteristics has always been a matter of great interest to agriculturists, yet practically nothing was known as to the principles which underlie and determine the results of hybridization in any given case until Gregor Mendel, an Austrian monk, carried out his work about fifty years ago. This work first placed the subject of inheritance on a definite basis.

Mendel gave his chief attention to the hybridization of varieties of peas, and from the results of his observations as to the manner in which certain definite characteristics were transmitted to succeeding generations, he was able to enunciate a theory of heredity which—although neglected for a number of years—has lately been applied with encouraging success to the building up of improved varieties of agricultural plants. The truth of Mendel's theory has also been repeatedly demonstrated in connexion with the breeding of poultry, rabbits, etc.

An idea as to the nature of the knowledge gained from Mendel's observations may best be given by instancing two illustrative examples relating to the inheritance of simple characteristics. There are two strains of the ordinary garden pea grown in England (*Pisum sativum*), one of which possesses coloured flowers, and the other white flowers. When these two kinds are crossed, the resulting hybrids all have coloured flowers similar to those of the parent with coloured blooms. On breeding those hybrids together, plants are produced in the next generation, some of which bear coloured blossoms, while others possess white flowers only; the two kinds of plants are present in the proportion of three with coloured blooms to one with white. Those pea plants with white flowers henceforward breed true when self-fertilized, no coloured flowers appearing in the next generation produced from them. The plants with coloured blooms may be shown, however, to be of two kinds: (1) those which, in the next generation, give plants with coloured flowers only, and (2) those which, on breeding among themselves, behave like the original hybrids, and produce plants, some of which have coloured flowers and others white, the two kinds being present at the rate of three of the former to one of the latter.

Now to turn for a moment to the second case, which is somewhat similar, but relates to animals instead of plants. Rose-combed bantam fowls are of two kinds, black and white. On crossing a pure-bred black bird with a pure white, the offspring are all black, similar to the black parent. In the second generation, bred from these hybrids, both black and white birds are present, the former being three times as numerous as the latter. The case here is exactly similar to that of the peas already mentioned. The white birds breed true, while the blacks are of two classes: (1) those which breed true, and (2) those which resemble the original hybrids, in that, when mated together, they give blacks and whites in the ratio of three to one.

Qualities which have been shown by experiment to be transmissible in the manner described, as colour and whiteness in the flowers of the pea, and blackness and whiteness of plumage in the case of rose-combed bantams, are known as Mendelian characters. That quality or characteristic which alone is apparent in the first generation produced from crossing the original parents, e.g., colour in the pea flowers, and blackness in the plumage of the bantams, is known as the 'dominant' character, while the alternative characteristic, which disappears in the first generation, but again reappears in a stable form in a definite proportion of the individuals comprising the second generation, i.e., whiteness of the pea flowers, or whiteness of plumage in the bantams, is referred to as the 'recessive' quality

The above facts having been observed, the next step is to find a theory which shall satisfactorily account for them and for similar phenomena. Mendel was able to put forward a simple explanation, which has since been proved many times over. The formation of a new individual (animal or plant) is the result of the union of two germ-cells, the spermatazoon or pollen grain in the case of the male, and the ovum or egg-cell from the female. In these single cells are necessarily contained the characteristics contributed to the offspring by the male and female parents, respectively. Now in the examples already given, we are dealing with the inheritance of alternative characters, i.e., colour or whiteness in the pea flower, and blackness or whiteness of plumage in the bantam fowls. The central idea of the Mendelian theory is that any given germ-cell can contain only one of these alternative characteristics, or 'unit characters' as they are termed. To return to the case of the garden peas: a germ-cell contributed by a plant of pure strain with coloured flowers will contain the character of 'colour' only, while germ-cells from a similarly pure plant with white blooms will contain the quality of 'whiteness' only. When in the process of crossing a 'coloured' germ meets a 'coloured' germ, the result is a coloured flower. Similarly, when two 'white' germs meet, a white-flowered plant necessarily results.

If now a 'coloured' germ meets a 'white' germ, as in the hybridization experiments referred to, the resulting plant bears coloured flowers, because colour is dominant to whiteness in this case. Such a plant possesses both alternative characters, but cannot transmit them in a blended form, and in the germ cells formed by this plant the 'unit characters' separate out. Half the germ cells of each sex will possess the quality of colour, and the remaining halves, that of whiteness. When the resulting hybrids are bred among themselves, therefore, the two sets of germ-cells come together, and, according to a simple mathematical law, this can only lead to the production of a number of plants, one quarter of which result from the union of two 'coloured' cells, one quarter from two 'white' cells, and two quarters by the union of a 'coloured' and a 'white.' The first and second classes are in each case pure bred plants, breeding true to type, and yielding respectively coloured and white flowers only. But the remaining two quarters are similar to the hybrid plants, possessing the qualities of both colour and whiteness, but appearing with coloured flowers because 'colour' is dominant to whiteness. These will necessarily breed in an exactly similar manner to the parent hybrids.

Such is Mendel's explanation of the manner in which simple 'unit characters' are said to be inherited. During the past few years this has been demonstrated to be true for such varied morphological and physiological characters as structure, size, shape, colour, and fertility among plants, as well as for a number of qualities in animals. For example, it has been shown that tallness and dwarfness are Mendelian characters in sweet peas, the former being dominant; and that in horses, bay or brown colour is dominant to chestnut.

(A concluding article dealing with the same subject will form the editorial in the next issue.)

SUGAR INDUSTRY.

Sugar Industry at Barbados.

Although the cane crop reaped at Barbados in 1908 was but a small one (yielding 29,416 tons of sugar, and 50,112 puncheons of molasses), largely owing to the irregular rainfall, yet it is apparent that estate owners and others in the island have decided confidence in the prospects of the sugar industry in the near future. This is evidenced by the ready sale at good prices of a number of estates that came into the market during the past year, and by the expenditure that is being made on many estates in improving machinery, etc. The Barbados *Agricultural Reporter* lately referred to these points, and after enumerating the estates that have changed hands in the past year, it gives the following particulars as to improvements on various plantations :—

Perhaps a stronger evidence of revived confidence in the sugar industry of Barbados than the purchase of estates is the active steps taken during the year to improve machinery. A five-roller mill was added to the fine plant at Bulkeley, in time for the crop of the year. At Carrington the 'triple' was used for the first time, extensive improvements having been made at the beginning of the year. Immediately after the close of the crop, arrangements were made at Kendal for remodelling the boiling house and for laying down a new Stirling boiler. The work is now being pushed so that the alterations may be ready for the coming crop. Stirling boilers have been put in at the Pine, Brighton, Applewhaites, and Easy Hall. The advantages obtained by the use of the centrifugal process are so evident, that in several places where the windmill is still used for crushing, oil engines are being set up this season for operating centrifugals. Mount Gay and Fisher Pond are estates where this improvement is being made.

The trend of opinion seems to have set more towards centralization in the manufacture of sugar than at any former period. At Foursquare, Bulkeley, Carrington, and Bruce Vale, a very considerable amount of work was done on the central system. Applewhaites also purchased canes from the small growers around. A Committee of the Legislature has been appointed to consider the question of establishing a Central Factory on co-operative principles; but its proceedings are not yet available to the public.

Tillage Experiments in Sugar-cane Cultivation.

In the report, recently issued by the Imperial Department of Agriculture, dealing with the work of the Agricultural and Botanical Departments of Barbados since 1898, there appears a note containing particulars of some tillage experiments carried out in the cultivation of sugar-cane on Hampton plantation.

In these experiments a very level field, $6\frac{1}{2}$ acres in area was first cut out into ten large strips. Five different processes of tillage were practised on the first five strips, and these were repeated on the second series of five strips.

Plots Nos. 1 and 6 were first subsoiled close. They were lined at distances of 6 feet by 6 feet, and cane holes dug. These two strips were cultivated in the usual estate manner, and gave a return at the rate of 15·75 tons of cane per acre, which was the highest yield obtained in the experiments.

The strips Nos. 2 and 7 gave the second highest return, viz., 15·59 tons of cane per acre. These two plots were ploughed flat with a disc plough, turning under farmyard manure 8 inches deep. Cane holes were dug, and the land cultivated by ordinary estate methods.

Strips Nos. 3 and 8 were first subsoiled close. Furrows were then opened with a mould-board plough 6 feet apart. Manure was spread on the banks, and canes planted in the furrows 6 feet apart. The average return was at the rate of 14·94 tons of cane per acre.

On strips Nos. 5 and 10, subsoiling was first opened in one direction. Between the cane holes, however, the land was left forked. Cultivation was carried on in the usual estate manner. The crop of canes obtained was at the rate of 14·2 tons per acre.

The smallest return (at the rate of 13·2 tons of cane per acre) was obtained on strips 4 and 9. These plots were first ridged with the disc plough, pen manure being turned under 8 inches deep. The canes were then planted in rows at the bottom of the furrow. The land was cultivated with the Diamond cultivator, and trashed as usual.

It will be observed that an extreme difference of $2\frac{1}{2}$ tons of canes per acre occurred between the most favourable and the most unfavourable plots.

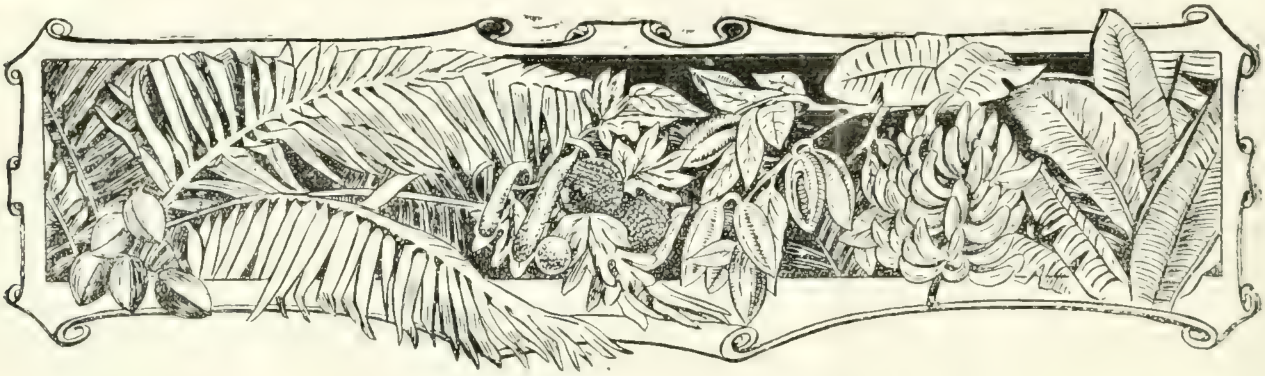
Sugar Industry in Trinidad.

As a result of the excellent rains experienced in December, and the frequent showers that fell in the early part of January, fields of young cane in Trinidad have lately presented a much more promising appearance than was the case previous to the rainfall. Planters are now busy applying pen manure and artificials to the crop. Cane reaping is now in progress on a few estates, the Usine St. Madeleine in Naparima having started crushing about the third week in January.

An interesting meeting of planters and cane farmers was held at Prince's Town on January 12 last, under the presidency of the Warden of Savanna Grande, in order to discuss the prices which should be paid by estate owners for farmer-grown canes in the coming season. One of the chief speakers on the subject was Mr. H. E. Murray, attorney to the estates of the New Colonial Company. Mr. Murray stated that when sugar fetched $3\frac{3}{4}$c. per lb. in New York, factory owners received only \$1·95 per 100 lb., so that at this figure they could only give 8*s.* 6*d.* per ton for farmers' canes. After discussion, the following scale of payment, based on the price of sugar on the New York market, was adopted :-

Price of sugar per lb.	Price of Farmers' cane per ton.
$3\frac{3}{4}$c. or under	8*s.* 6*d.*
$3\frac{15}{16}$c. to 4c.	9*s.* 0*d.*
$4\frac{1}{16}$c. to $4\frac{3}{16}$c.	9*s.* 3*d.*
$4\frac{1}{4}$c. to $4\frac{7}{16}$c.	9*s.* 6*d.*
$4\frac{1}{2}$c. to $4\frac{11}{16}$c.	10*s.* 0*d.*
$4\frac{3}{4}$c. to $4\frac{15}{16}$c.	10*s.* 6*d.*
5c. and over	11*s.* 0*d.*

On behalf of the farmers present, the Secretary of the Cane Farmers' Association expressed satisfaction with the terms of this scale.



WEST INDIAN FRUIT.

PACKING OF CITRUS FRUIT.

In reporting to the Permanent Exhibition Committee of Dominica on the exhibits of produce sent from that island to the Colonial Fruit Show held in London at the end of November last, Mr. A. E. Aspinall, Secretary of the West India Committee, makes the following reference to the packing of the citrus fruit sent over:—

The fruit was very well packed, but there is still room for improvement in the style of packages adopted, which lacked uniformity. Thus, oranges should be shipped in standard Florida boxes, measuring 2 feet $3\frac{1}{8}$ inches, by $12\frac{1}{2}$ inches by 12 inches, instead of in the slatted crates now used. On this point the fruit trade is quite unanimous. With regard to limes, there is no question that the cases measuring 1 cubic foot, and containing from 200 to 220 fruits are the most marketable, while, as I have so often pointed out, those limes wrapped in stout brown paper last far longer than those protected by thin tissue paper only.

THE DATE PALM.

Although the date palm (*Phoenix dactylifera*) is not a native of the West Indies, its natural home being in the dry, hot regions of Northern Africa, and the attempts so far made to cultivate it in these islands have been chiefly of an experimental character, yet it has been shown that the tree can be successfully grown in suitable situations, and at the Botanic Stations of Jamaica, Trinidad and Dominica, fruit of good quality has been produced of recent years. Since the tree is of a handsome character, it is well-suited for planting for ornamental purposes. It flourishes best in a very hot climate with little rainfall, but must be grown only in situations where its roots are in contact with a good supply of water.

A late number of the *Kew Bulletin* (No. 7, 1908) contains an article of some interest on the cultivation of the date palm in Mesopotamia, where it is grown on a very large scale. It is pointed out that though the tree can be raised from seed, it is preferable to plant 'offshoots,' which are suckers usually borne at the base of palms of from six to sixteen years of age. Since the date palm is 'dioecious,' i.e., having the male and female flowers on different trees, male trees constitute about 50 per cent. of the young plants raised from seed. But one male tree will usually suffice for the pollination of about 100 females, so that only a very small proportion of the former are required. The sexes cannot be distinguished until the trees flower, which does not usually occur until they are about six years of age, so that if a plantation is raised from seed, an undue proportion of the area will be occupied by useless trees. The advantage of growing from suckers is therefore apparent, as not only can the sex be assured, but the quality of the fruit is generally superior to that from seedling palms.

Larger offshoots are regarded with more favour than smaller ones. They should usually be removed from the parent tree when from three to six years of age. When cut for transplanting they appear as rootless stumps from which the larger leaves have been removed. They should be planted in holes about 3 feet deep, and of the same diameter, the holes being afterwards filled with loose earth mixed with pen manure. The shoots are planted from 10 to 15 feet apart. Date palms love abundance of sunshine, and grow slowly in shady situations. If the soil is not naturally provided with a good supply of water the young shoots need watering daily for at least six months.

It is mentioned that in Mesopotamia, under suitable conditions, the date palms develop rapidly, and bear fruit within four or five years from the date of planting. One variety of date, the Khadramee, the fruit of which is largely exported to Europe and America, frequently bears fruit at the end of three years. Two other kinds, Hallawee and Sayer, the former of which is mentioned as the best kind grown at Basra, begin to bear in four or five years. Where water is scarce and the ground hard, from seven to eight years elapse before any fruit is produced.

The male date palm is bigger and stouter than the female tree. The flowers on both the male and the female trees are enclosed in sheaths or spathes. In Mesopotamia the female flower opens about the end of March; at the same time a blossom from a male tree is secured, the sheath surrounding it artificially opened, and some pollen shaken on to the female flowers. If the process of fertilization is not carried out by hand, pollen from the male flowers is naturally distributed by the wind, but it is affirmed that the resulting fruit is never so good as that which is produced from artificial pollination.

The date fruits form about one month after pollination, but are not ripe and ready to gather till four months later. The clusters are then cut down carefully.

A large number of different varieties of dates are mentioned as being grown in Mesopotamia. In addition to the kinds already referred to, the fruits of the 'Zahdee' and 'Deree' varieties are exported in quantity. Arrack is also distilled from the 'Zahdee' dates, which are considered to be especially suitable for this purpose. The fruit of the many other varieties grown is consumed at home.

DR. FRANCIS WATTS, C.M.G., AND HIS WORK IN THE LEEWARD ISLANDS.

The departure of Dr. Francis Watts, C.M.G., from Antigua, in order to take up the work of Imperial Commissioner of Agriculture for the West Indies, has been the occasion of a number of resolutions of a complimentary nature from Agricultural bodies in the Leeward Islands.

At a meeting of the Antigua Agricultural and Commercial Society, held on January 15 last, it was resolved by the members present 'That this Society tenders to Dr. Watts its heartiest congratulations on his well deserved promotion to the important and responsible post of Imperial Commissioner.' The resolution went on to express the regret of the Society at the departure of Dr. Watts from the colony in which he had worked for the past twenty years with great benefit to the community at large, as well as its satisfaction that in his new position the Commissioner would still be able to give to Antigua, in common with other West Indian Islands, the benefit of his experience and advice in agricultural matters.

This resolution was proposed by Mr. A. P. Cowley and seconded by Mr. A. Spooner, both of whom referred in the highest terms to the value of Dr. Watts' services to the Leeward Islands during the past twenty years.

After Mr. J. D. Harper and the Hon. D. McDonald had spoken in support of the resolution, his Excellency Sir Bickham Sweet-Escott, K.C.M.G., Governor of the Leeward Islands, who presided at the meeting, made a brief speech. He wished to express his entire agreement with all that had been said by the preceding speakers. The services which Dr. Watts had given to Antigua had been of the highest value. They all regretted his departure, but hoped that the new Commissioner would be able to make frequent visits to Antigua, where his old friends would always be glad to see him. The resolution was then carried unanimously.

In reply, Dr. Watts thanked the members present for all the good things they had said about him, and he then referred to the work which he had been able to do at Antigua. His labours in the Leeward Islands had been attended with success, but he could not lay claim to more than a partial share in that success, inasmuch as it had been so largely brought about by the co-operation and assistance given by planters and others. He had realized that in order to advance agriculture it was necessary for him to associate with the planters, and to work with them. He trusted his successor would do the same.

Dr. Watts referred to the advances that had been made in the Leeward Islands during recent years. In addition to sugar—which was still the special product—they now had another important crop in cotton. Proper attention must be given to this crop and every effort made, by employing all up-to-date methods, to reduce the cost of production. In this way prosperity would be made more permanent.

On Thursday evening, January 21, the members of the Agricultural and Commercial Society gave a dinner to Dr. Watts at the Globe Hotel, St. John's, prior to his departure. About sixty members were present, his Excellency Sir Bickham Sweet-Escott, K.C.M.G., his Honour the Chief Justice (J. S. Udal, Esq.), and the Hon. E. St. John Branch, Colonial Secretary of the Leeward Islands, being among the guests.

In this connexion, reference may also be made to an article which appeared in the Antigua *Sun* of January 21 last, which placed on record the chief points in the work to which Dr. Watts has given his attention since he first came to the West Indies. Exactly twenty years ago, i.e., in January 1889, Dr. Watts was first appointed Chemist to the Government of Antigua. After serving nine years in this position, he was appointed Analyst and Agricultural Chemist to the Government of Jamaica, but returned one year later (in 1899) to take up the post of Analytical and Agricultural Chemist in the Leeward Islands under the then newly appointed Imperial Department of Agriculture. Four years later the duties of Superintendent of Agriculture for the Leeward Islands were added to this post.

The work connected with experiments with sugar-canes, begun in Antigua in 1891, and later greatly extended under the auspices of the Imperial Department of Agriculture, has occupied a considerable part of the time of Dr. Watts and his colleagues, and has been productive of very useful results.

The conclusions arrived at from this work showed the benefit that would be likely to accrue through the introduction of the Central Factory system, and it was largely due to this that it was made possible to establish the Antigua Central Factory in 1903.

Among other important matters which have claimed attention may be mentioned the cotton industry in Antigua, Montserrat, St. Kitt's-Nevis, and the Virgin Islands; the lime and cacao industries at Dominica and Montserrat, together with much work relating to minor industries.

Dr. Watts has always been closely associated with educational matters: first in Antigua and later in the Leeward Islands generally. He has done much to promote science teaching in connexion with secondary education, and to develop the systematic teaching of agriculture on broad lines.

A large number of papers dealing chiefly with the lines of work referred to, have been contributed in recent years to the *West Indian Bulletin* by Dr. Watts.

AGRICULTURAL EXPORTS FROM BRITISH GUIANA.

The volume of agricultural produce exported from British Guiana in 1908 indicates that the year was a prosperous one for the colony. Sugar, rum, balata, and rice form the chief agricultural exports, and all these show increases in the quantities shipped abroad last year.

The total quantity of sugar exported was 110,657 tons. Of this, Canada took no less than 68,752 tons, or considerably more than half; 23,921 tons were shipped to the United Kingdom, and nearly 18,000 tons to the United States.

Rum distilleries in British Guiana were very active in 1908, and the exports show an increase of 75,000 gallons as compared with the previous year. Probably this accounts for the fact that the shipments of another sugar product—molascuit—declined from 10,378 tons in 1907 to 7,932 tons in 1908.

The yield of balata collected in the colony during 1908, viz., 1,124,955 lb., was also a record quantity. In 1907-8, the output was 973,269 lb., valued at $368,538, and 634,242 lb., valued at $240,510, in 1906-7.

The progress of the rice industry of British Guiana is so frequently referred to in this journal that it is scarcely necessary to state that the exports of this product again showed a large increase in 1908. In 1907-8 the shipments were 6,977,877 lb., but for the year ending December 31, 1908, they reached 9,573,585 lb. This, too, is in spite of the fact that the yield of rice per acre was somewhat below the average.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows, under date of January 18, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 100 bales of West Indian Sea Islands have been sold, consisting of about 50 Barbados at $13\frac{1}{2}d.$ to $14d.$, 20 St. Kitt's at $13\frac{1}{2}d.$, and 25 St. Vincent at $14\frac{1}{2}d.$ to $15d.$

Holders of American Sea Islands have been reducing their prices and selling very freely of late, fearing competition with the West Indian, and a considerable number of crop lots have been sold at $12\frac{1}{2}d.$ to $13\frac{1}{2}d.$ In consequence, buyers are basing their offers on these purchases, and having supplied their immediate wants for some time, it has placed them in a very independent position. We are of the opinion, however, that prices will not go any lower, and it will be a wise policy for West Indian holders not to force sales.

COTTON IN THE SEA ISLANDS.

The market prices for cotton from the Sea Islands still remain very low as compared with those which prevailed a year ago. The demand, however, is stated to be good, and it is possible that prices may improve somewhat. In their Sea Island cotton report, dated January 9 last, Messrs. Henry W. Frost & Co., of Charleston write: —

There was an active demand throughout the week, resulting in the sale of a total of 1,900 bales of cotton from Charleston, and 3,144 bales from Savannah. [These sales of course include cotton of coarser grade from Florida and Georgia, as well as the finer quality lint from Carolina.] The prevailing prices for Islands cotton are as follows: 'extra fine' quality, $13d.$ per lb.; 'fully fine,' $12\frac{1}{4}d.$ to $12\frac{1}{2}d.$; 'fine', $11\frac{1}{4}d.$; tinged cotton, $9\frac{3}{4}d.$; and stains, $7\frac{1}{2}d.$ to $8d.$ per lb. The buying was general for England, France, and the Northern mills. As the entire stock of odd bags has been sold, we are now dependent on future receipts for graded cotton. No sales of 'planters crops' cotton have been made, since factors are unwilling to accept current prices.

The total amount of American Sea Island cotton ginned up to January 1 of the present year has been 86,016 bales, as compared with 73,425 bales ginned to same date last year. The present year's crop (American) is estimated at 100,000 bales.

On January 16, Messrs. Frost write:—

There has again been an active demand throughout the week for all the offerings of odd bags of all grades, and also for all the crop lots of 'fully fine' quality, which could be purchased up to $13d.$, leaving the market swept of all offerings excepting crop lots held at $13\frac{1}{2}d.$ and upwards. In view of reduced stock, factors are now disposed to hold these with more confidence, as the receipts from now on are expected to be small.

COTTON INDUSTRY IN THE VIRGIN ISLANDS.

Cotton cultivation has proved an excellent source of prosperity in the Virgin Islands, and its development since 1906, despite the low prices obtained for the lint, has been remarkable.

In 1903-4 the exports of cotton from those islands were valued at no more than £35. Two years later they were worth £265. For the year 1906-7, the shipments amounted 10,177 lb. of lint, valued at £620; while for the year ended March 31, 1908, they reached no less than 32,500 lb. of lint, worth about £1,800.

Cotton seed has been distributed free of charge by the Imperial Department of Agriculture, the amount given out in 1907 being 2,500 lb. Small holders of land form the main class in the Virgin Islands, and it is chiefly by these people that cotton is grown. The seed-cotton is also purchased and dealt with by the Department of Agriculture, and noting the amount of the shipments in 1907-8 (32,500 lb.), it will be seen that 13 lb. of lint were received at the factory connected with the Experiment Station, Tortola, for every 1 lb. of cotton seed distributed.

The advances made to small growers under the 'Cotton Loans Act' have been of great assistance, and have undoubtedly proved one of the chief means of developing the industry. In 1907-8, loans were made to twenty-seven growers, the total amount advanced being £102 12s. 0d. The whole of this was repaid at the end of the season. Leaf blister-mite has, so far, proved the most serious pest of cotton in the Virgin Islands; the cotton worm has been responsible for comparatively little damage, but cotton stainers have been troublesome in some cases.

In his report for the months of November and December last, Mr. W. C. Fishlock, Agricultural Instructor for the Virgin Islands, refers to the position of the cotton industry in the islands under his charge during the present season (1908-9). It is satisfactory to note that the progress of past years has been continuous, and there is no sign of falling off in the development of the industry. The increase again shown in the exports is remarkably good. From the beginning of the cotton picking season up to December 31, 1908, there was purchased at the Experiment Station, Tortola, 74,989 lb. of cotton, valued at £777 11s. 8d., as against 16,738 lb. of cotton, worth £241 12s. 2d., which was purchased to the same date in 1907. In other words, the amount of cotton purchased has increased four-fold, and the money paid out in 1908 showed a three-fold increase as compared with the figures for the corresponding period of 1907.

The Agricultural Instructor, writing on January 5, reported that there was cotton equal to about 94 bales (each of 200 lb.) still in store at the Station, about 25 bales having been ginned up to that time. The indications at present are that the total crop for the season will amount to 300 bales (60,000 lb.).

Cotton is purchased from the growers each week-end (Fridays and Saturdays). A good deal of labour is occasioned at the Station in consequence of the small quantities in which the cotton is usually sent in. It is mentioned that on the four days December 11-12 and 18-19, no less than 1,447 separate parcels of cotton were received, weighed, and the purchase money paid out.

THE TALIPOT PALM.

The accompanying illustration (Fig. 7) represents two specimens of the Talipot palm (*Corypha umbraculifera*) which are growing at the Dominica Botanic Station.

This palm is a native of Ceylon, where its leaves are commonly used by the natives as umbrellas, and also for thatching. Specimens of the Talipot have been introduced

FIG. 7. TALIPOT PALM AT DOMINICA BOTANIC STATION.

into various parts of the tropical world, and trees exist in several of the West Indian Islands, as well as in British Guiana.

The Talipot palm fruits but once during its life, and this fruiting process terminates its existence. A note appeared in the *Agricultural News*, Vol. II, p. 44, on the flowering and fruiting of one of these trees in Georgetown, British Guiana. At the time, the palm was about twenty-eight years old, it possessed a stem from 50 to 60 feet high, and was crowned with a panicle 10 to 12 feet long, bearing an enormous crop of fruit.

A Talipot palm at the Dominica Botanic Station flowered in the early part of 1904 being then about thirty years old. It has since died.

These palms, when they fruit, bear a very large number of seeds, which have been utilized for the manufacture of buttons. As the seeds are very hard, the buttons in their prepared state resemble vegetable ivory.

STERILIZATION OF DRINKING WATERS.

The results of experiments in the use of small quantities of calcium hypochlorite (an inexpensive chemical costing from 2*d.* to 2½*d.* per lb.) for sterilizing drinking waters which contain pathogenic bacteria were recently described by a writer in the *Lancet*.

To the water under test, the organisms *Bacillus typhosus* and *B. coli* (the causative agents of typhoid fever and of certain disorders of the alimentary tract respectively) were added. It was found that exceedingly minute quantities of the chemical sufficed for sterilization, in most cases 3 parts of hypochlorite per 1,000,000 of water being sufficient. The action takes place in a very few minutes, and the chlorine remaining can be removed by the addition of a little sodium bisulphite, as the result of which the palatability of the water remains unimpaired.

The 30 lb. of hypochlorite required for treatment of 1,000,000 gallons would cost about 5*s.* 7*d*, or at the rate of 1*d.* per 15,000 gallons of water. So far, it is stated, the investiga tors have not met with a natural water which required more than 6 parts of hypochlorite per 1,000,000 to effect sterilization. The amount of chemicals added is so small that it does not affect in any way the character of the water, and the chlorine and hardness are only increased by a minute fraction of a grain per gallon.

DEPARTMENT NEWS.

Dr. Francis Watts, C.M.G., the newly appointed Imperial Commissioner of Agriculture, having assumed the duties of the office at Antigua on January 6, proceeded to Barbados by the R.M.S. 'Esk,' which left Antigua on January 23, and arrived at Barbados on January 26.

Mr. F. A. Stockdale, B.A., F.L.S., who has held the post of Mycologist and Lecturer in Agricultural Science on the staff of the Imperial Department of Agriculture since August 1905, left for British Guiana by the R.M.S. 'Esk' on February 2 last, in order to take up the duties of his appointment as Assistant Director of Agriculture and Government Botanist in the latter colony. Mr. Stockdale takes with him the best wishes of his colleagues, and many other friends in the West Indies.

Mr. R. D. Anstead, B.A., Agricultural Superintendent of Grenada, has been appointed to a post in the Indian Agricultural Service, and will shortly be leaving the West Indies.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

An account of Mendel's theory of heredity is given in the editorial. A further article on the subject will appear in the next issue.

The general condition of the sugar industry at Barbados is satisfactory. A sliding scale of payment for farmers, cane, based on the price of sugar in New York, has been adopted at Trinidad (page 35).

A brief article on the cultivation of the date palm will be found on page 36.

Some account of the work of Dr. Francis Watts, C.M.G., while Government Chemist and Superintendent of Agriculture in the Leeward Islands appears on page 37.

Cotton Notes (page 38) include reports on market prices, together with a short article dealing with the remarkable developments of the cotton industry in the Virgin Islands.

Interesting reports on the quality and value of Dominica lime juice have lately been received (page 41). Valuable experiments with 'green dressings' crops were carried out at Antigua last season (page 43).

Attention is drawn to the articles entitled 'Some Beneficial Insects' and 'Fermentation of Pen Manure,' which appear respectively on pp. 42 and 47.

Manures for Sugar-cane at Jamaica.

The great value of periodical small dressings of lime on many of the sugar lands of Jamaica is one of the chief points brought out as the result of the manurial trials carried out at the Sugar Experiment Station of the island. The application of about ½-ton of lime per acre has frequently given surprisingly good results both with plant canes and ratoons. In the tropics, it is pointed out, lime should be applied on the principle of a little and often, rather than in larger dressings at irregular intervals. Heavy applications of lime, too, bring about a temporary paralysis of the activities of the soil bacteria. The experiments also show that nitrogen is the most generally profitable manurial constituent for application to canes in Jamaica, while potash and phosphoric acid are only occasionally required. Basic slag has proved itself the most suitable phosphatic manure, especially on the heavy clay soils of Trelawney.

Ration for Dairy Cows.

In connexion with the question of feeding live stock, to which reference was made in the editorial of the last issue, it may be worth while to note the kind of ration which has been most serviceable for milking cows at the Trinidad Government Farm. These animals, in addition to being grazed on the pasture area of the Farm, are given mixed rations of artificial foods, of which the following is a good example: 1 lb. cotton seed meal, 2 lb. cocoa-nut meal, 2 lb. pollard, 1 lb. crushed Indian corn, and 1 lb. dried ale grains. The total cost of this daily feed amounts to no more than 8·75c. This is a very nutritious mixture and one rich in nitrogenous constituents. When fed in conjunction with a good proportion of pasture grass, or other bulky fodder, consisting largely of carbohydrates, fibre, etc., the whole forms a diet well suited for sustaining a good flow of milk. The cows were also given 1 lb. of molasses per head per day, and 1 oz. of salt was added to the daily ration of each animal.

Prize Awards at Agricultural Schools.

On another page of this issue will be found the reports on the usual half-yearly examinations of the Agricultural Schools at St. Vincent, Dominica, and St. Lucia.

It will be remembered that prizes of books are awarded each half-year on the result of these examinations. Only one senior prize is offered, and this is awarded to the boy who gets the highest number of marks in the senior classes of all the three schools. Three junior prizes are given—one to the boy who does best in the junior class at each of the three schools.

As the result of the December examinations, the senior prize was awarded to J. Samuel of St. Vincent. It may be mentioned that this is the fourth time in succession that the senior prize has been won by a pupil of the St. Vincent Agricultural School. The junior prizes were awarded respectively to L. Wallace of St. Vincent, L. C. Douglas of Dominica, and H. Auguste of St. Lucia.

Honey Production in England.

Comparatively few persons appear to realize the possibilities of bee-keeping as a minor agricultural industry, and yet, under suitable conditions, the pursuit is one which affords returns of a very satisfactory nature, while making but small demands in the way of time and attention.

Recent agricultural reports from England mention that increased attention is being given to honey production in many parts of that country. This movement was started in Cornwall, which was the first county to engage the services of an expert on the subject for the purpose of giving advice and instruction to bee-keepers. The year 1908 is reported as having been a record one as regards the yield of honey, and many small holders are stated to be making as much as £100 per year from their bees. It is evident that a minor industry of considerable value has been built up in a comparatively short time.

Botanic Stations in Mauritius.

Three Botanic Stations exist in Mauritius, and inasmuch as they are all situated at different altitudes, they each have a special value. These Stations, besides being centres of acclimatization of large numbers of plants, also contain nurseries of valuable kinds of forest trees.

The Royal Botanic Gardens at Pamplemousses form the chief Botanic Station. In connexion with it a system of free exchange of plants with foreign correspondents has resulted in many valuable acquisitions to the colony. Altogether, 323,470 plants were sent out from the Station last year.

The Curepipe Nursery Gardens are 56½ acres in extent, and are situated at an altitude of 1,800 feet. These are chiefly used for forest nurseries. At the Réduit Gardens, valuable old timber trees exist which supply seeds of camphor, sandal-wood, eucalyptus, etc. for other nurseries.

A system of training gardening apprentices is in operation in connexion with these Botanic Stations.

Profitable Cotton Growing.

The officers at the Tuskegee Experiment Station, Alabama, have devoted attention to the best methods of cultivation for cotton, so as to secure the most remunerative results. Although the varieties of cotton dealt with did not include Sea Island, the system of soil preparation recommended is likely to give good results in the West Indies. The best returns were obtained from a plot ploughed to a depth of 9 inches, and thoroughly pulverized by repeated ploughing and harrowing until the soil is fine and mellow to that depth. The cotton plants grown on land so treated showed splendid root development, and bore an excellent crop.

The advantages consequent upon the maintenance of a dust mulch by shallow surface cultivation throughout the growing period of the plants were also demonstrated. Cultivation to a depth of 2 inches showed much better results than when the soil was stirred to a depth of 4, 5, or 6 inches.

Oil Grasses at Antigua.

Several experiments in the distillation of essential oils, especially that of the West Indian lemon grass (*Cymbopogon citratus*), were carried out at the Antigua Botanic Station in 1907-8. A few trials were also made with Cochin lemon grass (*C. flexuosus*) and citronella grass (*C. nardus*).

A total of 4,589 lb. of West Indian lemon grass was distilled; this gave 184·4 fluid ounces of oil, or at the rate of 4 oz. of oil per 100 lb. of grass. It is estimated that the yield of oil would be about 25 lb. per acre, affording at present prices (which are low) a monetary return of from £4 10s. to £5 per acre per year. Experiment appeared to indicate that the grass should be distilled immediately on cutting in order to obtain the maximum yield of oil. The Cochin lemon grass (*C. flexuosus*) appears somewhat more promising than West Indian grass, inasmuch as it is completely soluble in alcohol, and shows a higher citral content than *C. citratus*. If the prices of the essential oils improve, the cultivation of these grasses may be worthy of more attention in the West Indies.

Lemon grass oil is chiefly valued for the citral which it contains, this being used as the starting point in the manufacture of the essential constituent of artificial violet perfume.

Dominica Lime Juice.

Samples of Dominica lime juice were lately introduced, through the medium of the British-cotton Growing Association, to the notice of manufacturers at Manchester, who hitherto have been in the habit of purchasing Sicilian lemon juice for trade purposes. The reports received on the samples of juice (two of which were raw and one concentrated) are interesting.

The best time for selling the raw juice, for which there is a considerable demand in the preparation of cordials and essences, is in the spring or early summer. The samples sent were valued at from 10*d.* to 1*s.* per gallon.

The manufacturers were naturally most interested in the specimen of concentrated juice, which they report on as being practically identical in quality with the material imported from Messina. Messina lemon juice (concentrated) usually contains about 64 oz. of citric acid per gallon, and at current prices, is worth about £21 per pipe of 108 gallons without export duty. The average quality of West Indian concentrated lime juice imported into England, estimated on the basis of 64 oz. of citric acid per gallon, is worth about £3 per pipe less than the Messina product.

As already mentioned, the specimen of concentrated lime juice referred to was equal in quality to Messina juice, and at a strength of 113½ oz. per gallon, was worth £37 4*s.* 2*d.* per pipe of 108 gallons, estimating it on the basis of Sicilian prices.

It may here be remarked that under the new law lately established in Italy, a duty equivalent to £5 per pipe of 108 gallons will in future be levied upon lime juice exported from the country, so that the price will be £26 per pipe, in place of £21 as in the past.

INSECT NOTES.*

Some Beneficial Insects.

Beneficial insects may be classed under three headings: (*a*) those which form products useful to man, of which the honey bee (*Apis mellifica*) and the silk worm (*Bombyx mori*) are the best-known examples; (*b*) insects which play such an important part in the cross pollination of plants, as the bees and the hawk moths; and (*c*) those which, while themselves harmless, destroy other insects that are harmful to cultivated crops. It is this last class of insects to which these notes refer. They live in a variety of different ways: some are predatory, either, like the lady-birds (Coccinellidae), feeding in all stages on other insects, or, like the predatory wasps, storing their nests with larvae and spiders, to furnish a supply of food for their own larvae: others are parasitic, laying their eggs in or on some other insect, and the resulting larvae from these eggs pass through their whole metamorphosis at the expense of this insect host.

The most important of these parasites are found in the two orders Hymenoptera or the wasp-like insects, and the Diptera or true flies. There are also some among the Coleoptera or beetles.

In the Hymenoptera the following parasitic families are found: the Proctotrypidae, Chalcidae, Ichneumonidae, and Braconidae. These are the four most important families, though there are other smaller ones with parasitic habits.

Among the Diptera, the chief parasites are the Tachinid flies.

The Proctotrypidae are completely parasitic in the eggs of other insects or spiders. They are very small and include what is thought to be the smallest existing insect, viz., *Alaptus excisus*, Westwood, the length of which is given as $\frac{1}{6}$ mm., or about $\frac{1}{150}$ inch. Sometimes half a dozen of these minute insects will find sufficient food for their development in a single egg.

The Chalcidae are also very small; nearly 5,000 species are known, and there are doubtless still a great number of unknown species. They attack scale insects, plant lice, bees, and Lepidopterous insects.

The Ichneumonidae contain larger forms of insect life; there are upwards of 6,000 species known, most of which live in Lepidopterous larvae.

The Braconidae are another large family, and are parasitic on Lepidopterous larvae.

The Diptera include many families which contain among them a few parasitic forms but, as stated above, the Tachinidae are the most important.

The Tachinidae are medium to large flies, but they vary a great deal in size and details of structure. They are much like the common house-fly in general appearance. They are parasitic on insects belonging to the Orthoptera, Hymenoptera, Coleoptera, and Lepidoptera, particularly on the last mentioned.

In the order Coleoptera, the Stylopidae are important parasites on Hymenoptera, and on Hemiptera or bugs.

An attacked caterpillar continues to live and feed even though it is being gradually devoured by the invading parasite. This is because the latter leaves the vital organs of its so-called 'host' untouched until it is ready to pupate. If the larva dies too soon, the parasites must necessarily die also.

The important part which these several parasitic families play in keeping in check the many pests of our crops can scarcely be overestimated. Any unusually severe attack of a pest is invariably followed by a corresponding increase in its particular parasite, owing to the abundance of the food supply of the latter; and the planter or whoever the person interested may be, is surprised to find that the pest disappears as quickly and as suddenly as it had arrived, often not realizing to what he owes its disappearance. An example in point is instanced in Dr. Howard's 'Insect Book' where the author mentions that in a certain year, in the cotton fields of Northern Florida, 95 per cent. of the eggs from which would have hatched the voracious cotton caterpillar were killed by the minute Chalcid parasite *Trichogramma pretiosa*. It is only in cases where a pest has long been established in a country that the influence of these parasites is noticed. Each species of parasite has its own particular host species, or at most only a few. In consequence, it frequently happens that where a pest has been recently introduced into a country, a parasite which preyed upon it in the country from which it came is not introduced at the same time, and so the pest multiplies for a while, unchecked by its natural enemy, until either the parasite is introduced, or some indigenous species alters its habits and becomes parasitic upon it. It is owing to the recognition of these facts that, in the United States and elsewhere when some imported pest has become established, so much trouble is taken to discover, if possible, its original home, in order that its natural parasites may be looked for, and if feasible, may be introduced. Unfortunately, the effects of this satisfactory state of things are modified by the existence of other members of the families, which themselves prey, not on the pests, but on the parasites of the pests. Thus we have what are known as primary, secondary, and even tertiary parasites. For instance, we may have a bad attack of a particular pest on some crop. As it becomes more abundant, so does its primary parasite increase, and at last gaining the upper hand, practically demolishes the pest. Next season there are numbers of the parasite but there are few of the pest. Then the secondary parasite has its turn, and finding its prey (the primary parasite) present in large numbers, increases and destroys it, thus giving the original pest another chance of asserting itself, and as stated above, in some cases there may be a tertiary parasite which destroys the secondary parasite, thus giving the primary parasite again the upper hand.

In the West Indies, where the scale insects—Coccidae—are so abundant, one may frequently notice many of the scales with a large hole in them. It is through this hole that the parasite, having killed the scale insect and completed its own development, has escaped.

Nearly all Lepidopterous larvae also are preyed upon by parasites. In the cotton field one can often find dead cotton worm pupae with a small round barrel-shaped cocoon lying in or on it. This is either a Tachinid or Sarcophagid cocoon as the case may be, and on emerging, the fly hastens away to lay its eggs on other larvae, and thus quite a number are destroyed.

Mr. Ballou mentions in the *West Indian Bulletin*, Vol. VII, No. 1, that *Erania laevigata*, *Orphion bilineatum*, *Chalcis annulatus*, and *Trichogramma pretiosa*—the last of which was referred to earlier in these notes— are all of frequent occurrence in the West Indies. There are doubtless many others present, the life-histories of which will sooner or later be worked out.

* The Insect Notes on this page have been contributed by Mr. C. W. Jemmett, lately appointed Government Entomologist to Southern Nigeria, and who has for the past few months been connected with the Imperial Department of Agriculture.

GREEN DRESSING CROPS AT ANTIGUA.

The value of green dressing crops, more especially those belonging to the leguminous family, such as cowpeas and woolly pyrol, grown in connexion with sugar-cane cultivation, is being more recognized every year in the West Indies. Increased attention has been given in recent years to such crops at Antigua, and the latest report on the Botanic Station in that island gives an account of a number of experiments carried out at Skerrett's in the past year.

The total number of crops under experiment as green dressings were fourteen, including four varieties of cowpeas. The time of planting of these crops was generally in March, and the period from planting to reaping varied from two months in the case of white mustard (*Brassica alba*) and the Soy bean (*Glycine hispida*), to nearly eight months in the case of the 'Barbuda' bean. The cowpeas, however, required no more than three months to come to maturity.

The weight of produce yielded per acre was extremely satisfactory in the case of a number of these crops. The leading place was taken by the Barbuda bean, which yielded 20,000 ℔. of green bush per acre. Woolly pyrol gave a return of 14,850 ℔. of green bush, and bonavist 3,200 ℔. The four varieties of cowpeas grown were the 'White,' the 'Black Eye,' the 'Clay,' and the 'Red.' These gave returns in the order named: the 'White' cowpea yielded 10,570 ℔. of green bush, the 'Black Eye' 9,440 ℔., the 'Clay' 8,440 ℔., and the 'Red' cowpea 8,250 ℔.

Some distance below these from the point of view of return come the Pigeon pea (*Cajanus indicus*) (4,950 ℔. per acre), buckwheat (4,922 ℔.), the Babricou bean (*Canavalia* sp.) (3,520 ℔.), and the white mustard (3,000 ℔. per acre).

The three remaining crops—the Soy bean, the Sand vetch and Japan clover gave poor returns and the yield was not weighed in either case. The Barbuda bean proved a most promising green dressing. This plant is a rapid grower, and soon covers the land with vegetation, so that weeding operations are greatly minimised. The plot remained perfectly free from insect attacks, and it is mentioned in the report that this bean can be recommended with confidence for green dressing purposes at Antigua. Woolly pyrol has been more largely grown in such islands as Barbados than at Antigua. The report on the experiments, however, states that it is a crop which can distinctly be recommended, although it is somewhat liable to attack by caterpillars and red spider. If woolly pyrol is grown for the purpose of obtaining a crop of seed, it should be planted during the period from October to February.

The bonavist bean gave a satisfactory return, and it would certainly seem that this plant is worthy of trial on a large scale as a green dressing. This bean, too, was quite free from attack by caterpillars. Cowpeas have been fairly extensively grown in Antigua of recent years, with the object of supplying humus to the soil. They grow quickly and cover the ground, but it is mentioned that the great drawback to this crop is its susceptibility to caterpillar attack. Further, when insecticides have been applied in the hope of controlling this pest, the foliage of the plant is very readily damaged.

Pigeon peas, though less liable to attack from insects than cowpeas do not cover the ground so well, nor give the same amount of produce per acre. The greater number of plants mentioned are members of the Leguminosae and therefore of special value in increasing the amount of nitrogen in the soil. Buckwheat, however, belongs to the Polygonaceae, and therefore does not possess this special advantage. A small plot of this was grown; the produce was particularly free from insect attack, but the weight of green bush per acre was not great.

The Babricou bean shows itself a very hardy plant. It was cut about four months after planting at a time when it had not yet reached maturity. This bean can be recommended for planting on land that is to remain fallow some time before the permanent crop is planted.

The results given by the mustard were not sufficiently good to warrant the experimenters in recommending that it should be grown on estates for green dressing purposes.

SOIL CAPILLARITY.

Water in the soil is drawn to the surface by what is known as capillary action. An example of the working of this capillary force can be observed when open tubes, having a very small bore, are placed in a vessel of water or other liquid. It will be seen that the level of the liquid in the tube has risen higher than the general surface in the vessel. Similarly, if a piece of loaf sugar is placed in a saucer containing a small quantity of water, so that only a fraction of the sugar is immersed, the liquid will be observed to mount rapidly through the substance of the sugar, until the whole piece is saturated. This ascent of the water is also due to the working of capillary force, and water in the soil rises to the surface in the same way. The following notes are extracted from an article on this subject, which is one of great importance to the practical cultivator, that lately appeared in the American *Journal of Agriculture*:—

Water deep down in the soil is attracted and drawn to the surface of the soil grains there, the soil particles above them attract and draw the water to their surfaces, so in turn the different layers of soil particles draw the water to themselves and up till it reaches the surface. Once at the surface, the air claims the water and it is taken away from the soil by evaporation.

Soil particles not only have the power of drawing water to themselves, but of holding it as well. By a simple mathematical law, the smaller the particle the greater proportional surface it has, hence the finer the particles are, the more water a given soil is capable of holding. Also, the closer together the soil grains are, the more retentive is the soil of moisture. For this last reason deep ploughing for breaking up large masses into fine grains, and heavy packing to bring these grains into close contact, are employed in dry-farming operations, and may be adopted in any region, in dry times, to make deep soil hold large amounts of water.

The practical application of the principles of soil capillarity consists in first loosening the soil to as great depths as possible for creating large surfaces for exposure, allowing the soil to catch and imbibe as much water as possible, if it be not already saturated, and then stirring the surface frequently to break capillary action at the surface to prevent loss from above. The farmer who understands fully the laws of capillary action and so handles his soil as to receive and retain large amounts of moisture has mastered one of the greatest points of successful farming.

GLEANINGS.

It is reported from Jamaica that the Belle Isle Estates Company are erecting a central sugar factory in that island at a cost of £30,000.

At a late meeting of the Trinidad Board of Agriculture, it was decided to appoint Mr. F. W. Urich as Entomologist, for a term of two years, at a salary of £400 per annum.

Dr. W. A. Murrill, Assistant Director of the New York Botanical Garden, accompanied by Mrs. Murrill, is now on a visit to Jamaica, for the purpose of collecting and studying specimens of the fungus flora of that island.

In a late report of the Trinidad Government Stock Farm, the manager speaks very highly of cocoa-nut meal as a nutritious food for all kinds of animals except young calves. In regard to cotton-seed meal as a food for mature stock, it is recommended that it be fed in connexion with molasses.

As an instance of increasing interest in the utilization of economic plants in Mauritius, it is mentioned in the latest *Annual Report* (1907-8) on the colony, that some beautiful fibres prepared from the 'Traveller's Palm' (*Ravenala madagascariensis*) were shown at the last Horticultural Exhibition held in the island.

The stock on service at the Agricultural School, Union, St. Lucia, include the Ayrshire bull 'Gipsy Star of Bellevue,' fee 2*s.*; the African woolless ram sheep 'Egba,' fee 1*s.* (or less to peasant proprietors at the discretion of the Agricultural Superintendent); and the Berkshire boar 'Homestead Hero,' fee for service 1*s.*

As in past years, an experimental plot of onions was grown at the Antigua Botanic Station in 1907-8. The seeds were first sown in a nursery and then transplanted to the beds. Planting took place on October 8, and the last of the crop was gathered in on February 17. The yield of onions obtained was at the rate of 1,450 lb. per acre.

Two Agricultural Inspectors are being appointed under the Board of Agriculture for Trinidad. The chief work of these officers, who are to be men with practical experience in cacao cultivation, will be to inspect estates, report on plant diseases, etc., together with any other duties which the Board may direct.

A lecture on the subject of 'Ticks' was given at the Jamaica Institute, Kingston, on January 13 last, by Professor Newstead of the Liverpool School of Tropical Medicine, who is at present on a visit to Jamaica for the purpose of investigating the disease-bearing insects of the colony. (*Jamaica Telegraph.*)

Exports of preserved pine-apples from the Bahamas show a considerable decline from 1906-7 to 1907-8. In the former year, they were 117,196 cases, valued at £19,090, but in 1907-8 they fell to 68,349 cases of value £13,579. This decrease is attributed to drought, and it is stated that later prospects are more encouraging. (*Annual Report*, 1907-8.)

In a recent letter to the *Times*, Mr. A. D. Hall, M.A., Director of the Rothamsted Experiment Station, England, points out that experiments, carried out at the Station, in the inoculation of the soil with nitrogen-fixing bacteria, preparatory to the cultivation of leguminous crops, have so far not proved satisfactory. They have, however, only been in progress for two years.

There are a few vacant scholarships for pupils at the St. Lucia Agricultural School. Candidates must be healthy, strong, and intelligent boys of about sixteen years of age. The boys selected will receive free board, lodging, and an agricultural training for three years. Further particulars may be obtained from Mr. J. C. Moore, Agricultural Superintendent, St. Lucia.

The output of cane sugar in Queensland has made considerable advances in recent years. In 1903-4, the total yield was 91,828 tons, but in 1904-5 it increased to 147,688 tons, and to 152,722 tons in 1905-6. For the season 1906-7 the output was 184,377 tons, and in 1907-8 it had reached 188,307 tons. The yield of sugar (94° test) has been, on the average, 10·09 per cent. of the weight of the cane.

Cowpeas are largely grown for green dressing purposes at Antigua, but a great disadvantage connected with this crop is the susceptibility of the plants to attack by caterpillars. Experiments have been carried out in dusting the affected plants with Paris green and lime, the proportions varying from 10 to 35 parts of lime to one of Paris green; but in all cases the leaves of the cowpeas were scorched by the application of the insecticide.

It is seen from the latest *Annual Report* on Trinidad and Tobago that the total value of the exports from the colony during 1907-8 amounted to £3,907,503, as compared with £2,872,325 in the previous year. The chief items responsible for this advance of trade are Trinidad cacao, which shows an increase of £984,300; Venezuelan cacao, an increase of £157,800; and sugar, an increase of £90,900.

At a recent meeting of the Trinidad Board of Agriculture, it was announced that samples of cacao pods damaged by thrips, together with specimens of the insects in question, had lately been received from Tobago. This is believed to be the first time that an attack of cacao by thrips has been reported from that island. An article 'Thrips on Cacao,' by Mr. H. A. Ballou, M.Sc., which contains information as to methods of treatment, appeared in the *West Indian Bulletin*, Vol. VIII, p. 143.

A note in the *Journal* of the Jamaica Agricultural Society mentions that the rubber trees planted in Jamaica are chiefly grown on big cacao and banana plantations, and with the hope that the rubber trees will form a suitable shade for the cacao. The *Journal* advises small holders not to plant rubber trees on their land. Their cacao and coffee are already, as a general rule, more than sufficiently shaded, and, grown on a small scale, rubber is not likely to be a profitable cultivation.

STUDENTS' CORNER.

Seasonal Notes.

FEBRUARY.

1ST FORTNIGHT.

Take note of the young canes now growing from the planted 'tops.' Compare the 'top,' and its buds with the seed and its embryo. Note how the young roots arise, and the course they take. See if the root tips in any case are attacked by root disease (*Marasmius*).

Examine the young cane shoots for 'dead hearts' and see how these are caused by boring caterpillars. Study the life-history of this moth borer.

In cacao-growing localities read up the facts relating to grafting cacao; understand what is aimed at, and what has been done. Make experiments in grafting.

Make notes as to the best lots of seed to save from cotton fields for next year's planting. Examine carefully and systematically any samples of cotton passing through your hands.

In many places the cotton plants will be shedding their leaves. Learn what changes take place in a leaf as it ripens and prepares to fall.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What gases in the atmosphere play a part in plant life? In what manner are they taken in by the plant?

(2) Describe, with sketches, the germination of a cacao seed.

(3) Describe a plough, and its action on the soil. What constitutes good ploughing?

INTERMEDIATE QUESTIONS.

(1) What causes the so-called 'dead hearts' in young cane sprouts, and what steps should be taken in connexion with them?

(2) What are the advantages of grafting fruit trees, cacao, etc., as against raising from seed?

(3) What precautions are necessary in picking cotton?

RICE IN BRITISH GUIANA.

Weather conditions continue favourable for rice growers in British Guiana. A good deal of produce is now being placed on the market, and prices are steady. Messrs. Sandbach, Parker & Co., of Georgetown, report as follows on January 22 last:—

The weather for the past fortnight has been favourable, only two rainy days being experienced, which did not seriously interfere with milling operations, and fairly large quantities of rice are now being received in town.

The market keeps firm, and in fact prices have advanced slightly, small offerings being eagerly bought for local consumption. Two sales for export have been reported, but we do not think that there will be much offered in the West India islands, except at an increase on previous sales.

Shipments to the West India islands during the fortnight amount to about 1,800 bags.

The price of good export rice, f.o.b. Demerara, is, at date of writing, 19*s.* 3*d.* to 19*s.* 6*d.* per bag of 180 lb. gross.

ST. VINCENT AGRICULTURAL AND COMMERCIAL SOCIETY.

An interesting meeting of the above Society was held at the Court House, St. Vincent, on January 13 last, under the presidency of Mr. Alexander Smith.

A resolution of thanks to the British Cotton-growing Association for the kindness shown to the delegates from St. Vincent to the Cotton Conference held in England in August last, was carried unanimously, as was also a second vote of thanks to the Royal Mail Company for carrying the delegates at reduced rates.

The question of mechanical tillage at St. Vincent was then brought up for discussion by Mr. G. R. Corea. Mr. Corea mentioned that he thought the time had come when it was necessary for planters to go into this matter, in view of the serious shortage of labour at present existing on estates. He understood that at Antigua certain implements had been imported from the Southern States of America, and were reported on very favourably. They were, it appeared, eminently suited for cane and cotton cultivation. He had also heard that the cost of production of crops was reduced, better work was done, and a good deal of labour saved. He suggested that the Society should go into the matter with a view to obtaining full information as to whether such implements were likely to be of service in this island. He would give his support in every way possible, and suggested that the question be laid before Dr. Francis Watts, C.M.G.

Mr. Sands gave a general idea of what had been done at Antigua. He pointed out that there was a good area, probably half of the arable land of St. Vincent which could be worked by machinery, but that in the first place skilled instruction was necessary. The implements imported from Louisiana into Antigua were well suited for cotton and cane cultivation and all the different cultural operations could be carried out by them.

Other speakers referred to the shortage of labour on many estates, and since the introduction of implements might help towards production at a minimum figure, it was decided to obtain more information on the subject. Since mechanical tillage had been tried at Antigua, the Secretary was instructed to write to Dr. Francis Watts, Imperial Commissioner of Agriculture, asking for his views on the subject, together with full data as to the cost of implements, the cost of working, and the amount of saving effected per acre in the production of sugar-cane and cotton. If the adoption of implemental tillage was likely to be suitable on St. Vincent lands, and to reduce the cost of production, every effort should be made to introduce it into the island.

The question was next raised by the Hon. C. J. Simmons as to whether there was, at present, a sufficient supply of labour in the island, or whether owners would not be advised to co-operate for the introduction of indentured labour.

While it was generally agreed that the present deficiency of reliable labourers increased the difficulty of remunerative cotton production, some of the members present believed that the introduction of indentured labour would prove too expensive just now. Further discussion on the matter was deferred.

The last item of business on the agenda was a resolution expressing regret at the retirement of Sir Daniel Morris, K.C.M.G., from the office of Imperial Commissioner of Agriculture for the West Indies, together with appreciation of the services rendered to the West Indies by the ex-Commissioner. This resolution was carried unanimously.

AGRICULTURAL SCHOOLS.

The usual half-yearly examinations of the agricultural schools at St. Vincent, Dominica, and St. Lucia were held in December last. Below are given those portions of the reports of the examiner, Mr. F. A. Stockdale, B.A., F.L.S., which are of general interest:—

ST. VINCENT.

Fifteen boys sat for the examination. Three took the papers set for the senior class, ten those for the junior class, and two were new boys. The average percentages of marks obtained by the three classes were as follows: Seniors, 75·5; juniors, 66·0; and new boys, 61·0. These percentages show considerable improvement over those obtained in the last examination, and indicate that the examination results of the school have greatly improved.

Agriculture has shown improvement, and many of the papers were highly satisfactory. Marked progress has been made in Chemistry. It is hoped that continued attention will be given to this latter subject in order that the improvement may be maintained.

Arithmetic was the weakest of the more important subjects, and should receive attention before the next examination. In fact, it might be advised that extra time be allotted to this subject during the coming half-year, as it was inclined to be weak at the examination conducted last June. Geography has improved and the Composition papers may be considered to be fairly satisfactory.

Considering the papers as a whole, this examination indicates that the pupils at this school have been receiving very careful attention, and that they have a creditable elementary knowledge of the scientific principles underlying agricultural practice. With good practical grounding, these pupils should not fail to be of value to the agriculture of the colony.

DOMINICA.

Seventeen boys sent in papers for examination. Two took the papers set for the senior class, thirteen those for the juniors, and there were two new boys. The average percentages of marks obtained were as follows: Seniors, 72·3; juniors, 57·1; and the new boys 62·5. There is a distinct falling off amongst the junior class, particularly when it is considered that Arithmetic produced a large proportion of marks.

The papers sent in by the two senior boys were, on the whole, satisfactory, with the exception of Agriculture—a subject that should receive further careful attention.

The work of the junior class is still very poor. The science subjects have made practically no progress during the the past half-year, and as they were unfavourably reported upon at the last examination, it is necessary that every effort should be made to give this class particularly close attention. Out of thirty-nine papers on science subjects submitted by this class for examination, only fourteen obtained more than half marks. Not a single paper in Agriculture was worthy of over half marks.

The general school subjects have again shown some improvement. Arithmetic was very satisfactory and some further improvement has been made in Geography, but attention should still be given to the latter subject.

The new boys sent in fair papers. Their Arithmetic was very good. The Geography marks of these pupils have been withheld, pending an investigation.

ST. LUCIA.

Twenty-three pupils sent in papers for examination. Eight took those set for the senior class, twelve those for the juniors, and there were three new boys. The average percentages of marks of the three classes were as follows: Seniors, 62·3; juniors, 44·0; and new boys, 53·7. These percentages show improvements since the last examination, especially in the senior class.

The work of the senior class was, on the whole, fairly satisfactory. Considerable improvement has been made in Agriculture, and some good answers were submitted in this subject. Chemistry and Botany have slightly improved but the pupils should still receive careful attention in these subjects.

The Arithmetic of this class has made but little progress since the last examination, and must receive close attention. Some improvement has been made in Geography, but the pupils should be given further careful instruction in this subject.

The work of the junior class is not yet satisfactory. Only three boys obtained over 50 per cent. of the total marks. Two of these have only been admitted to the school since the last examination and have made marked progress. Some improvement has been made in the science subjects, especially in Agriculture and Botany, but the pupils require further very careful instruction in these subjects.

The Arithmetic has made practically no progress since the last examination, and it is necessary that extra time should be given to this subject during the next half-year, in order that improvement may be shown at the next examination. Geography and Composition should also receive attention.

BROOM CORN CULTIVATION AT ANTIGUA.

The Curator of the Antigua Botanic Station in his latest report gives particulars of experiments carried out with broom corn at Skerrett's in the past season. Two plots, each one-tenth of an acre in area, were planted with the crop. The following details are taken from the report:—

One of the plots of broom corn was planted on June 21, 1907, the seeds being sown 3 feet apart on 4-feet finished banks. Reaping commenced on October 1 and finished on October 31. The weight from this plot was 74 lb. of dried broom corn.

The second plot was planted on June 28; reaping commenced on September 2 and finished on October 4. The seed was sown 6 inches apart, on rows 18 inches apart. The weight from this plot was 77½ lb. of dried broom corn.

The difference in the results from these two methods of planting was 3½ lb. in favour of the 18 inch × 6 inch planting. This is not great, but the corn produced on the more closely planted plot was somewhat finer than that on the other plot. This is a point of some importance, as it has been reported that broom corn grown in Antigua is somewhat too long and coarse. Later experiments point to larger yields than above recorded from close planting.

Broom corn experiments have been carried on in Antigua for a number of years, the object being to obtain a remunerative crop which may prove useful in a rotation of crops, and for which a fair and large market is open. The want of a broom corn cleaner has handicapped the growing of this crop in the past, but as a cleaning machine has been imported during the year, this difficulty will not be felt in the future.

FERMENTATION OF PEN MANURE.

An article already referred to in the *Agricultural News* (see Vol. VII, p. 169) lately appeared in the *Journal* of the British Board of Agriculture and Fisheries (Vol. XV, No. 1), which dealt in an exhaustive way with the composition and storage of farmyard manure, the fermentation and accompanying changes in composition undergone by the manure during storage and after application to the land, the loss of nitrogen (in the form of ammonia gas) from the manure, that readily takes place if the greatest care is not exercised to prevent it, and also the chief methods of preventing this escape of ammonia.

The proportion of nitrogen that is lost under average conditions of storage would by most persons be regarded as surprisingly large. From experiments referred to, which were carried out in Germany about ten years ago, it is seen that even with the most careful management, 13 per cent. of the nitrogen was lost from the dung. This loss increases very rapidly if conditions be less favourable, and if the manure is merely allowed to accumulate in a loose heap, as much as 30 or 40 per cent. of the nitrogen may escape. The minimum loss takes place if the manure is trampled under the animals in a deep bed or pit.

The account that is given of the bacterial and other changes occurring in farmyard manure should be of interest to planters, since, in the main, they apply also to the pen manure of the West Indies. Some of the facts conveyed should also be of value, as they may indicate points in which the preparation and methods of application of pen manure on estates may be modified with a resulting saving in nitrogen. The following notes form a summary of portions of the article mentioned :—

Pen manure, which is originally a mixture of solid excrement, urine, and litter, soon undergoes changes in composition that in the main are brought about by bacteria. One of the most important of these changes is the conversion of the urea of the urine into carbonate of ammonia. This conversion into ammonium carbonate is exceedingly rapid; in the liquid draining from a yard or a manure heap, little or no urea can be detected, so complete has been the change to ammonia. If loss of nitrogen is to be prevented, the liquid containing the carbonate of ammonia must be protected from evaporation. Otherwise, the higher the temperature, and the more extensive the surface exposed to the air, the greater will be the loss of ammonia passing off in a gaseous condition. This volatilization of ammonia causes most of the loss of nitrogen that takes place in making pen manure. In addition, however, there are always present various bacteria which oxidize the ammonia of ammonium carbonate to free nitrogen gas and water. Loss of nitrogen in this way is always increased when the manure heap is in a loose condition.

The so-called 'putrefactive' bacteria are also abundant in fresh manure, and their function is to convert the insoluble nitrogenous bodies (proteids) of the straw into soluble bodies, ammonia being the final substance formed. It may be mentioned, too, that the reverse action to this is also in progress at the same time; the multiplying bacteria seize upon the soluble forms of nitrogen, and convert them into insoluble proteins in their body tissue. Owing to this fact, in long-stored manure, most of the ammonia has returned to a proteid form.

The most characteristic change that takes place in pen manure is the destruction of the trash, and its conversion into 'humus.' Trash and other carbonaceous matter, when spread out thin and exposed to the air, are subject to attack from a number of organisms, which completely convert the material into carbon dioxide, water, and inorganic ash. The importance of keeping the manure heap compact and protected is therefore apparent from this fact alone. Anaerobic bacteria, i.e., those capable of acting in the absence of oxygen, and whose activities therefore are not accompanied by oxidation processes, are chiefly responsible for the conversion of trash and other similar material into the indefinite brown, acid substance known as 'humus.'

It will be seen that the changes occurring in the making and storage of pen manure are very complex. In the early stages bacterial action is most rapid, and it is concerned chiefly with the soluble nitrogenous compounds, like urea. As soon as the first violent reactions are over, the rate of change slows down considerably; and it now consists mainly in the attack of the anaerobic bacteria upon the carbohydrate material of the trash. During this second change but little loss is experienced by the nitrogenous compounds if the mass be kept tightly pressed and moist, so as to exclude air; there will be no loss of fertilizing constituents, only a gradual decline in weight as some of the carbon compounds are converted into gases.

One other change sometimes takes place when the manure is allowed to get loose and dry; instead of bacteria, fungi begin to develop very rapidly, and the whole mass becomes permeated with the mycelium. It is generally agreed that manure in this state is seriously deteriorated, but no analyses of such material are available.

At the close of the article, the best methods of preventing the loss of nitrogen are discussed. A well-known German investigator found that the only practical means of reducing the loss of ammonia was to place a layer of old well-rotted manure as a basis for the new heap. This had a distinctly beneficial effect, which was possibly owing to the fact that the carbonic acid, of which there is a constant evolution, combined with the free ammonia, fixing it as carbonate of ammonia, and so preventing its escape in the gaseous form.

PARA RUBBER SEEDS.

It should be a matter of interest to those who have planted, or contemplate planting, Para rubber trees (*Hevea brasiliensis*) to know that the seeds of these trees, which are usually produced in abundance, are likely in the future, when available in sufficient quantity, to prove of some value as a commercial product. In reference to the extending rubber industry of the British colonies, the latest report of the Imperial Institute contains the following note :—

In connexion with the present extensive planting of Para rubber trees, the fact that the abundant seeds of this tree can be utilized as the source of a valuable oil may become a matter of commercial importance in the near future, when the seeds will be available in quantities far in excess of those required for planting. The investigations conducted at the Imperial Institute have proved that this oil, which resembles linseed oil, will probably command about the same price as the latter commodity, whilst the residue of the seeds from which the oil has been expressed may prove to be serviceable locally as a feeding stuff for cattle. It is therefore possible that a valuable subsidiary industry may arise in connexion with rubber planting.

MARKET REPORTS.

London,—January 19, 1909, The West India Committee Circular; Messrs. Kearton Piper & Co., January 5, 1909; Messrs. E. A. de Pass & Co., December 24, 1908.

Arrowroot—Quiet; $2\frac{1}{8}d$. to $2\frac{1}{4}d$. for fair to good manufacturing.
Balata—Sheet, 2/1 to 2/4; block, no quotations.
Bees'-wax—No sales reported.
Cacao—Trinidad, 56/- to 70/- per cwt.; Grenada, 48/6 to 57/- per cwt.
Coffee—Santos, 30/- per cwt.; Jamaica, no quotations.
Copra—West Indian, £19 per ton.
Cotton—St. Kitt's, $13\frac{1}{2}d$.; Barbados, $13\frac{1}{2}d$. to $14d$.; St. Vincent, $14\frac{1}{2}d$. to $15d$.
Fruit—
Bananas—Jamaica, 4/6 to 6/- per bunch.
Limes—Not wanted.
Pine-apples—St. Michael, 2/6 to 5/6.
Grape Fruit—5/- to 8/- per box.
Oranges—Jamaica, 4/- to 7/- per box.
Fustic—£3 to £4 per ton.
Ginger—Quiet.
Honey—No quotations.
Isinglass—West India lump, 1/10 to 2/- per lb.
Lime Juice—Raw, 1/2 to 1/5 per gallon; concentrated, £18 per cask of 108 gallons; distilled oil, 2/9 per lb.; hand-pressed, 7/- per lb.
Logwood—£3 to £4 5s. per ton; roots, no quotations.
Mace—Steady.
Nutmegs—Steady.
Pimento—$2d$. per lb.; slow.
Rubber—Para, fine hard, 5s. 2d. per lb., on the spot.
Rum—Jamaica, no quotations; Demerara, 1/6 to 1/7, proof.
Sugar—Crystals, 14/6 to 17/-; Muscovado, no quotations; Syrup, 12/- to 14/-; Molasses, no quotations.

New York,—January 8, 1909. Messrs. Gillespie, Bros. & Co.

Cacao—Caracas, $12\frac{1}{4}$c. to 21c.; Grenada, $11\frac{3}{4}$c. to 12c.; Trinidad, $12\frac{1}{2}$c. to $13\frac{3}{4}$c.; Jamaica, $9\frac{1}{2}$c. to $11\frac{1}{2}$c. per lb.
Cocoa-nuts—Jamaica, select, \$22·00 to \$23·00; culls, \$13·00 to \$15·00; Trinidad, \$21·00 to \$22·00; culls, \$13·00 to \$15·00 per M.
Coffee—Jamaica, ordinary, $7\frac{3}{4}$c. to $8\frac{1}{4}$c.; good ordinary, $9\frac{1}{2}$c.; washed, $10\frac{1}{4}$c. to 11c. per lb.
Ginger—9c. to $12\frac{1}{2}$c. per lb.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
Grape Fruit—Florida, \$1·50 to \$3·00 per box.
Limes—No quotations. Market overstocked.
Mace—28c. to 32c. per lb.
Nutmegs—110's, $10\frac{3}{4}$c. to $10\frac{3}{4}$c. per lb.
Oranges—Jamaica, \$3·00 to \$3·50 per barrel; \$1·00 to \$1·50 per box.
Pimento—$3\frac{5}{8}$c. per lb.
Sugar—Centrifugals, 96°, 3·67c.; Muscovados, 89°, 3·17c.; Molasses, 89°, 2·92c. per lb., duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Leacock & Co., January 30, 1909; Messrs. T. S. Garraway & Co., February 1, 1909.

Arrowroot—St. Vincent, \$4·00 per 100 lb.
Cacao—Dominica and St. Lucia, \$9·00 per 100 lb.
Cocoa-nuts—\$13·00 for unhusked nuts.
Coffee—Jamaica and ordinary Rio, \$8·50 to \$11·50 per 100 lb.
Hay—\$1·20 per 100 lb.
Manures—Nitrate of soda, \$62·00 to \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$72·00 to \$75·00; Sulphate of potash, \$67·00 per ton.
Molasses—No quotations.
Onions—Strings, \$2·00; loose, \$1·20 per 100 lb.
Potatos—Nova Scotia, \$1·30 to \$1·60 per 160 lb.
Peas—Split, \$6·25 per bag of 210 lb.; Canada, \$3·30 per bag of 120 lb.
Rice—Ballam, \$5·30 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—No quotations.

British Guiana,—Messrs. Wieting & Richter, January 23, 1909; Messrs. Sandbach, Parker & Co., January 23, 1909.

Arrowroot—St. Vincent, \$9·00 per 200 lb.
Balata—Venezuela block, 32c.; Demerara sheet, 48c. per lb.
Cacao—Native, 16c. to 18c. per lb.
Cassava—60c.
Cassava Starch—\$5·00 to \$6·00 per barrel of 196 lb.
Cocoa-nuts—\$12·00 to \$16·00 per M.
Coffee—Creole, 12c. to 13c.; Jamaica, 11c. to 12c. per lb., slow.
Dhal—\$4·60 to \$4·75 per bag of 168 lb.
Eddos—\$1·44 per barrel.
Molasses—No quotations
Onions—Madeira, 4c. per lb.
Plantains—12c. to 28c. per bunch, plentiful.
Potatos—Nova Scotia, \$2·50 per 100 lb.
Potatos—Sweet, Barbados, \$1·68 per bag.
Rice—Ballam, \$6·00 to \$6·25; Creole, \$4·65 to \$4·75; Seeta, \$6·00.
Split Peas—\$6·00 to \$6·25 per bag (210 lb.); Marseilles, \$4·25 to \$4·50.
Tannias—\$1·92 per bag.
Yams—White, \$2·00; Buck, \$2·00 per bag.
Sugar—Dark crystals, \$2·20; Yellow, \$2·60 to \$3·10; White, \$3·60 to \$3·80; Molasses, \$2·10 to \$2·20 per 100 lb. (retail.)
Timber—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—\$3·75 to \$5·75 per M.
——— Cordwood—\$2·40 to \$2·64 per ton.

Trinidad,—January 23, 1909.—Messrs. Gordon, Grant & Co.

Cacao—Venezuelan, \$12·25 to \$12·50 per fanega; Trinidad, \$11·50 to \$12·00.
Cocoa-nuts—\$22·00 per M., f.o.b., for selected peeled in bags of 100 lb.
Cocoa-nut Oil—68c. per Imperial gallon, cask included.
Coffee—Venezuelan, $8\frac{1}{2}$c. to 9c. per lb.
Copra—\$3·10 per 100 lb.
Dhal—\$4·50 to \$4·60 per 2-bushel bag.
Onions—\$2·00 to \$2·25 per 100 lb. (retail).
Potatos—English, 90c. to \$1·10 per 100 lb.
Rice—Yellow, \$5·40 to \$5·60; White, \$4·50 to \$4·90 per bag.
Split Peas—\$5·75 to \$6·00 per bag.
Sugar—American crushed, \$5·00 to \$5·10 per 100 lb.

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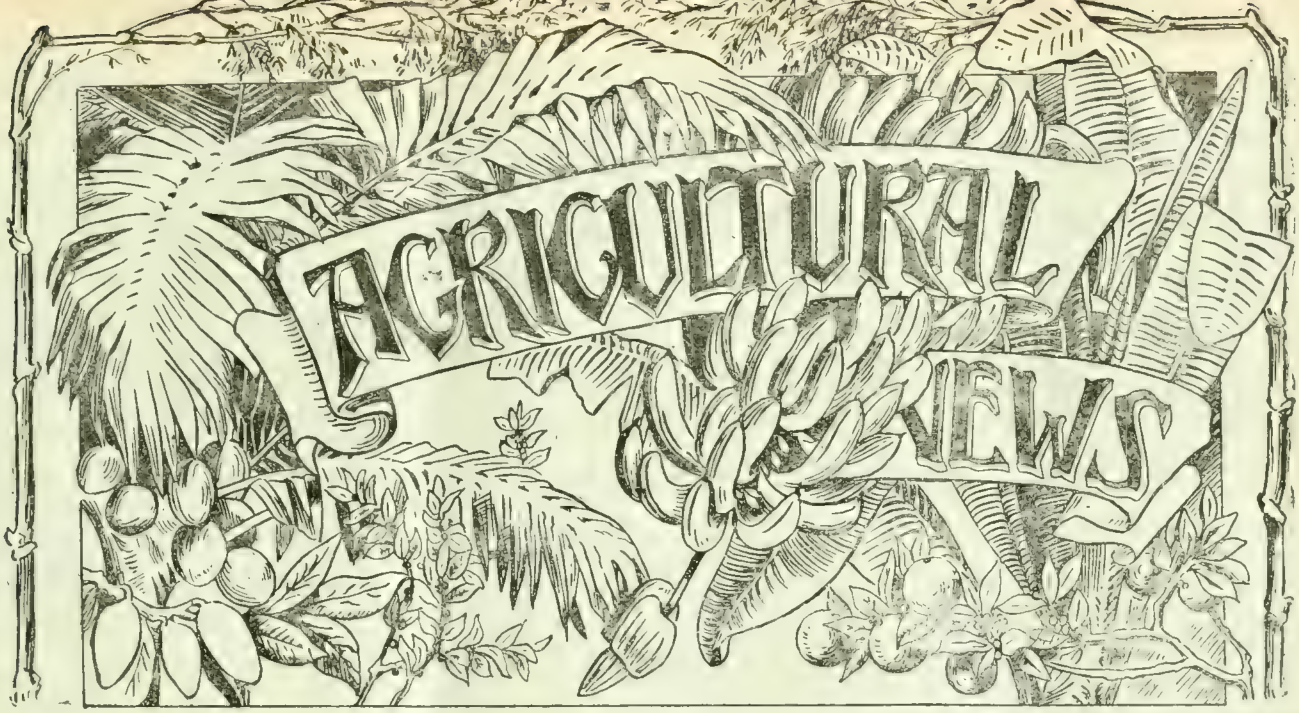

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Mendelism:

PART II.

IN the editorial of the last issue the system according to which it has been shown that simple 'unit characters' in plants and animals are transmitted from one generation to the next was described.

The cases of crossing dealt with in the previous article were of the most simple nature *only*, *i.e.*, those in which the individuals concerned differed from each other in respect to but a single pair of characters. More frequently, however, it will be found that the original parents vary in a number of qualities, so that the question becomes one of greater complexity. But it has been shown that in such cases, each pair of characters in which the parent plants (or animals) differ is transmitted according to simple Mendelian rule, and often independently of any other pair.

To take an example: Tallness and dwarfness are Mendelian characters in ordinary garden pea plants, the former being dominant. Similarly, in the same plant, as already mentioned, coloured flowers are dominant to white flowers. We have here an example of two pairs of unit qualities in the individuals to be crossed. If now a tall pea plant having white flowers is crossed with a dwarf plant possessing coloured blossoms, the plants of the next generation will all be tall, and will all bear coloured flowers. In the offspring of these hybrids, however, according to Mendelian rule, both tall and short plants will appear, the former being three times as numerous as the latter. Out of every sixteen plants of the second generation, therefore, twelve will be tall and four dwarf. The characters of colour and of whiteness in the flowers are transmitted in a similar way, but quite independently of those of tallness and shortness, and distributed equally among both the tall and the short plants, so that there will be three with coloured blooms to one with white among the 'talls,' and similarly three with coloured blooms to one with white among the 'dwarfs.

It will be seen that, as the result of crossing, a combination of characters has been brought about, and two new kinds of peas now exist, viz., coloured talls and white dwarfs. In this generation, too, a certain definite proportion of each of the four classes have become fixed, and by picking out such plants the new varieties may be established.

The economic importance of the knowledge that has now been demonstrated as to the simple and systematic manner in which unit qualities are inherited is apparent to everyone, and its effects on the work of improvement of agricultural crops will, undoubtedly, be far-reaching in the future. In the past this work has had to be carried forward by the long-continued, and frequently unsatisfactory method of selection, but now, given a knowledge of the Mendelian or unit characters of the varieties of plant under consideration, crosses can be made with a complete fore-knowledge of the results, and the whole subject of inheritance has been placed on a definite basis. Having selected, from all the varieties at hand, the qualities needed, the breeder will be able to combine these qualities according to his will, and by suitable crossing, to build up a plant or animal possessing the desired characteristics.

From this it will be seen that the first step necessary is to determine what are the Mendelian characters of a given species of plant or animal. It is here that the chief difficulties of the work lie, for the complete analysis of the qualities of the individual to be dealt with is a very lengthy and tedious process. Judicious and repeated crossing, with intelligent interpretation of the results, is, of course, the only method by which to approach the task, and this line of investigation carried out for a few generations will usually reveal some pairs of characteristics that are transmitted in the way described.

Interesting work in the breeding of plants on Mendelian lines, and which promises to lead to valuable results, is in progress at the Agricultural Department of the University of Cambridge under the direction of Professor R. H. Biffen, and among the economic plants under trial, chief attention has been given to the wheat plant. The numerous crossing tests that have been made have now at least laid the foundations of an accurate knowledge of the various unit characters that occur in wheat. Among the qualities of this crop which experiment has shown to be transmissible as pairs of Mendelian characters are red grain and white grain, early and late ripening, heavy as opposed to poor cropping capacity, glutenous grain and starchy grain, and—probably most important of all—immunity to rust disease and liability to this pest. The possibilities that may arise from the now ascertained fact that resistance to rust is a Mendelian 'unit character' will be evident when it is mentioned that the average annual loss to the world's wheat crop, as the result of rust attack, has been placed at over £100,000,000.

In Egypt, experiments of the same nature were established some years ago with a number of native varieties of cotton, and have now been continued for several years. Probably the most valuable point that has so far been demonstrated in these trials is that long lint and short lint form a pair of Mendelian unit characters, the former being dominant. Other pairs of qualities inherited in the same way are: large seed and small seed, fuzzy seeds and seeds with small quantities of fuzz, yellow flower and cream-white flower, etc.

From the examples that have been quoted, it will be seen that a desirable characteristic which the breeder would wish to combine with other qualities of similar economic value, and permanently fix in an improved plant, may be either 'dominant' or 'recessive.' In the majority of cases so far instanced, the desirable characteristic has been the 'dominant' unit of the pair, but immunity to rust in wheat is a 'recessive' character, to which liability to the disease is the corresponding 'dominant.' It may be pointed out that the work of the investigator is made easier when the quality it is desired to fix proves to be a simple recessive. This is on account of the fact that plants showing the recessive character breed true from the moment of their first appearance in the second generation from the original parent plants, while only one-third of those individuals which in the second generation show the 'dominant' quality will breed true, and a further generation has to be raised before the pure dominants can be picked out.

The terms 'dominant' and 'recessive' as applied to a pair of Mendelian characters may at first appear to imply that the latter is inferior to the former in some way. It should be borne in mind, however, that this is not the case, and that the terms relate only to the first generation of hybrids produced from the original parents, where the fact that one characteristic (as whiteness in the pea flowers first referred to) disappears for the time being, accounts for the term 'recessive,' while the opposing quality of colour, which is apparent in all the individuals of this generation, is referred to as the 'dominant' character. The quality of 'whiteness,' however, as it appears in the flowers of a proportion of the plants of the second generation, is pure, fixed, and permanent, despite the fact that these plants are the offspring of hybrid pea plants bearing coloured flowers.

SUGAR INDUSTRY.

The Antigua Sugar Factory.

The development of the Antigua Sugar Factory was fostered by the Government with the object of obtaining reliable information concerning the working of factories of moderate size, and as to the desirability of substituting such factories for the muscovado methods of manufacture.

An account of the origin of the factory, the constitution of the company, and the working arrangements was given in a paper contributed to the *West Indian Bulletin* (Vol. VI, p. 60); and an editorial article containing information on this subject, together with a summary of the report on the working for the 1907 season appeared in the *Agricultural News* for March 21 last (Vol. VII, p. 81).

The fourth Annual Report of the Directors (for the season 1908) has now been issued, and the following extracts should be of interest:—

The weather during the past season was not unfavourable. The supply of canes, however, fell off somewhat from most of the estates, but the deficiency was more than made up from the additional estates brought into connexion with the factory through the extensions of the railway. The figures were as follows: —

Contracting planters: 26,912 tons against 28,046 tons in 1907.

Outside estates: 12,905 tons against 8,689 tons in 1907.

Peasants: 3,243 tons against 4,047 tons in 1907.

Total: 43,060 tons against 40,782 tons in 1907.

The various improvements and additions made to the plant, with the careful control maintained at the factory, have brought the yield of sugar up to 10·90 per. cent. of the canes crushed, as against 10·37 per cent. in 1907. The total production of sugar for the year has been 4,695 tons, as against 4,230 tons last year. The sugar market has ruled at a higher level, the average price realized being £11 15*s.* 9*d.* per ton as against £9 16*s.* last year.

The extensions of the factory and railways, referred to in the last report, have now been completed, and as they represent solid and permanent additions, their cost has been carried into the balance sheet as additional capital expenditure, to be gradually written down by the action of the sinking and reserve funds.

After charging revenue as usual with £2,000 for sinking fund, and £1,000 for reserve fund, and crediting the 'contracting planters' with £7,081, 11*s.* 3*d.* (equal to an addition of about 5*s.* 2*d.* per ton to the payment on account for canes supplied by them), there remains a similar amount to be credited to the 'A' Shareholders, making a total to their credit of £10,483 17*s.* 7*d.* Out of this it is proposed to declare a dividend of 5*s.* per share, amounting to £3,125, carrying forward, for the present, the balance of £7,358 17*s.* 7*d.*

The amount paid to the original contracting proprietors for cane was 15*s.* 11*d.* per ton, in addition to which there is their proportionate interest in the factory, of which they become part-owners on the extinction of the debentures.

In addition to the facts mentioned in the above extracts from the Directors' report, the following details, in reference to the working of the factory will be of interest:—

Canes crushed, tons	43,060
Sugar made, tons	4,695
Tons of cane per ton of sugar	9·17
'Indicated' sucrose in mixed juice (tons)	5,284
Recovery on 'indicated' sugar	88·9 per cent.
Per cent. of water in megass	46·47
,, ,, ,, sucrose ,, ,,	6·05
,, ,, ,, fibre ,, ,,	45·06
Normal juice lost in megass per 100 of fibre	71·6

Average composition of first mill juice:—

	per cent.	lb. per gallon.
Total solids	20·60	2·228
Sucrose	18·75	2·029
Purity	91·00	..
Glucose	0·64	·069
Glucose ratio	3·40	...

Average composition of total juice, including maceration water:—

	per cent.	lb. per gallon.
Total solids	17·04	1·816
Sucrose	14·74	1·571
Purity	86·50	...
Glucose	0·63	0·67
Glucose ratio	4·30	...
True juice, gallons		6,147,062
,, ,, per ton canes		142·8
,, ,, ,, 100 lb. canes (crushing)		68·85 lb.

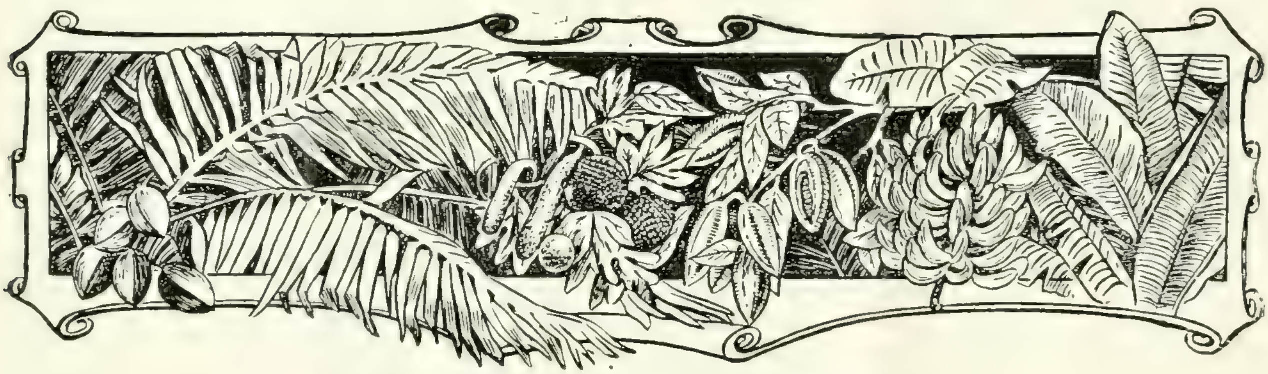
Sucrose in cane	14·31	per cent.
Fibre in cane	15·24	,, ,,
Maceration (water per 100 juice)	20·90	,, ,,
Molasses, gallons		228,555
,, per ton of sugar, gallons		48·68
Fuel used, cords wood		407·25
Coal for locomotives and workshop		175·1

While the expenses for repairs and maintenance, both under factory charges and railway and transport expenses, as shown in the profit and loss account in the Directors' report, appear comparatively high, it may be pointed out that these charges include extension work both in the factory and the railway, and are not exclusively for repairs and maintenance.

The foregoing figures bring out in a striking manner the value of the determination of the juice lost in the megass per 100 of fibre (see *West Indian Bulletin*, Vol. IX, p. 85). From this it is seen that the work done by the mills is very good, while a mere consideration of the percentage of juice expressed from the canes might be misleading.

It is interesting to note that these returns give an account of the composition of the megass—a most important point in modern factory work.

It is also to be noted that the average fibre and average sucrose content of the *cane* are also given. These very important points are often absent from the reports of sugar factories. It is now recognized that a knowledge of the fibre content of a cane is practically as important as the knowledge of the amount of sugar present. It will be observed that the fibre is extremely high in the canes dealt with at Antigua.



WEST INDIAN FRUIT.

BANANA PRODUCTION.

The banana industry of the West Indies is now of such value that all literature on the subject is likely to create interest. Some information on the conditions of banana cultivation in these islands, and the factors which control the profitable production of the crop are brought together in two articles which appear respectively in the issues of *Tropical Life* for November, and December last. The three factors upon which banana growing as a commercial industry depends are soil, climate, and transportation.

The ideal banana soil is one containing an abundance of moisture, without being subject to periodical droughts, and a good supply of humus and plant food. The land must also be well drained. Bananas are largely grown in the Annatto Bay and Port Antonio districts of Jamaica on rather heavy clay soil, but the most profitable plantations are on soil of a loamy consistency. If the land is allowed to deteriorate in character, smaller bunches of bananas are produced, and the size of the individual fruit also decreases.

A good supply of water is undoubtedly essential to successful banana culture, and the trees succeed well under irrigation. It is mentioned that, early in 1908, there were 8,300 acres of bananas under irrigation in Jamaica, for which 11,376 cubic yards of water per hour were being used.

Strong winds are destructive to the leaves of the banana, and as a result, vitality is lost and growth checked. The nature of the leaf, being all in one piece, and soft and pleasant to the touch, indicates that the plant will grow best in fairly moist conditions, and where the air is still.

Bananas remove a great deal of plant food from the soil, and if production is to be carried out on a commercial basis, fertilizers must be judiciously applied. The quantity of potash removed is remarkably large, and has been estimated at 272 lb. per acre per year. Although phosphoric acid is not utilized to anything like the same extent, yet experiment has shown that a mixed manure is necessary. Under favourable soil conditions in the West Indies, it is recommended that a suitable mixed fertilizer for application is: 200 lb. sulphate of potash, 250 lb. sulphate of ammonia, and 450 lb. superphosphate, per acre.

The physical condition of the soil must also receive attention. As already mentioned, drainage must be ensured, lime must be applied if the land is sour, and deep cultivation is also valuable. Banana plants are grown about 10 feet apart each way, but to have a chance of developing to the best advantage, their feeding roots should extend throughout the whole area of soil. This cannot be the case unless the soil is lightened by deep tillage.

The provision of humus is ensured by burying all dead leaves and trash. Sometimes, too, as in parts of Cuba, it is possible to grow a crop of cowpeas or the like, between the rows of banana plants. These when dug into the soil are of great value.

TROPICAL FRUIT PRODUCTION IN QUEENSLAND.

The good progress that has been made in agricultural industries in Queensland is evident from the particulars given in the report for the year 1907-8 of the Department of Agriculture and Live Stock of that colony. Owing to the enormous extent of Queensland, the vegetable products naturally show great diversity, ranging from such tropical crops as sugar-cane, cacao, and bananas in the north, to the crops of temperate climates in the extreme south. Bananas, pine-apples, oranges, and mangos are cultivated over increasing areas.

In 1905 there were 6,198 acres under bananas in Queensland, but the occurrence of a cyclone in 1906 caused great havoc in the plantations. This has resulted in the temporary reduction of the acreage, although the crop has increased from 1,343,033 bunches in 1906 to 1,502,636 bunches in 1907. The average return for the whole State was 302 bunches per acre.

In the past nine years the pine-apple industry has undergone good development, the area under cultivation having increased three-fold. The land planted with pine-apples in 1907 was 2,230 acres. From this area 618,473 dozen fruits were produced. Pine-apples now form an important item among the fruit exports of Queensland, the value of the fresh fruit shipped in 1907 being £33,881, while canned pine-apples to the value of £16,090 were also exported.

The total orange area of the colony amounted to 3,168 acres. Of this, however, only 2,019 acres are yet in bearing, from which 514,751 bushels of fruit were gathered in 1907, as against 266,600 bushels gathered from the bearing acreage of 1906.

Mangos have also been planted in Queensland over 386 acres, the crop from the area that has reached the fruiting stage (308 acres) being 201,741 bushels in 1907. Some of the mangos are consumed locally, or manufactured into preserve, while small quantities find a market in the Southern States of Australia.

INDIAN GOATS.

As Indian (or Punjab) goats are remarkable for their size and milking properties, an attempt was made in 1905 by the Imperial Department of Agriculture to obtain rams of this variety direct from India, for introduction into the West Indies, where it was thought they would be likely to prove of much value in improving the local breeds of goats. Unfortunately the first attempt failed, since two animals purchased died on the voyage; but in June 1906, two other rams of the Punjab breed were successfully landed at Barbados and proved to be fine animals. These are shown in the accompanying illustration (Fig. 8).

The Indian goats are quiet and gentle, and when at Barbados, their services were in considerable demand by goat-keepers. Numbers of their progeny can now be seen about the island, and are valuable additions to existing stock. The kids of any ordinary Barbados goat are, in general, worth from 10s. to £1, but those resulting from a cross with the Punjab rams have a higher value.

FIG. 8. INDIAN GOATS AT BARBADOS.

One of the rams died towards the end of 1907, but the second—'Rajah'— is still the property of the Department, and is at present stationed at St. Kitt's.

Progeny of these Indian goats, more especially male animals, have in several cases been shipped from Barbados to the neighbouring islands.

A competitive examination for two Government Scholarships, tenable at the Dominica Grammar School, will be held at the School on April 5 and 6 next. The Scholarships are open to boys in the island under fourteen years of age. One scholarship will be reserved for candidates whose parents live at least 3 miles from Roseau, and will be of the annual value of £16, together with books and stationery; in the case of boys residing in Roseau, the value of the second scholarship will be £6, together with books and stationery. Intending competitors must send in names, dates of birth, etc., to the Head-master of the school before March 27 next.

HINTS TO GOAT-KEEPERS.

The economic value of goat-keeping to holders of small areas of land is fairly generally recognized in the West Indies, yet with further knowledge and care on the part of the owners of these animals much more might be done than is at present the case. The more general distribution of superior varieties—such as the Toggenburg the Anglo-Nubian, and the Punjab—which is being slowly effected, will be a great help towards the desired end.

In response to request, an article dealing with the system of breeding, feeding, and management of goats that should be adopted by small holders in Jamaica was given in the October (1908) number of the *Journal* of the Jamaica Agricultural Society. This contains some useful advice.

Poor feeding is bad economy with all animals, and with goats no less than other kinds. If goats are fed well, they grow quickly, and mature in about half the time than if tied out on bush land or poor pasture, and shifted only once or twice a day.

The best feeding for goats is a mixture of bush and grass, and in addition they will utilize profitably such waste products from the kitchen as yam and potato peelings, mango and banana skins, pea pods, etc. Frequently these materials are given to pigs, but the food necessary for one pig will, it is affirmed, suffice for several goats, and the latter animals will be ready for the market earlier than the pig. Goats require little water, but a supply should always be within their reach.

Under ordinary circumstances it is of course necessary that these animals should be tethered at pasture, but they should be moved at least three times a day. Goats do not like rain, and it is important that they are not exposed to continuous wet weather for any time. In regions where heavy rainfall is experienced, therefore, it is important that a small shed of simple construction be erected, to which the animals can retreat when necessary.

When a number of goats are kept, and bush or other such material is available, this may well be utilized for bedding purposes in the pen or shed allotted to the animals at night. By this means the liquid as well as the solid excreta will be absorbed.

Goats not infrequently suffer from lice, more especially when kept in dirty pens at night. In this case they should be washed with carbolic soap and water, the solution being well rubbed in by means of a stiff brush.

The need of care in breeding, as well as in feeding and housing has already been referred to. It is mentioned that one of the most frequent causes of deterioration among goats is the early age at which these animals are frequently allowed to breed. Nannies should not be mated till they are at least eight months old, and only the best billies should be used for breeding.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows on February 1, with reference to the sales of West Indian Sea Island cotton :—

Since our last report there has been rather more enquiry for West Indian Sea Islands, and about 300 bags have been sold, including Montserrat, 12½*d.* to 13½*d.*; St. Kitt's, 13½*d.*; Barbados, 13½*d.* to 14*d.*; Nevis, 12½*d.* to 13½*d.*, and a few bags from St. Vincent at 15½*d.* The sales also include about 60 bags of 'stains' from various islands at 6½*d.* to 7½*d.*

American Sea Island crop lots are still pressed for sale at 13*d.* to 14*d.*, which prevents any improvement in the market.

COTTON MARKET IN THE SEA ISLANDS.

There appears to be little change in the conditions of the market for cotton from the Sea Islands. A steady demand for odd bags at practically the same prices as were reported a fortnight ago, is the chief feature. Planters' crop lots, it is reported, are being held for higher prices. For the fortnight ended January 23, sales amounting to 750 bales were reported from Charleston. In their fortnightly report, dated January 30 last, Messrs. Henry W. Frost & Co. write : —

The receipts for the past fortnight consisted largely of portions of crop lots. Receipts of odd bags have been very light, since cotton of this kind has nearly all been marketed. There continues an active demand for the small daily receipts of this kind, at prices of from 14c. per lb. for 'stains,' up to 23c. per lb. for 'fully fine' quality. The stock in hand consists of planters' crop lots, which are held for prices of 24c. and upwards.

COTTON AT BARBADOS.

A memorandum has been received from the Superintendent of Agriculture at Barbados (Mr. John R. Bovell, I.S.O.) showing the area of Sea Island cotton grown in the island during the year 1908 (January to December). The total area planted with the crop was 5,768¾ acres. Of this, 5,162¼ acres was new cotton, i.e., cotton planted during the year, while 616½ acres consisted of ratoon cotton.

Some cotton was grown in all the parishes of the island, St. Philip and Christ Church having the largest areas, with 2,023½ and 1,534 acres respectively. In St. Andrew's parish only 26¼ acres were planted.

It will be observed that ratoon cotton was again grown to a fairly considerable extent at Barbados last year, apparently with the object of supplementing the short yields of the previous season. This subject has been discussed in past numbers of the *Agricultural News*, and taking into consideration the quality of the lint produced, and its effect on the price of the consignment in which it is included, planters have been strongly urged not to ratoon their cotton. Mr. C. M. Wolstenholme, of Liverpool, in a letter written to Sir Daniel Morris in 1905, condemned the practice of ratooning cotton plants, and pointed out its bad effects on the produce.

Samples of ratoon cotton lint were some time ago examined at this Department, and the truth of Mr. Wolstenholme's statements were very apparent, since the fibres were poor in quality, and especially lacking in strength.

In the *Agricultural News* of September 9, 1905 (Vol. IV, p. 278), Mr. Bovell suggested a suitable rotation of crops for land on which cotton was grown at Barbados, by the adoption of which it was pointed out that ratooning of the cotton crop would be avoided. This rotation was as follows :—sugar-cane, sweet potatos, cotton, and Indian corn, and then sugar-canes again commencing the rotation anew. The cotton planted after the sweet potatos have been removed, should, it is pointed out, remain in the ground until about the end of May, when the plants should be pulled up and Indian corn sown. In this way, as has been so frequently demonstrated, all cotton plants affected with scale insects and other pests would be destroyed before the planting season again comes on, thus preventing any likelihood of the young cotton becoming infected from the old crop.

SEASONABLE COTTON NOTES.

The wet weather that was generally experienced in many of the West Indian islands during December was not favourable to the first pickings of cotton, and the lint proved to be more or less damaged in some cases. Rain, however, was badly needed, and the supply of moisture thus afforded, followed by the fine weather of January and February, has encouraged the development of a good second crop, and the pickings that have lately been made are stated to be very satisfactory in character. From Montserrat the report comes that, despite the cyclone experienced in October last, which did considerable damage at the time to trees and cultivated crops, the cotton yield for this season is expected to prove a record one.

In view of the present low price for cotton, planters should see that special care is exercised in ginning and grading operations, so that the lint may be placed on the market in the most advantageous condition. Cotton that is at all damp should be sunned and dried before being sent to the factory. If it is ginned in a damp condition, the fibres are in danger of being broken, the resulting cotton being known as 'gin-cut cotton.' This is sometimes a prominent source of loss to the cotton spinner, and diminishes the returns obtained by the grower.

Another kind of cotton which reduces the value of a consignment, when included with the general crop, is that obtained from bolls on old plants that have been pulled up, or on the tops of plants which have been pruned off to encourage secondary growth. The bolls frequently open soon after removal of the plants, branches, etc., but the lint contained is of inferior quality, much of it being very weak.

Dusting with Paris green and lime should still be continued in all fields where the cotton worm is apparent so long as any cotton yet remains to be gathered. During the development of the bolls a large supply of food material is being drawn to these parts, and if the leaves are removed, the food supply is likely to run short, and the bolls, with their contents, will not develop fully.

Now that the end of the crop season is in sight, planters should consider the advisability of clearing all old cotton plants off their estates at least a month before planting operations begin for the next season's crop. In this way a closed season for cotton would be ensured, which, if generally adopted, would undoubtedly be of great benefit in assisting to reduce the prevalence of insect pests and fungoid diseases The wisdom of the step advocated is more apparent every year.

'BUCO' HAND CULTIVATORS.

Some months ago a sample shipment of 'Buco' hand cultivators was forwarded to the Imperial Department of Agriculture for trial in the West Indies, since it was thought that this tool should prove especially useful in cotton cultivation in these islands. A number of cotton planters at Barbados were afforded an opportunity of testing the implement on their estates, and in most cases were pleased with the results. Favourable reports were also received from St. Vincent, Antigua, and St. Kitt's, where specimen tools were sent for trial.

The 'Buco' cultivator has five tines of spring steel, which can be adjusted to the width desired. One or more of the tines can be removed, if necessary, for special work. They can also be replaced by new tines when worn.

Mr. W. H. Patterson, Acting Agricultural Superintendent of St. Vincent, at the time of writing (September 29 last), reported that the tool proved well adapted for breaking up the surface soil after heavy rain, in order to let in air, and to form a surface mulch of loose earth. In addition, it could also be utilized for stirring weeds that have been left on the surface, and which readily root again during showery weather; and for dragging from the soil weeds of the type of 'devil' or 'Bahama' grass after the land has first been broken up with forks.

Mr. T. Jackson, Curator of the Antigua Botanic Station, in reporting upon the implements, writes as follows:—

The 'Buco' hand cultivators have been recently tried at Antigua in cotton cultivation. It would seem from these trials that the implements in question would be of value on light, fairly clean land. At least twice as much work can be done with them on such land, after a little practice, as with the ordinary agricultural hoe used in the West Indies. The cultivators are light and are worked in a somewhat similar manner to the common 'draw hoe;' thus, when working in cotton fields there is little danger of the bolls being injured.

On heavy or weedy land they will be of little value, as they are apt to clog and become unworkable.

The 'Buco' cultivators are obtainable from the Barbados Co-operative Cotton Factory, at a price of 5*s.* each.

SPRAYING FOR WEED DESTRUCTION.

Spraying with various chemicals has in many cases been found to be the best means of destroying certain pestilent weeds. This method of destruction is especially worthy of adoption when the weed in question occurs over extensive areas, is of vigorous growth, and reproduces itself readily by vegetative means. Cheapness of the chemical employed is an essential factor in the economic success of the method.

In England and other European countries, spraying with a solution of copper sulphate is frequently adopted for the destruction of 'charlock,' a pestilent and vigorous weed which occurs largely in fields of wheat, oats, and barley, at an early stage of the development of these crops, and tends to choke out their growth. This method, which was first adopted about ten years ago, has proved both successful and economical. The 'charlock,' which possesses broad, rough leaves, and is allied to the mustard plant (*Brassica alba*), is destroyed, while the growing corn suffers little or no injury.

Another example of the application of spraying methods to weed destruction comes from the Malay States. In that country large areas of land are covered with what is known as 'lalang' grass (*Imperata arundinacea*). This is a creeping weed, with underground stems, which rapidly propagates itself by vegetative means as well as by seed, and quickly covers the ground with its thick, coarse growth. Slow-growing crops are checked out, and cattle refuse to eat the dry, coarse lalang. Digging out the weed proved to be a costly and unsatisfactory method, but experiment has lately shown that the lalang can be got rid of by spraying with a solution of arsenite of soda. The leaves are all killed within a comparatively short time, and are either turned into the ground, or allowed to rot on the surface. In the latter case, the dead vegetation acts as a mulch, and prevents evaporation of moisture. Not only lalang, but also other weeds, more especially those presenting a large and flat surface to the spray, were found to be readily destroyed by the solution.

The price of the chemical is the chief item in the cost of the spraying work. This price amounts to about 6*d.* per lb., including freight. The solution can be applied by means of any of the ordinary sprayers on the market.

In the Malay States the arsenite solution was used on land monopolized by the lalang grass and not applied to the weed growing among cultivated crops. The object was to clear the land in a cheap and efficient manner before bringing it under cultivation, and the maximum cost for freeing from weeds is mentioned as about 2*s.* per acre, while usually it does not reach half this figure. It will therefore be seen that this method might best be adopted in clearing waste land.

Since the soda arsenite is so destructive in its action, it is probable that it would not be advisable to use it in spraying weeds occurring in a cultivated crop, as it appears more than likely that the latter would also be injured. In any case, experiments should first be made on a small scale

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Messrs. Bowen & Sons, Bridgetown, Barbados. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W., and The West India Committee, 15, Seething Lane, E.C. A complete list of Agents will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

A concluding article on Mendel's theory of heredity forms the editorial of the present issue.

On page 51 are given some interesting particulars in regard to the working of the Antigua Sugar Factory during 1908.

The conditions of banana cultivation in the West Indies are discussed on page 52, where also a few notes on tropical fruit production in Queensland will be found.

Market prices of Sea Island cotton are reported on page 54. A note on cotton at Barbados in 1908, together with seasonable hints to growers, etc., appear on the same page.

Attention is drawn to Mr. Ballou's report (pp. 58-9) on the insect responsible for flower-bud dropping of cotton at Antigua.

Exports of agricultural produce from Southern Nigeria have of late shown remarkable increase (page 59). Resin oil has given very good results at Grenada as a dressing for cuts on cacao trees (page 61).

Experiments in the inoculation of leguminous crops with nitrogen-fixing bacteria, carried out England, have not given favourable results (page 62).

Visit of Scientists to Jamaica.

As already mentioned in this journal, two scientists from the Liverpool School of Tropical Medicine, Professor R. Newstead and Dr. William Prout, C.M.G., are at present in Jamaica, on a visit (which has already extended over about three months) of investigation in regard to certain insect pests of the island, more especially those of a disease-bearing character. Professor Newstead is giving particular attention to cattle ticks, as well as those scale insects which are at present threatening citrus, cacao, and cocoa-nut cultivations in Jamaica, while Dr. Prout is enquiring into the presence of filarial and malarial diseases, in the hope of being able to suggest improved methods of prevention. This visit should result in increased knowledge in regard to many of the numerous insect pests of the West Indies, from which agriculturists in particular may derive considerable advantage.

Eucalyptus Trees.

Eucalyptus trees grow readily on almost all kinds of soils and are very suitable for planting as windbreaks. Their timber is also valuable for a number of purposes. These trees are native to Australia, but have now been introduced into a number of other countries, and in California they have met with special favour in view of their rapidity of growth and general usefulness. Few eucalyptus trees are found in the West Indies, and the *Journal* of the Jamaica Agricultural Society recommends that plantings might with advantage be made. The wood is excellent for fuel, and is hard, strong and tough, so that it can be used for vehicle construction, for wooden parts of agricultural implements, for wharf piles, and for railway sleepers. The trees grow well on all kinds of soils but those of a swampy nature. Two of the most valuable kinds of eucalyptus are the blue gum (*Eucalyptus globulus*) and the red gum (*Eucalyptus rostrata*).

Ginger from Sierra Leone.

The great possibilities of West Africa for the production of tropical agricultural crops are attracting more attention every year, and among the minor products worthy of note, ginger will probably take an important place in the near future, since it is being grown in increasing amount in Sierra Leone, and improved methods of preparation have lately been introduced, as the result of advice and assistance obtained from the Imperial Institute. London, although this improved process is yet far from being generally adopted by the cultivators of the colony.

In 1906, ginger was shipped from Sierra Leone to the extent of 618 tons, valued at £11,578, while in the following year, the exports showed an increase of 39 tons, and an increased value of £699.

Samples of ginger were forwarded to London in 1907, some of which had been prepared by the old native method, and others by the improved methods lately introduced. The better prepared specimens realized 64*s.* to 66*s.* per cwt., as against 32*s.* 6*d.* paid for the product prepared in the ordinary way.

Timbers of Cuba.

Cuba, in common with a number of other West Indian islands possesses large tracts of country which are well adapted for the production of many valuable kinds of hardwood timber. To this, the flourishing condition of the scattered woodlands still remaining in the island bears evidence, although these are almost entirely neglected. The *Cuba Review* of January last refers to this question and enumerates the chief economic trees of the island. Prominent among these are the logwood—valuable for its use in the manufacture of dyes—cedar, and mahogany. Lignum-vitae, so valuable where extreme hardness and toughness are required, is also fairly abundant. Other important trees which grow readily, are ebony (*Brya Ebenus*), mastic (*Bursera simaruba*), and the Jack Fruit (*Artocarpus integrifolia*).

Rubber in Tobago.

Landowners in Tobago who have planted rubber on their estates in the past now regard the result as very promising, according to the correspondent of the *West India Committee Circular* in the island.

The first rubber trees (Castilloa) were planted on Richmond estate about twenty years ago, and they are now fine specimens, ranging up to a girth of 7 feet. Planting has also been carried out on 'Louis D'Or' estate, where tapping operations are now in progress on a commercial scale. Fine rubber is being turned out, which should fetch the highest price on the London market. Large tracts of land suitable for this cultivation are available, and on many estates small plantings are being made, chiefly with the object of providing shade for cacao. Hevea is being planted in small quantity, but Castilloa does best. Trees can be seen which at three years old are 25 feet in height, and have a girth of 12 inches. These reports are very satisfactory.

Cane Trash and Soil Moisture.

An improved system of cultivation in the growth of ratoon canes, which is recommended from the Cuban Experiment Station was lately described in the *Agricultural News* (Vol. VIII, p. 355). The main features of this system are that the 'middles' are alternately double-trashed and planted with such a crop as cowpeas, the cowpea vegetation being later ploughed into the land. In the following year (assuming ratoons are again grown) this treatment is reversed; the 'middles' that were double-trashed in the previous season being now planted with a green crop, and vice versa.

In this connexion a letter has been received from a correspondent who raises the point as to whether rain, falling in moderate showers, is not to a large extent lost on land covered with trash—more especially if double-trashed,—being dissipated by sun and wind before reaching the soil. Where the rainfall is deficient, this might possibly be a drawback of some moment and should receive consideration. On the other hand, taking the year through, it is probable that the good effect of the trash in preventing evaporation would more than balance losses of moisture brought about in the way suggested. The subject should form an interesting one for discussion by Agricultural Societies in the West Indies.

Agriculture in the Virgin Islands.

The peasantry of the Virgin Islands are sea-faring rather than agricultural in their habits, yet a perusal of the latest report (1907-8) from the Experiment Station at Tortola shows that increasing interest is being taken in the cultivation of a number of crops, and that with an improved condition of agriculture the material prosperity of the people has lately advanced.

The rapid expansion of the cotton industry of those islands was described in the last issue of this journal; as mentioned then, the cotton exports increased from a value of £35 in 1904 to £1,800 in 1908.

Attention has also been directed to the possibilities of other industries which may prove profitable in a minor degree It has been shown that cacao will grow in certain carefully selected spots, and some good trees have now come into bearing, the produce of which has been valued at a very satisfactory price on the London market. There is evidence, too, that the efforts of the Agricultural Department to establish a local lime industry will be attended with at any rate a modicum of success.

Barbados Monkeys.

That the few monkeys now found wild in certain parts of Barbados and St. Kitt's are not of native origin, but are descendants of African monkeys, probably introduced by slave ships in the seventeenth century, has long been generally recognized (see *Agricultural News*, Vol. VI, pp. 201, 238). These animals proved very troublesome pests to planters, in breaking or rooting up sugar-canes, yams, etc., and in 1680 a law was passed at Barbados offering a reward of 5*s.* for every wild monkey destroyed in the island.

The Barbados monkey has lately been identified at the London Zoological Gardens as a West African species, *Cercopithecus sabaeus*. Sir Daniel Morris was recently able to present the skin of one of these animals to the Zoological Gardens, and in acknowledging its receipt, Mr. R. I. Pocock, the Superintendent, writes: 'It is an interesting fact that the monkey does not seem to have become modified in any way since its introduction into the West Indies. The skin might indeed have come from Sierra Leone, the natural home of this species.

'I am afraid there are no records telling how many specimens were originally taken across the Atlantic, or if they were introduced upon more than one occasion. If it were known that only a few pairs were turned loose, it might throw some interesting light upon the vexed question of in-breeding.'

INSECT NOTES.

Flower-bud Maggot of Cotton at Antigua.

It will be remembered that the insect responsible for flower-bud dropping of cotton at Antigua has again made its appearance in the present season. Some account of the insect, with illustrations, appeared in the *Agricultural News* of January 9 last, and in the same issue it was mentioned that Mr. Ballou, Entomologist to this Department, had gone to Antigua for the purpose of making investigations in connexion with the attack of this pest.

The following is Mr. Ballou's report on his visit:—

One object of the work of investigation was to discover if possible the plant or plants other than cotton (wild or cultivated) in which the flower-bud maggot may live and breed. In the report on my visit to Antigua in November, it was stated that both Mr. Jemmett and myself had made careful search for this insect, but did not succeed in finding it, though Sea Island cotton was examined in several fields, and the wild cotton at Judges (Blizzards).

On my arrival at Antigua, one of the first things I did was to pay a visit of examination to the wild cotton mentioned above, and the flower-bud maggot was at once found, and in considerable quantity.

Examination of other plants then in blossom in the immediate vicinity led to the discovery of a Cecidomyiid larva in the flower-buds of the Privet or 'Wild Coffee' (*Clerodendron aculeatum*). I was not able to determine whether this was the same as the flower-bud maggot of the cotton by comparing the maggots, so I collected a large quantity of flowers and buds of the plant from the hedge surrounding the Botanic Station. These were placed in breeding jars at the laboratory, and from them I reared two (or three) different Cecidomyiid flies, one of which is apparently identical with the fly which is the adult of the flower-bud maggot of the cotton.

In order to obtain further proof as to the identity of this insect, experiments have been started at the Botanic Station, with the object of producing an attack of flower-bud maggot on cotton directly from the insect in the flowers and buds of the Privet. This experiment is not finished.

In connexion with this portion of my work the flowers and flower-buds (in some cases two or three lots) of some eighty-four different plants have been examined. I am indebted to Mr. Jackson for having most of these collected by persons connected with the Botanic Station.

The experiments started during my visit to Antigua last year gave no definite results, perhaps because the attack of the flower-bud maggot was on the decrease at the time the experiments were started, and perhaps because of the drought which set in soon after, and stopped the flowering of the plants. Similar trials have been started again and are at present in progress. These may give results later which will suggest direct remedial measures.

The experiments are established in two places. There are five plots in the field of cotton at the Old Hospital, each about $\frac{1}{10}$ acre, which received the following applications of manure: No. 1, sulphate of ammonia; No. 2, sulphate of potash; No. 3, Vaporite; No. 4, nitrate of soda; No. 5, Vi-phosphate. These plots were established with the consent of Mr. Fishre, who detailed Officer Maynard to assist in carrying out the work. At McKinnons there are seven plots established with the consent and co-operation of Mr. J. Roden, and the active assistance of Mr. Halpike. These plots are about $\frac{1}{12}$ acre, and received applications of manure as follows: — No. 1, sulphate of potash; No 2, sulphate of ammonia; No. 3, nitrate of soda; No. 4, superphosphate; No. 5, Vaporite; No. 6, Vi-phosphate; No. 7, salt. In both these series the applications consisted of 20 lb. of each substance, except in the case of No. 7 at Mc Kinnons, where only 10 lb. of salt were applied.

Previous to my arrival in Antigua, Dr. Watts had given Mr. Robert Goodwin 100 lb. of Vaporite for use at Greys, where the flower-bud maggot had made serious attack. This was applied to 1 acre of cotton, and at the time of my visit to this estate (Feb. 2), the cotton field treated with Vaporite showed a greater proportion of flowers than any other field on that estate, and it was decided that it would be worth while to make more extended trial of this material. With this end in view, Mr. Tempany, Acting Superintendent of Agriculture, sent out a circular letter to a limited number of representative planters asking if they wished to make a trial of Vaporite and offering 100 lb. of this material to each one, with directions for applying it.

In combating insects closely related to the flower-bud maggot it has been found that applications of mineral fertilizers have had a decidedly beneficial effect, not only from their usefulness as manures, but from the effect of the mineral salts in solution in the soil. How much effect these may have on the flower-bud maggot is very problematical, but they are considered worth the trial.

I noticed that the parasitic Hymenoptera which were abundant in February and March 1908, were much less numerous during January 1909.

In nearly all the cotton fields I visited, I noticed that the youngest bolls then existing on many of the plants must have been formed about the middle of December. That is to say, the attack of the flower-bud maggot must have become sufficiently severe about that time to prevent the later development of flowers and bolls, and for the most part there had been no bolls developed from that time up to the first week in February. In most cotton fields I noticed that the fallen flower-buds were not so numerous as the small bolls or 'forms,' which appeared to have dropped within two or three days of the opening of the flower and the shedding of the corolla. I do not feel sure that I should be quite correct to lay all that to the charge of the flower-bud maggot. The shedding of the corolla is a perfectly normal circumstance, but the dropping of bolls is abnormal. Whether these bolls were dropped because they were unfertilized I cannot say, but I believe that this was the reason in many cases. Further, I cannot say whether they were unfertilized because the flower-buds from which the bolls were being developed suffered attacks from the flower-bud maggot, but this was probably the reason in most cases.

As already stated, very few bolls were developed from the middle of December to the first week of February, and as a consequence the top of the plants for some 12 to 18 inches, with the developing laterals from this amount of growth, was quite unproductive of bolls, and I believe that most of this was due to the flower-bud maggot.

In past years the dropping of these very small bolls has been ascribed to the weather, and in a sense this may be correct, for there seems to be a definite relation between certain weather conditions and the attacks of the flower-bud maggot. For instance, the flower-bud maggot appears to begin its attack with the advent of cold nights or nights with heavy dew, or during any period when the chill winds are from an unusual quarter, and the severity of the attack seems to vary with changes in the weather within a very short time.

During my stay at Antigua I visited cotton fields in the north of the island, at High Windward, and in the Valley district.

With the exception of Cade's Bay and Orange Valley estates the cotton in all fields presented the same general features, but in the fields of the two estates just mentioned there was an abundance of flowers and young bolls, and almost a total absence of the flower-bud maggot. At Cade's Bay I found maggots in one bud and saw a few that I judged to be attacked, but when I reached Orange Valley I could not find the maggot though I found many buds that I should have said were infested. Mr. Pateson told me that that had been his experience for the entire season. He had frequently found buds which appeared to be infested, but he had not found the maggot.

After coming to the conclusion that the flower-bud maggot of cotton infests the flowers and buds of Privet, I was constantly observing the wild plant growth, trying to get as good an idea as possible of the distribution of this plant. In most parts of the island, I should say that Privet is more widely distributed and more abundant than almost any other woody plant, either tree or shrub, except that in the Valley district from Jolly Hill to Cade's Bay it seems to be much less abundant. This may be connected with the comparative freedom of flower-bud maggot at Cade's Bay and Orange Valley.

In the matter of remedial measures, and measures of prevention, I am of opinion that it is essential to remove all wild cotton from the vicinity of cotton fields at the time of planting, and that at the beginning of an attack of flower-bud maggot, much may be accomplished by hand-picking the infested buds, which are indicated by the 'flared' bracts. When the attack becomes general this may not be profitable and it may be found best to discontinue hand-picking of infested buds. The planter should, however, be able to judge as to this.

If it is proved later that the infestation can be conveyed directly from the Privet to the cotton it will probably pay to cut and burn all Privet near the fields to be planted.

The experiments now in progress at Antigua may give results that will suggest other lines of action against the attacks of the flower-bud maggot, but the foregoing recommendations are all that can be made just at present.

AGRICULTURE IN SOUTHERN NIGERIA.

Southern Nigeria is one of the chief among the West African colonies which must, in the future, be notable as the source of a large number of tropical agricultural products. Its possibilities have undergone very considerable development of recent years, more especially since 1905. The total value of the exports, practically all of which were agricultural products, amounted in 1906 to £2,951,000, and in the course of the following year advanced to no less than £3,863,000.

Palm oil and kernels form the most valuable among the products of the colony, and the phenomenal increase in the value of the exports during 1906-7 is chiefly attributed to the exceptionally good crop yielded by the oil palm in that year. Southern Nigeria undoubtedly possesses enormous resources, but the development of these resources is at present in a very elementary stage. Two factors mentioned in the latest *Annual Report* on the colony, which are essential to primary advancement, are improved means of communication, and the material development of agriculture.

In addition to palm oil and kernels, the other valuable articles of export are rubber, cotton, timber, cacao, and maize. Palm oil was shipped in 1907 to the extent of over 18,000,000 gallons, valued at £1,313,960, while, in addition, 133,630 tons of palm kernels of the value of £1,658,292 were also exported. These figures are the highest on record for any year in connexion with the palm oil industry of Southern Nigeria. Valuable as the palm oil industry is at the present time, it is mentioned that with improved methods of transport, it would rapidly undergo very great development, more especially in the Central and Eastern Provinces.

Rubber also forms an important item in the colony's exports. In 1907 this product was exported to the value of £244,989. These figures show a decline on those of the previous year, but this is due to the fact that unskilful tapping has been prohibited in some of the principal rubber districts. The Forestry Department of the colony is endeavouring to encourage the natives to plant rubber trees, and also giving instruction as to the best means of tapping and preparing rubber. There are large tracts of land, eminently suited to this product, and plantations of both Para and Funtumia trees, started in recent years, are said to be doing well. All the rubber at present exported is forest produce.

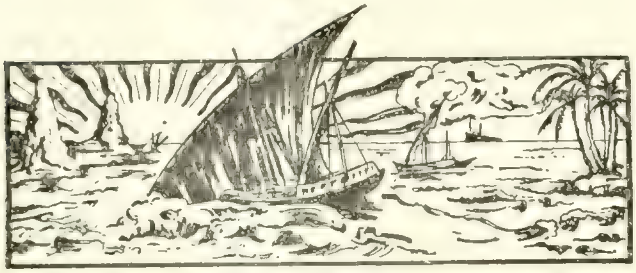
It is satisfactory to note that the efforts of the British Cotton-growing Association, aided materially by the Government, are having excellent results in Southern Nigeria. This work was started in 1903, when the cotton exports were worth only £375 per annum. In 1906, the shipments of lint and seed were valued at £51,906, and in 1907 had advanced to £107,891. Cotton is produced at a very low cost in the colony, and a price of only $3\frac{1}{2}d.$ per lb. at Liverpool allows a profit to the grower. Points which will have to be considered in relation to the development of the cotton industry are: careful seed selection work, with proper attention to the improvement of indigenous varieties; suitable rotation of crops, involving the cultivation of a second product which will improve the soil, and also yield some return that can be exported—ground nuts for example—and the more extended introduction of ploughs and other labour-saving implements.

A good deal of timber—chiefly West African mahogany—is obtained from Southern Nigeria, the exports in 1907 being valued at £69,241. It is evident, too, that the colony is one which, like the Gold Coast, possesses great possibilities in the way of cacao production. Excellent land well suited to this cultivation exists over extensive areas, and it is mentioned that the industry is in a most flourishing condition.

At present faulty fermentation and lack of proper attention to pruning are said to diminish the value of Southern Nigeria cacao from 10 to 15 per cent. on the European market. The exports in 1907 were valued at £47,840 as compared with £27,054 in 1906.

Maize is another agricultural crop which is largely grown in the protectorate, more especially in the Western Province. The annual exports are worth about £30,000.

Three Botanic Stations exist in Southern Nigeria, one in each province. Large numbers of plants and seeds are distributed to holders of land in all parts of the colony. Instruction as to the best methods of cultivation are also given.



GLEANINGS.

An account of the work of Sir Daniel Morris in the West Indies, together with a portrait of the ex-Commissioner, appeared in the *Gardeners' Chronicle* of January 2 last.

Mango trees have been planted on a small scale in Florida, and the fruit is growing in popularity in the United States. Among the varieties grown, two East Indian kinds—the 'Mulgoba' and 'Sundusha' mangos—are referred to in high terms. (*Porto Rico Horticultural News.*)

Mr. J. B. Carruthers, Director of Agriculture in the Federated Malay States, and formerly Government Mycologist and Assistant Director of the Royal Botanic Gardens, Ceylon, has been appointed Assistant Director of Agriculture at Trinidad.

The cacao crop of the Brazilian State of Bahia for 1908-9 promises to be the most abundant on record. In 1907-8 it was 25,182 metric tons, but in the present season it is expected to exceed this by more than 2,000 metric tons. (*British Consular Report.*)

Devil grass or Bahama grass (*Cynodon Dactylon*), which is now found almost all over the tropical and temperate regions of the world, is a native of the East Indies. On cultivated land it is a troublesome weed. This grass withstands drought well and thrives even on poor soils. It forms a fine turf when given good attention.

Four samples of Shea nuts, the seeds of the West African tree *Butyrospermum Parkii*, and one sample of fat (known as 'Shea butter') extracted from these seeds, were lately sent to the Imperial Institute, London, from Southern Nigeria for examination and report. The fat was valued at £27 5*s.* to £27 10*s* per ton.

Reports from Cuba, where cane reaping and grinding operations are in active progress, state that 135 centrals are working, as compared with 122 in operation last year, and the quality of the juice is said to be good. Shipments of sugar from the island for the fortnight ending January 22 amounted to 21,000 tons, as compared with 18,600 tons for the corresponding fortnight of the previous year.

The question is frequently raised whether it is better for a bee keeper to raise his own queen bees, or to purchase from professional queen raisers. In a recent issue of *Gleanings in Bee Culture* in which the point is discussed, the author concludes that in most cases, ordinary bee keepers will do well to rely upon professionals, and that if certain queen bees in the private apiary should develop particularly desirable qualities, they may be sent to a breeder for the purpose of producing other queens with similar characteristics.

The cane reaping season at Barbados is expected to be late this year. No general start has yet been made, but small lots of syrup have been placed on the market, the price obtained being 18c. per gallon.

Messrs. Sandbach, Parker & Co., of Georgetown, report that the weather for the fortnight ending February 5 was wet and unfavourable for rice milling, though suitable for the growing crop, and for planting, which is now being carried on in some districts. Shipments of rice to the West Indian islands during the fortnight amount to about 2,500 bags. Prices are unchanged.

A sample of cotton (variety unstated) from the British Honduras Botanic Station was lately reported upon by the Imperial Institute, London. The lint was described as of good quality, and similar to 'improved' American Upland cotton. It was soft, lustrous, and of good colour, yielding 33 per cent. of lint on ginning. The length of fibre was from 1 to 1½ inches, and the cotton was valued at 5¼*d.* per lb. (*Government Gazette.*)

The latest market report of Messrs. Gillespie Bros. & Co., state that the New York market is flooded with fruit from Florida and Porto Rico. Present prices for ordinary grape-fruit are from \$1·50 to \$2·50 per box, and for oranges from \$1·75 to \$2·25 per box. A limited demand exists for West Indian limes of good quality. The latest shipment from Dominica sold at from \$5·75 to \$6·50 per barrel.

Great interest has of late been taken in fruit raising in the State of Vera Cruz, Mexico, and in the past six years the industry has undergone steady expansion. Cultivators and merchants have now built up a trade of considerable value. It is claimed that, owing to its more profitable nature, fruit culture will largely supersede coffee growing in the State. (*British Consular Report.*)

The proposal to have a 'close time' for cotton each year at St. Croix (the month of June has been suggested) is under discussion. During this close time no cotton, either young or old, would be allowed in the island. This proposal has been brought forward on account of the losses suffered from insect pests, chiefly the leaf-blister mite and the cotton worm.

Cotton growing is receiving encouragement in the Portuguese territory of Angola, West Africa. The Government has established a station for instructing the natives in planting, ginning, and oil extraction. A Portuguese translation of the 'A B C of Cotton Planting' has also been issued. Rubber exports from Angola have lately fallen off owing to low prices.

In connexion with the list of books recommended for estate overseers and other candidates entering upon the courses of reading and examination in practical agriculture lately established by this Department, it should be mentioned that the price of Fream's 'Elements of Agriculture' is 3*s.* 6*d.* and not 2*s.* 6*d.*, as stated in the *Agricultural News*, Vol. VII, p. 267. Further, a revised and enlarged edition of 'The Soil,' by A. D. Hall, has lately been issued, and the price of this book has been increased to 5*s.*

STUDENTS' CORNER.

Seasonal Notes.

FEBRUARY.

2nd FORTNIGHT.

Preparations will now be made for beginning to reap the cane crop. Students should note the indications of ripening in the different varieties of cane. Some kinds—such as B. 147—ripen slowly and late: others, as B. 208, come early to maturity. The process of manufacture should be studied, and the correct use of such instruments as the hydrometer (or saccharometer) should be understood. Where larger factories exist, the use of the polariscope will claim attention.

Cotton picking will be general. The principles underlying the work of seed selection at the Experiment Stations and on the estates should be enquired into and studied.

Cacao picked early in the month will now be completely cured. Study as many samples of cacao as possible at various stages, and learn to recognize well-cured cacao by its 'break,' etc., and note the effects of fermentation, drying, and trampling. Observe the methods of bagging and shipping.

Pruning of lime trees should be continued, and all dead wood, etc., removed, should be burned. Tar over all cut surfaces to prevent disease from entering.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the differences in physical properties between a clay soil and a sandy soil?

(2) Describe how pen manure is prepared and stored. What constituents of plant food does it convey to the soil?

(3) What do you mean by green dressings? What crops would you use for this purpose?

INTERMEDIATE QUESTIONS.

(1) Discuss the use of lime as a means of improving soil. How would you apply lime, and how much would you use?

(2) Why should cacao pod stems be buried after cacao picking?

(3) Describe the symptoms of root disease (*Marasmius*) of sugar-cane. What precautions should be taken to control this disease?

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Eden' on Tuesday, February 16, for a short visit to Grenada. Dr. Watts will return on February 23.

Mr. H. A. Ballou, M.Sc., Entomologist to the Imperial Department of Agriculture, returned to Barbados from Antigua by the R.M.S. 'Eden' on Tuesday, February 9.

Consequent on the promotion of Dr. Francis Watts, C.M.G., Mr. H. A. Tempany, B.Sc., F.I.C., is acting provisionally as Government and Analytical Chemist and Superintendent of Agriculture for the Leeward Islands.

SISAL HEMP IN THE BAHAMAS.

The latest *Annual Report* (1907-8) on the Bahamas contains the following note on the sisal industry:—

The raising of sisal hemp is the most important industry in the colony, and the area under cultivation with this crop is considerably over 25,000 acres. In 1906-7 the sisal exports from the Bahamas were valued at £40,140, while in 1907-8 they had advanced to the value of £46,669.

The Curator of the Botanic Station reports that a good demand was experienced for fibre from the beginning of the year up to October, and that good prices were obtainable. At the end of October, as the result of the financial crisis in America, to which country the greater quantity of the fibre is exported, prices fell away considerably.

Complaints of the gathering of immature and badly cleaned fibre still continue.

RESIN OIL AS A DRESSING FOR CUTS ON CACAO TREES.

Resin oil has lately been tried as an antiseptic dressing for cuts and wounds on cacao trees at Grenada, and is reported on very favourably by estate owners and managers, and by the Agricultural Superintendent of the island.

Coal tar was formerly the chief dressing used for wounds caused by pruning or as the result of an accident, but it is stated that resin oil is superior for the purpose. The Agricultural Superintendent of Grenada (Mr. R. D. Anstead, B.A.) reporting on the matter, mentions that the oil can be applied easily and in a cleanly manner, and it is noticed that the bark of the tree does not shrink away at the edges of the wounds as much as when tar is used; further, the new bark starts into growth more quickly than when tar is the antiseptic dressing applied.

On cacao estates in Grenada it is the custom for a boy to follow close behind the pruners, and to dress all the wounds made on the trees. It has been found that the best means of applying these dressings is by the use of a paint brush, and in most cases brushes of two or three different sizes are carried, so that all the holes and crevices may be readily reached. In this way the dressing is neatly and quickly placed on the wound and there is less likelihood of any being smeared on the surrounding bark. This was a point to be borne in mind when tar was the material in use, since it frequently burned and damaged the bark; but no harmful effects have been observed from the use of resin oil.

The only objection which has so far been raised against the oil is that it is not easy to recognize, without careful examination, which wounds have been dressed, and which have not yet received an application. This difficulty has been got over, however, by mixing 1 part of tar to 4 parts of oil. This mixture naturally possesses the advantages of the oil dressing, and, owing to the presence of the tar, wounds which have been treated can be recognized at a glance.

Mr. Anstead states that resin oil, or the mixture of oil and tar mentioned, is rapidly coming into use on the large estates at Grenada in place of coal tar, and has also been adopted at the Botanic Station, Experiment Station, and on the Experiment Plots.

At Grenada the oil is purchased in cases containing 8½ gallons at £1 5s. per case. It is stated that, when properly applied, 1 gallon of oil will go as far as 2 gallons of tar, so that the former material is cheaper in the end.

DISEASE OF EVERGREENS AT BARBADOS.

Frequenters of the Garrison Savannah of Barbados will have noticed that many of the fine evergreen trees (*Ficus nitida*) have died during the past few years. Several fine specimens can now be noticed to be dying, as for example in front of the buildings now occupied by the Savannah Club.

Careful observation of these dying trees will show that in many places the bark of the branches and trunks is being pushed off, and a blackish incrustation is making its appearance. These black patches are the fructifications of a fungus, *Eutype erumpens*, that may account for the unhealthy appearance of these trees. The mycelium of the fungus spreads in the internal tissues and bark of the trees, and at the fruiting period, fructifications make their appearance under the bark, eventually pushing it off.

This fungus is extremely common amongst the evergreen trees of Barbados, and has been particularly noticeable during the last two years. Several very large trees have died in many different parts of the island, for the fungus is not confined to those evergreens around the Savannah. The mode of spread of the parasite has not yet been ascertained, nor have remedial measures yet been given a satisfactory trial.

This note is here published for the purpose of directing the attention of people at Barbados particularly to this disease, with a view to obtaining information as to what measures will check its spread. All affected limbs should certainly be cut off and burned and all dead trees removed and destroyed.

This same fungus has been recorded on nutmegs in Trinidad, and on a number of plants in some other of the West Indian islands, and it is possible that investigations may prove that it is of economic importance in some colonies agriculturally.

INOCULATION OF LEGUMINOUS CROPS.

In view of the fact that the cultivation of leguminous crops under suitable conditions offers a means of enriching the soil with nitrogen, and that this power of assimilating atmospheric nitrogen is due to the presence and action of nodule-forming bacteria on the roots of these plants, it would seem, at first sight, a comparatively easy matter to ensure the presence of the bacteria, and the consequent production of crops of greater value, by inoculating the soil with the organisms in question. A considerable amount of experimental work on this subject has been carried out in the United States, in Germany, Canada, and—quite recently—in England, but the results attained, speaking generally, have not, so far, been by any means of so promising a nature as was at one time anticipated. Some trials, it may be mentioned too, have lately been made at Antigua and Grenada, under the direction of this Department, and it is hoped shortly to publish a note on the results.

Cultures of bacteria for inoculation purposes have at different times been prepared and sent out in a number of different forms, one of the latest being that known as 'Nitro-Bacterine,' devised by Professor Bottomley of King's College, London. Experiments with this material were carried out by the Royal Horticultural Society at the Wisley Gardens, England, during the summer of 1908, the soil of these Gardens being of the kind where inoculation might be expected to have a good effect. An exhaustive report on this experimental work is contributed by Mr. F. J. Chittenden, F.L.S., to the *Journal* of the Society for November last (Volume XXXIV, Part II), from which it appears that from no point of view did inoculation prove to have a beneficial effect.

The following summary of the results is given at the end of Mr. Chittenden's report:—

A trial of the effect of inoculation of peas with 'Nitro-Bacterine' was conducted at Wisley in 1908.

The soil of the Wisley Gardens is one more likely to respond to such inoculation than the majority of garden soils.

The experimental area was divided into twenty-four equal plots, twelve being on well-worked soil, and twelve on soil that had been fallowed in 1907.

Each pair of plots on the cultivated ground received different soil treatment, and the corresponding pairs on the fallowed land received the same treatment.

One of each pair of plots had seed which had been inoculated sown upon it; the other, seed which had not been inoculated. One row of each of four varieties was sown upon each plot, the same varieties being used throughout.

It is shown that the Wisley soil is lacking in none of the chemical elements necessary for the successful growth and development of nodule-forming bacteria.

Seven out of the twelve plots on which inoculated seed was sown, gave smaller crops than the corresponding uninoculated crops, and one gave an equal crop.

There was, under no soil treatment, a consistent increase in the crop due to inoculation.

The total weight of the crop from the whole of the plots receiving inoculated seed was 450 lb., while the total from the plots in which uninoculated seed was sown, was 515 lb. The uninoculated seed therefore gave, in the aggregate, a crop 14 per cent. heavier than the inoculated.

The crop from the inoculated seed was not better in any way than that from the inoculated, nor did it reach maturity earlier.

There was a remarkable difference in the yield from the well-cultivated land and the fallowed land, greatly in favour of the former.

It is concluded that the inoculation of leguminous crops with 'Nitro-Bacterine' in *ordinary garden soils* is not likely to prove beneficial.

EAST INDIAN IMMIGRANTS IN TRINIDAD.

The *Annual Report* for 1907-8 on Trinidad and Tobago contains the following note in reference to East Indian immigrants in the colony:—

The number of East Indians brought to the colony under indenture in 1907-8 was 1,860, whilst the number who returned to India was 752. The amount deposited by the latter in the Colonial Treasury for transmission to India was £13,578 11*s*. 10½*d*., and in addition they consigned £306 to the care of the Surgeon-Superintendent in charge of the ship in which they sailed. The amount of remittances to India by immigrants, exclusive of the money taken back by immigrants returning to India, was £3,227 0*s*. 2*d*. The amount deposited by East Indians in the Government Savings Bank during the year 1907 was £74,822 8*s*. 7*d*., and the total balance to their credit on December 31, 1907, was £111,675 6*s*. 11½*d*., the total number of East Indian depositors for the year having been 6,361.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets during the month of December:—

Throughout the month of December the markets in spices and drugs have been quite of a character that usually prevails in the two or three weeks before Christmas. In the first two weeks of the month there was a firmer and more steady undertone in drug dealings than is common at that period of the year, but as the Christmas holidays approached and stock-taking time was in view, business began to flag, and at the end of the month the news of the terrible earthquake at Messina paralysed buiness generally, and at once caused a serious rise in the products of the afflicted country, such as the essential oils of lemon and bergamot, which at time of writing had risen 50 per cent. in price, with the probability that owing to stocks of bergamot oil in London being nearly exhausted there would be a further rise immediately in this product. The dealings in West Indian produce were without special interest, as the following items will show.

GINGER.

At the second spice sale on December 9, Jamaica ginger sold at steady rates. Of the 216 packages offered, 146 were sold, good ordinary small fetching from 48*s.* to 50*s.*; slightly inferior realized 46*s.* 6*d.* to 47*s.* 6*d.*, and ratoon 39*s.* Cochin and Calicut were offered to the extent of 600 packages, all of which were bought in, rough Cochin at 36*s.* On the 16th there was no Jamaica offered, but 297 bags of Cochin were brought forward, all of which were bought in at 37*s.* per cwt. for fair washed. After this date there were no further quotations.

NUTMEGS, MACE, AND PIMENTO.

Of nutmegs, at the spice sale on the 9th, 307 packages of West Indian were offered, and nearly all sold at steady to rather advanced prices. At the auction on the 15th, 26 packages of West Indian were offered and disposed of at the following rates: 70's to 74's at 7*d.*, 99's at 4½*d.*, and 121's at 3½*d.* No further offerings were made during the rest of the month.

Mace was steady at auction at the first spice sale on the 2nd, when 13 packages of West Indian were offered and disposed of at 1*s.* 4*d.* to 1*s.* 5*d.* for ordinary to fair, and 10*d.* to 11*d.* for broken. A week later 58 packages of West Indian were sold at 1*d.* to 2*d.* advance on previous rates, viz., 1*s.* 6*d.* to 1*s.* 7*d.* for fair to good; 1*s.* 4*d.* to 1*s.* 5*d.* for fair pale and reddish, and 1*s.* 2*d.* to 1*s.* 4*d.* for fair to good red. Of pimento at the first sale on the 2nd, 100 bags were offered and bought in at the following rates: Greyish to fair 2*d.* to 2¼*d.*, and siftings at 1⅛*d.* to 1¼*d.* per lb. On the 9th, when 567 bags were offered, 44 only were disposed of at from 2*d.* to 2⅛*d.* for fair; at later auctions there was but little demand and no change in price.

SARSAPARILLA.

The market in this drug remains firm with little or no alteration. At the first drug auction on the 3rd, grey Jamaica was represented by 45 bales, Lima-Jamaica by 7 bales, and native Jamaica by 6 bales. The first fetched 1*s.* 4*d.* to 1*s.* 6*d.* per lb. for fair to good, and 1*s.* 3*d.* for coarse. For Lima-Jamaica, 1*s.* 1*d.* to 1*s.* 2*d.* per lb. was paid, and 11*d.* to 1*s.* 1*d.* per lb. for the 6 bales of native Jamaica. No business of any importance has been done since.

CASSIA FISTULA, OIL OF LIME, LIME JUICE.

Three bags of good bold fresh Cassia Fistula from the West Indies were disposed of at 22*s.* per cwt. At the same sale a case of hand-pressed oil of lime from Dominica fetched 5*s.* per lb. One case of ordinary distilled was sold at 1*s.* 9*d.*, and 5 other cases were disposed of at from 1*s.* 7*d.* to 1*s.* 8. per lb. Ten cases of West Indian lime juice were also brought forward at this auction, and 5 sold at 1*s.* per gallon.

IMPROVED COFFEE-HULLING MACHINE.

In view of the enormous output of coffee from Brazil it is not surprising to learn that a good deal of effort is being made to improve the machinery now in use for preparing the product. These efforts are receiving assistance from the Government, and some have met with a fair measure of success.

In the United States' *Consular Reports* for November last, it is mentioned that a new machine for hulling coffee has lately been installed on a plantation in the State of Sao Paulo, which is a considerable advance on those formerly operated. This machine is about 16 feet high, occupies about 3 square yards of space, and is worked by an engine of 6-horse power. In ten hours it hulled 400 arrobas (12,953 lb.) of coffee, separating the beans into three grades. This is considered a notable success.

NEW FIBRE-EXTRACTING MACHINE.

Although the cultivation of fibre-yielding plants cannot be included in the list of agricultural industries which exist in the more important of the West Indian islands, yet sisal hemp fibre is largely produced in the Caicos Islands, and in the Bahamas, too, the industry is a valuable one. Some efforts, it may be mentioned, have also been made to introduce the cultivation of the sisal plant into Jamaica.

Fibre-yielding plants are not usually expensive crops to grow, but the provision of a machine for extracting and preparing the fibres is necessarily a comparatively costly feature of the industry. For this reason the announcement that a new machine, for which many advantages are claimed, has lately been invented and put on the market in Mauritius, should be noted with interest by those concerned. The chief fibre plant of Mauritius, and one which is cultivated on a fairly extensive scale in that island is *Furcraea gigantea*.

It is claimed for the machine in question that all the fibres of the plant dealt with are extracted in their full length, and in clean condition; there is no waste whatever of the fibre. The machine, it is stated, works automatically, and when a regular supply of leaves is provided, all the processes of defibration are carried out without human assistance. In an average day's work (10 hours) it is said to be capable of turning out 1 ton of dried Furcraea fibre, the force required being about 10-horse power.

In Mauritius the price of this machine is about £300. It is stated that its cost might be reduced in certain other countries.

The inventor is M. Maingard, and the machine is known as 'Maingard's Automatic Defibrating Machine.'

It is affirmed that in addition to Furcraea, the machine is equally capable of dealing effectively with leaves of sisal hemp, Manila hemp, Phormium, etc.

MARKET REPORTS.

London,—February 2, 1909, THE WEST INDIA COMMITTEE CIRCULAR; Messrs. KEARTON PIPER & Co., February 2, 1909; Messrs. E. A. DE PASS & Co., January 8, 1909.

ARROWROOT—Quiet; 1¾*d.* to 2$\frac{1}{16}$*d.* for common to good manufacturing.
BALATA—Sheet, 2/2 to 2/4; block, no quotations.
BEES'-WAX—No sales reported.
CACAO—Trinidad, 56/- to 70/- per cwt.; Grenada, 48/- to 57/6 per cwt.
COFFEE—Santos, 29/- per cwt.; Jamaica, no quotations.
COPRA—West Indian, £18 10*s.* to £19 10*s.* per ton.
COTTON—St. Kitt's, 13½*d.*; Barbados, 13½*d.* to 14*d.*; St. Vincent, 15½*d.*
FRUIT—
BANANAS—Jamaica, 4/6 to 6/- per bunch.
LIMES—Not wanted.
PINE-APPLES—St. Michael, 3/6 to 6/.
GRAPE FRUIT—5/- to 8/- per box.
ORANGES—Jamaica, 5/- to 9/- per box.
FUSTIC—£3 to £4 per ton.
GINGER—Very quiet.
HONEY—No sales reported.
ISINGLASS—West India lump, 1/10 to 2/- per lb.
LIME JUICE—Raw, 1/- to 1/4 per gallon; concentrated, £18 per cask of 108 gallons; distilled oil, 2/9 per lb.; hand-pressed, 7/- per lb.
LOGWOOD—£3 to £4 5*s.* per ton; roots, no quotations.
MACE—Steady.
NUTMEGS—Steady.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5*s.* per lb., on the spot.
RUM—Jamaica, 3/3 to 3/4; Demerara, 1/6 to 1/7, proof.
SUGAR—Crystals, 14/3 to 17/-; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York, January 22, 1909.—Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 12c. to 13c.; Grenada, 11¼c. to 11¾c.; Trinidad, 11¾c. to 12¼c.; Jamaica, 9½c. to 11½c. per lb.
COCOA-NUTS—Jamaica, select, \$24·00 to \$25·00; culls, \$13·00 to \$15·00; Trinidad, \$22·00 to \$23·00; culls, \$13·00 to \$15·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8½c.; good ordinary, 9½c.; washed, 11½c. per lb.
GINGER—9c. to 12½c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
GRAPE FRUIT—Florida, \$1·50 to \$2·50 per box.
LIMES—Dominica, a limited demand at \$5·75 to \$6·50 per barrel.
MACE—25c. to 31c. per lb.
NUTMEGS—110's, 9¼c. per lb.
ORANGES—Florida, \$1·75 to \$2·25 per box.
PIMENTO—3¾c. per lb.
SUGAR—Centrifugals, 96°, 3·67c. to \$3·71; Muscovados, 89°, 3·17c. to \$3·21; Molasses, 89°, 2·92c. to \$2·96 per lb., duty paid

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., February 13, 1909; Messrs. T. S. GARRAWAY & Co., February 15, 1909.

ARROWROOT—St. Vincent, \$4·00 per 100 lb.
CACAO—Dominica and St. Lucia, \$10·00 per 100 lb.
COCOA-NUTS—\$13·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb.
HAY—\$1·25 per 100 lb.
MANURES—Nitrate of soda, \$62·00 to \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$72·00 to \$75·00; Sulphate of potash, \$67·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, \$2·00; loose, no quotations.
POTATOS—Nova Scotia, \$2·00 per 160 lb.
PEAS—Split, \$6·25 per bag of 210 lb.; Canada, \$3·30 per bag of 120 lb.
RICE—Ballam, \$5·30 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana,—Messrs. WIETING & RICHTER, February 6, 1909; Messrs. SANDBACH, PARKER & Co., February 5, 1909.

ARROWROOT—St. Vincent, \$9·00 to \$9·50 per 200 lb.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. per lb.
CACAO—Native, 16c. to 18c. per lb.
CASSAVA—72c.
CASSAVA STARCH—\$6·00 to \$7·00 per barrel of 196 lb.
COCOA-NUTS—\$16·00 per M.
COFFEE—Creole, 12c. to 13c.; Jamaica, 11c. to 12c. per lb., slow.
DHAL—\$5·00 to \$5·25 per bag of 168 lb.
EDDOS—\$1·32 per barrel.
MOLASSES—No quotations
ONIONS—Madeira, 4c. to 5c. per lb.
PLANTAINS—16c. to 36c. per bunch, plentiful.
POTATOS—Nova Scotia, \$2·50 per 100 lb.
POTATOS—Sweet, Barbados, \$1·08 per bag.
RICE—Ballam, \$5·80; Creole, \$4·60 to \$4·75; Seeta, \$6·00.
SPLIT PEAS—\$5·90 to \$6·00 per bag (210 lb.); Marseilles, \$4·25 to \$4·75.
TANNIAS—\$1·80 per bag.
YAMS—White, \$2·00; Buck, \$1·80 per bag.
SUGAR—Dark crystals, \$2·20; Yellow, \$3·10 to \$3·25; White, \$3·60 to \$3·80; Molasses, \$2·10 to \$2·20 per 100 lb. (retail.)
Timber—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—\$3·50 to \$5·50 per M.
——— CORDWOOD—\$2·40 to \$2·64 per ton.

Trinidad,—February 6, 1909.—Messrs. GORDON, GRANT & Co.

CACAO—Venezuelan, \$12·00 to \$12·50 per fanega; Trinidad, \$11·50 to \$12·00.
COCOA-NUTS—\$22·00 per M., f.o.b., for selected peeled in bags of 100 lb.
COCOA-NUT OIL—76c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8½c. to 9c. per lb.
COPRA—\$3·15 per 100 lb.
DHAL—\$4·65 to \$4·70 per 2-bushel bag
ONIONS—\$4·00 to \$5·00 per 100 lb. (retail).
POTATOS—English, 90c. to \$1·10 per 100 lb.
RICE—Yellow, \$5·40 to \$5·60; White, \$4·50 to \$4·90 per bag.
SPLIT PEAS—\$5·75 to \$6·00 per bag.
SUGAR—American crushed, \$5·00 to \$5·10 per 100 lb.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Departments of Agriculture and Their Functions.

THE functions of Departments of Agriculture are numerous and varied; it is desirable, therefore, from time to time, to review them in order to ensure that all are properly exercised.

Some of the chief functions of a Department of Agriculture are to collect the results of experimental work that is in progress at the stations under its control, to keep in touch with investigations carried on elsewhere, and to include in its organization suitable means for diffusing the knowledge thus accumulated.

The last named point is most important in agricultural work, and more especially in regard to tropical agriculture. The great diversity of the whole subject, and the fact that a good deal of knowledge has been placed on record which, however, is not yet accessible in text-book form, but is scattered in different journals and other publications, together with the further fact that the fund of information is constantly being added to, all combine to make the collection and diffusion of results a very prominent part of the work of an Agricultural Department. It is not enough that the knowledge exists; it must be made available to those whom it most concerns, and every effort made to adapt it to local conditions. The men most interested—planters and farmers—are frequently too busy or unable to hunt up required information from out-of-the-way sources, hence the value of a central agricultural office, with its organized sub-stations and staff of officers, which recognizes as a chief part of its duty the necessity to indicate where facts needed are to be found, and to make them easy of access to all.

A planter working alone encounters many difficulties and stumbles upon many problems interesting or perplexing; he may expend much time, thought and energy upon these; he may even experiment and alter his methods of working as the result of these efforts. All this is time-consuming and the results are uncertain. If he is in touch with a well-equipped Department, he can at the outset explain his difficulties or views; he can then learn whether these points have already received attention, either in his own neighbourhood or elsewhere, and his line of action can be directed by the information thus made available

Should his difficulties or views be new, he can have laid before him the general principles underlying the questions at issue, and his thoughts, experiments, and work can be directed in right channels. Erroneous ideas will be eliminated and sound ones encouraged, and thus the departmental assistance may make for continuous progress with the minimum waste of energy.

The usefulness of agricultural experiment work cannot be lightly estimated, since by its means the stock of definite knowledge is increased; but it may safely be stated that much of the value of this work would be lost, were it not for the continued existence of central Agricultural Departments and the organized staff of officers at the outlying stations, whose duties keep them in touch with the work of planters all the year round. It is not enough to issue periodical reports on the results of experimental work. Planters seldom assimilate all that appears in the reports brought before their notice, even when these deal with their own subject; they may, it is true, read such publications carefully, but the points picked up in this reading appeal to the mind according to the particular work in hand at the time, or the bent of the mind at the moment. As a result, much valuable information that is contained in reports and occasional papers is often passed over and forgotten, simply because it is not immediately applicable.

The facts would be noted as being useful if read at a seasonable time, or when the subject in question was occupying the mind of the reader; but under other circumstances no impression is made, and the results of the experimental work are in danger of being lost.

It is, however, the function of an Agricultural Department, not only to carry out experiments but to use every effort to see that the results are applied by the planters concerned. The points elucidated therefrom, are again brought to the notice of the planter by officers of the Department, and emphasized at the time when the work in question is calculated to be of value, or its application appears opportune. Indeed, planters themselves rely on the departmental officers to point out the application of the latest experimental results, and to be ready to give specific information if asked for it, and progress is probably largely determined by the readiness with which this exchange of thought takes place.

An up-to-date Agricultural Department, therefore, whose operations ramify in different directions, and whose officers are in touch with each other so that there is a continuous interchange of ideas, finds one of its most valuable functions as a collector and distributor of information. Knowledge which may exist in the minds of isolated individuals, and which would otherwise have but a limited use, is brought out and made available for the service of all. From this point of view the existence of the central and sub-central officers and stations must be regarded as being most valuable, and even necessary, since it ensures that the results of research are not lost, that they are put to the test and modified, to suit local conditions, and that they are continually being kept before the notice of those whom they immediately concern.

It may be pointed out that this work of taking existing knowledge and making it available for general use is one which may perhaps be regarded as being more valuable, and more practically remunerative to the general body of mankind even than the creation of knowledge itself. Much useful knowledge may lie stored up and unused for lack of an intelligent guide to its existence and usefulness, while its proper diffusion may change the current of thought of a community or class of workers and immediately prove remunerative and of tangible value. What better instance can be cited than that of Mendel whose discovery lay hidden in *The Proceedings of the Natural History Society of Brün* for nearly forty years! As soon as his work was brought to light and adequately made known, it was immediately fruitful of great results, the full importance of which is probably yet unrealized.*

It is important that those in administrative charge of affairs should recognize the value of organization for the purpose of diffusing knowledge—agricultural and otherwise. They are often prone to think that if useful facts have once been placed on record that is sufficient, and that in the usual course of things they will be discovered and applied by those locally interested; but this is seldom the case. Progress in any given line of work is immensely hastened and rendered both easier and more certain by the existence of organizations whose duty it is to collect, co-ordinate, classify and diffuse knowledge. In agricultural work this implies agencies of many kinds, reaching out on the one hand into the fields and into close touch with the daily work therein, and culminating in a central organization capable of the duties outlined above. Such a system is well exemplified in the agricultural organizations of various countries, but perhaps nowhere to greater advantage than in the magnificent system of the Department of Agriculture of the United States, which is proving of incalculable value to that progressive country.

* See *Agricultural News*, Vol. VIII, pp. 33-4 and 49-50.

SUGAR INDUSTRY.

Seedling Canes at Antigua and St. Kitt's.

The pamphlet report (No. 56 in the Series issued by the Imperial Department of Agriculture) on the experiments with seedling and other canes carried out at Antigua and St. Kitt's in the season 1907-8 has just been issued by this Department, and the information supplied in regard to the relative returns given by the different varieties is of considerable interest. The experiments were carried on at eight estates at Antigua and eight at St. Kitt's, so that the results placed on record were obtained under a thoroughly representative range of soil and climatic conditions.

In the plant cane trials at Antigua made during 1907-8 six seedlings gave returns superior to that yielded by White Transparent; these include Sealy Seedling, B. 208, B. 156, and B. 306. which were also among the seedlings heading the list in last year's results, and so are to be commended as useful canes. The four seedlings mentioned gave returns in 1908 of 5,730, 5,640, 5,460, and 5,170 ℔. of sucrose per acre respectively, as compared with 5,100 ℔. of sucrose yielded by White Transparent.

It should be pointed out that the general yield from plant canes at Antigua in 1907-8 was decidedly below the average of the previous six years.

With the object of ascertaining which canes are above the average in merit and may safely be planted over a wide range of conditions, it is customary every year to note those which come among the first seven on the list at each station. In the past year in the plant cane trials at Antigua, Sealy Seedling, and B. 376 were among the first seven at six out of the eight stations, while B. 208 and B. 156 came within the first seven at five stations.

The mean results obtained over the past seven years in these plant cane experiments are also tabulated, and on the basis of these returns it is seen that eight seedlings have done better than the White Transparent. Chief among these are: B. 208 (average yield 7,560 ℔. of sucrose), B. 156 (7,360 ℔.), Sealy Seedling (7,350 ℔.), B. 306 (6,950 ℔.), and B. 109 (6,680 ℔.). White Transparent yielded 6,090 ℔. of sucrose per acre.

Judging from their merits as plant canes, the following seedlings are recommended for planting at Antigua: Sealy Seedling, B. 208, B. 156, B. 306, and possibly B. 376 and B. 109. The good results given by D. 625 in 1906-7 have not been maintained in 1907-8, and therefore the planting of this seedling on any considerable scale is not recommended.

The plots from which the plant canes in these experiments are reaped are afterwards cultivated as first ratoons, since the vigour with which a cane ratoons is an important factor in judging its usefulness.

Ratoon experiments were carried out at seven stations at Antigua in 1907-8. On the basis of the mean returns from all the stations the canes which gave the best yields as ratoons were: D. 109 (4,370 ℔. of sucrose), Sealy Seedling (4,360 ℔.), B. 306 (4,210 ℔.), and B. 147 (4,140 ℔.); B. 208 gave 3,920 ℔. of sucrose per acre and White Transparent 3,850 ℔. The cane Sealy Seedling came within the first seven at six stations, while B. 306, B. 109, and D. 109 were within the first seven canes at five stations. It will be noticed that several of the canes which are promising as plant canes also possess merit as ratoons, notably D. 109, Sealy Seedling, B. 306, and B. 376. Relatively better results were given by B. 147 as ratoons than as plant canes.

Combining the information available with regard both to plants and ratoons, the canes which appear to be best worth planting at Antigua are: Sealy Seedling for heavy soils in indifferent tilth; B. 208 for the best soils in first-class order; also B. 156, B. 306, and possibly D. 109. In some districts, principally those with a light well-drained soil, B. 147 finds favour with planters.

In the season under review, a number of new varieties of seedling canes which have not yet been introduced into the general experiments were cultivated at two of the Antigua stations. Although it is undesirable at present to say much regarding the probable usefulness of these canes, the collection undoubtedly contains some very promising varieties. The plots will shortly be reaped for the 1909 crop, and planters are advised to give careful attention to the results.

When the experiments carried out at St Kitt's in 1907-8 are considered, it is observed that the yield given by the plant canes was well up to the average of previous years. This is interesting in contrast with the case at Antigua.

Taking the mean returns of 1908 alone into consideration, the varieties which did best in the plant cane experiments are: B. 254 (8,570 ℔. of sucrose per acre), B. 208 (8,430 ℔.), D. 109 (7,840 ℔.), and D. 116 (7,240 ℔.). B. 254 has come within the first seven canes at seven stations, B. 208 at six stations, while B. 306, D. 109, B. 1,753 and D. 116 were among the first seven at five stations. It will be seen that B. 254 has once more sprung into remarkable prominence among the plant canes as it did in 1905-6. In 1906-7, however, it fell back very considerably, and this erratic behaviour should cause it to be treated with caution. It may be mentioned that a new cane—B. 1,753—occupies a good position (fifth) on the list, with a yield of 7,180 ℔. of sucrose. The return given by White Transparent was 6,360 ℔. of sucrose per acre.

The mean returns obtained in these experiments during the past eight years testify to the merits of B. 208, D. 116, D. 74, B. 306, and B. 376 as plant canes. Mont Blanc also shows a good average (7,370 ℔. of sucrose) over the period.

The weather conditions which prevailed at St. Kitt's in 1907-8 did not appear to be favourable to the growth of ratoons. Only the hardiest canes ratooned well, and promising varieties, such as B. 208 and D. 109, occupy quite a low position on the list On the average returns for the past seven years, B. 208 (5,840 ℔. of sucrose), D. 74 (5,800 ℔.), B. 306 (5,680 ℔.), D. 95 (5,660 ℔.), and D. 116 (5,560 ℔.) have proved most profitable as ratoon canes at St. Kitt's.

The pamphlet report contains an appendix which shows, in tabular form, the area occupied by the different varieties of cane at Antigua and St. Kitt's. The White Transparent is still by far the chief cane planted at Antigua, and, for the plantings to be reaped in 1909, occupies 7,067¾ acres out of a total of 9,555¾ acres. B. 147 comes second on the list—but far below—with an area of 699 acres; then come Sealy Seedling (575¾ acres), B. 208 (334½ acres), D. 95 (293 acres), Bourbon (107½ acres), B. 306 (76 acres), and D. 109 (59 acres). The areas under B. 147, Sealy Seedling, D. 109, B. 109, and D. 625 have all been increased since last year.

At St. Kitt's the position is quite different, seedling canes occupying nearly two-thirds of the area devoted to the sugar crop. B. 147 is the seedling chiefly favoured, and this is planted over 3,276 acres as compared with 2,708 in 1908; B. 208 covers 2,074 acres, or 27 acres less than in 1908, while White Transparent occupies 1,577 acres, as against 2,171 in 1908. B. 109 covers 131 acres, and 123 acres have been planted with the seedling D. 116.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows, under date of February 15, with reference to the sales of West Indian Sea Island cotton:—

A moderate business has been done in West Indian Sea Island cotton since our last report, and prices are steady. The sales include St. Kitt's and St. Croix at 13*d.* to 13¼*d.*, Barbados at 13¾*d.*, and St. Vincent at 15¾*d.* We are inclined to the opinion that the pressure of American Sea Islands is less urgent, and although, owing to spinners' large stocks, we do not expect any active markets for some time to come, we are inclined to think that prices will remain steady.

COTTON AT ST. VINCENT.

Mr. W. N Sands, Agricultural Superintendent of St. Vincent, has recently made a tour of the island, for the purpose of inspecting the condition of cotton and other cultivations. The following are the chief points in his report:—

It is apparent that the heavy rainfall experienced in December has done a considerable amount of damage to the late planted cotton. But, apart from this cause, it is evident that the yield for this season would have been, on the whole, a fairly low one. This is due to the facts that a good deal of impoverished land has been planted, and that the labour supply was, in many cases, deficient.

On one or two estates where the land had been well worked and manured, good returns of cotton have been obtained. The December rains have stimulated growth, too, and the plants give promise of a good second picking.

Crushed cotton-seed was applied as a manure for the crop on one estate, and has proved satisfactory. On another plantation the beneficial effects of an extra weeding and cultivation after the greater part of the first crop of lint had been gathered, was apparent.

Planters were already destroying old cotton plants on some estates, with the object of checking the spread of insect pests affecting the crop. In most cases the plants were being disposed of by burning in the fields, as recommended by the Department of Agriculture, and this is undoubtedly the most thorough manner of carrying out the work. In one or two instances, however, the estate owners were using the old cotton stalks, etc., as a mulch for cacao plantations, being unwilling to destroy the organic matter by burning. This is a plan of very doubtful advantage if the plants are much infested with scale insects, etc.

A method which is certainly not to be recommended has been observed on one or two estates at St. Vincent. In these cases the stalks of the plants are taken away to serve as firewood, while the small branches are left scattered about the field, and if affected with insect pests, serve as a ready source of infection for the next crop.

COTTON IN THE SEA ISLANDS.

Reports from Charleston indicate little or no change in the prices of American Sea Island cotton. For the week ended February 6 last, Messrs. Henry W. Frost & Co. report sales of 450 bales at Charleston and 637 bales at Savannah. The sales at Charleston included several planters' crop lots of 'fully fine' to 'extra fine' quality. The 'extra fine' cotton sold at from 26c. to 30c., and the 'fully fine' at from 23c. to 24c.

On February 13 Messrs. Frost reported:—

Receipts for the past week have been mostly of planters' crop lots. The sales have been entirely of crop lots of 'fine' to 'extra fine' quality at 23c. per lb. and upwards. There has been considerable enquiry for crop lots of all grades, but generally at prices below the views of factors who are showing firmness in holding their stock for increased prices.

SEA ISLAND AND EGYPTIAN COTTONS.

A delegation of cotton growers from Florida lately waited upon the United States Government to ask that an import duty shall be placed on Egyptian cotton brought into the country, as a protection to American growers of Sea Island cotton, since it is asserted that the native long staple cotton is in danger of being displaced in certain kinds of manufactures by the Egyptian variety. The question is discussed at considerable length in the *Cotton Trade Journal*, which, however, does not support the proposal, as it is unable to see any evidence that there is any competition between the two kinds of cotton, for which it claims there are separate and distinct uses.

In the United Kingdom at any rate, where both cottons have free entry, each supplies a want which cannot be met by the other variety, and it has never been stated that the Egyptian cottons are being utilized for purposes of manufacture in which Sea Island cotton was formerly alone employed. In any case, it may be pointed out, the matter would not appear to concern growers in the West Indies, since the type of Sea Island cotton with which the Egyptian lint is stated to compete is the coarser cottons of Florida and Georgia, and not the finer, longer staples of the Sea Islands and the West Indies.

ONION CROP AT ANTIGUA.

The following details in regard to plantings of onions that have been made at Antigua in the present season have been received from Mr. Thomas Jackson, Curator of the Botanic Station in that island :—

The area of the present season's (1908-9) onion crop in Antigua is about 50 acres ; this area is slightly less than that planted last year, when 52 acres were grown.

As already reported, onions are grown in this island mostly as a catch crop previous to planting sugar-cane.

The seed is sown in nursery beds, the soil of which is well pulverized, and raised from 8 to 12 inches, the seed being sown in drills which are from 4 to 8 inches apart. From these beds the seedlings are transplanted into their permanent position, which, in most cases, is a cane field in good tilth.

During the year under review, this crop has suffered very little from insect attacks. When the seeds were first planted, some loss was caused by the depredations of ants. It was found, however, that if a little kerosene oil was, on the first two or three occasions, added to the water to be applied to the plants—a wineglass full of kerosene being put to each gallon of water and thoroughly stirred—these insects kept away from the seed bed.

As in previous years, the greater part of the seed for this crop was imported from Teneriffe, through the Imperial Department of Agriculture. The germination of the seed was good.

PEN MANURE.

The continuous provision of a suitable supply of humus is one of the chief problems of tropical agriculture, since in consequence of the rapidity with which nitrification proceeds under the prevailing climatic conditions, the quantity present in the soil at any given time tends quickly to disappear. The capacity of a soil to retain moisture depends largely upon the proportion of humus contained: decaying vegetable matter, too, lightens heavy soils and imparts cohesion to sandy soils. Its presence also is a condition without which bacterial life will not flourish. On most estates in the West Indies, the supply of pen manure seldom reaches the quantity which could be utilized with advantage, and consequently it is a matter of the utmost importance that the amount available should be managed in such a way that the most is made out of it. The fermentation of pen manure and the losses of fertilizing constituents that frequently occur from mismanagement were discussed in a recent number of this journal (*Agricultural News*, February 6 last, p. 47). The following notes, which are taken from an article on pen manure lately published in the *Porto Rico Horticultural News* are given here, as supplementing the information contained in the previous article :—

The term 'farm manure' includes dung from domestic animals as well as waste materials from the farm. As the average plantation keeps but few animals, the manure from this source is of no great importance. But considering that most soils in the West Indies are greatly benefited by pen manure, it becomes an important question how to make the most out of the small amount at hand.

Dung is undigested food, and its content depends largely on the kind of food consumed by the animal. The manure from pasture-fed cows is of little more value, as far as the plant foods, potash, phosphoric acid and nitrogen are concerned, than the guinea grass in the pasture. If cows or horses are stall-fed, the dung will be more valuable because of the more concentrated feed. The average composition of such dung in the West Indies will probably be about 10 ℔. nitrogen, 5 ℔. potash, and 5 ℔. of phosphoric acid per ton, which compared with the market price of plant foods in commercial fertilizers would be worth \$3 to \$5. This, however, is not a fair estimate, because such manure is worth much more than the actual plant food it contains when applied on the average soil in the West Indies.

Stable manure is valuable for the humus it contains as well as for the bacteria it supplies. The cultivated soils lose humus rapidly in this climate, and with the humus the bacterial life disappears, which renders the soil inert and unprofitable for cultivation.

It seems to be well established that there is less loss when the manure is gathered up every morning, spread over the land immediately and covered up, than if kept for some length of time. This, however, is not practical when there is but a small amount, and it is usually best to keep it under conditions where it is least exposed to deterioration.

The chief sources of loss are : fermentation, draining, and leaching. Drainage can best be overcome by using sufficient bedding in the stalls or the yard to absorb all the liquids. This bedding may be any absorbent material that can be obtained cheaply, such as dry grass or leaves.

Leaching cannot well be avoided except the yard is covered. This it seldom is in the West Indies, but considering the value of manure and the comfort that it would afford the animals, it would undoubtedly pay to cover the barn yard. On large sugar states in some of the West Indian islands where hundreds of work-oxen are kept, and often fed for long periods with cane tops and molasses, the manure is usually left exposed to the sun and rain until it is of very little value. In a covered yard where plenty of bedding is used, the manure should be gathered up every twenty-four hours and added to the manure heap, which may conveniently be placed at one end of the yard under cover.

This method eliminates the two sources of loss, but the third one, fermentation, is still to be guarded against. If manure contains enough bedding to absorb all the liquids it will be too dry in the pile, and dry fermentation will take place. This can be avoided by frequently moistening the heap with water and packing it down as firm as possible. If the heap is large enough, it is well to let a few animals in to tramp it down. In moistening the heap it is almost impossible to avoid leaching, and it is well to have a tank in the ground to catch the liquids running off and leaching through the heap, which can again be returned at the next watering.

Lime should never be used in the manure heap as it hastens decomposition and liberates nitrogen too fast. Sulphate of lime or gypsum is very good because it absorbs ammonia. Superphosphate is also good, and kainit is an exceptionally good absorbent. It is therefore a good plan to add about 75 ℔. of kainit and superphosphate to each ton of manure in the heap, which not alone helps to preserve the nitrogen, but also increases the value of the manure to the extent of the potash and phosphoric acid content in the ingredients added, thereby making a mixture much more suited to the requirements of the average crop.

WEST INDIAN FRUIT.

BUDDING THE MANGO.

Seedling mangos, as is well known, can seldom be relied upon for the production of fruit, as the produce is almost sure to be of inferior quality. Even if the parent tree be of a superior variety, seedlings are likely to revert to the original species. Resort must therefore be had to propagation by vegetative means if the best mangos are to be perpetuated.

In the West Indies the method known as 'grafting by approach' is practically the only method that has so far been adopted for multiplying superior kinds of the fruit. This method, however, is not so satisfactory as it might be, more especially when a large number of young trees are required, since it is slow and elaborate, and involves the erection of an unsightly structure, laden with pots, around the tree from which the graftings are to be made.

In Queensland and also in the United States, 'budding' or 'bud-grafting' has of late years been adopted with great success in the propagation of the mango. This system is much more rapid than that of grafting by approach. It has already been described in an early number of the *Agricultural News* (Vol. III, No. 62), but in view of recent enquiries, and of the fact that the number in question is out of print, it has been thought desirable to again refer to the subject. The method is described in *Bulletin No. 46* of the Bureau of Plant Industry, U.S. Department of Agriculture, from which the following details have been abstracted:—

Seedlings of two or three years old, and which have stems at least an inch in thickness, may most suitably be used as stocks on which to bud the mango. In young trees at this stage of growth, both wood and bark are thoroughly ripe, and union of the scion with the stock will easily be accomplished if insertion of the buds is performed carefully. A method of budding which has proved most satisfactory is shown in Fig. 9; this consists in removing a rectangular piece of bark from the stock, and inserting another piece—taken from a branch of a desirable variety of mango. This latter piece of bark will be similar in shape to that removed, but a trifle larger in size, and will have a bud in the centre.

As the results of experiments carried out in the United States, it has been found that branches of very young growth (less than a year old) are unsatisfactory for providing bud-wood. This should be selected from wood old enough to have lost its foliage, which means that bud-wood will frequently be over two years old. The use of bark of this age, and even older, ensures success in budding the mango, as it unites rapidly with bark of a similar age on seedling stocks or on branches of trees. Precision in removing the section of bark from the stock, and also from the variety to be propagated, are factors upon which success depends to a certain extent.

When the section of bark from the bud-wood has been

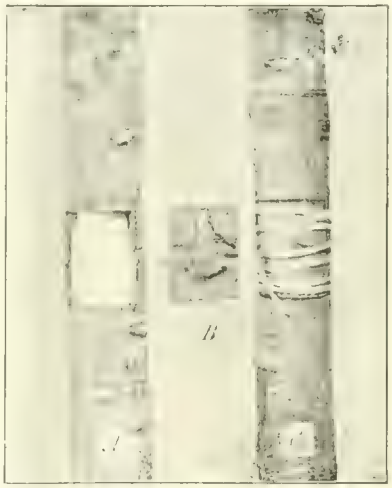

Fig. 9. Rectangular Patch Method of Budding the Mango.

properly fitted in place, a small quantity of grafting wax should be smeared over the edges of contact, and the bark then tied firmly with thick strands of bast as shown at C. (Fig. 9). After this, the cut surfaces, and all but the bud, should be covered with strips of cloth dipped in melted paraffin, as a further preventive against the admission of air and moisture between the cut surfaces of stock and scion. If there is undue exposure to the sun, shade should be provided by means of strips of paper tied over the bud, and extending down over it.

At the end of a fortnight from budding, the stock may be examined to ascertain the progress that has been made. The cloth wrappings may be removed, and the raffia loosened if there is danger of its cutting into the bark. When a sufficient time has elapsed to make certain that union has taken place, part of the top of the stock should be removed, in order to encourage the bud to start. This it will do with very little coaxing.

Budding may be performed at any time during the growing season, but with every plant there are certain periods when the operation will be more successful than at others.

These periods are indicated by the growths or 'flushes' being about half developed. At these times the bark peels from the wood more readily than when the growths are of firmer texture.

Another method of attaching the bud, known as 'shield budding,' and which varies slightly in the details from the

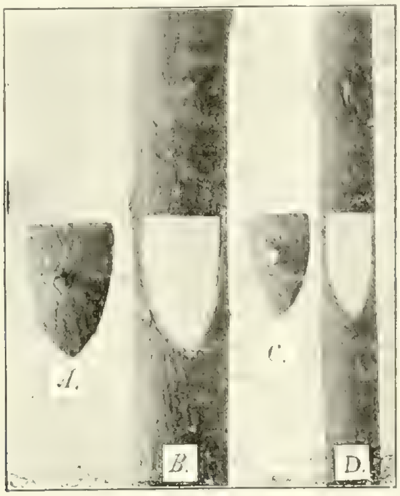

Fig. 10. Method of Budding the Mango used in Florida.

process described above, has been practised for some years in Florida with encouraging success. This method is shown in Fig. 10. The bud section differs from the rectangular-shaped piece of bark in that one end of it is pointed instead of being cut straight across, which makes it possible to push the bark of the scion down tight against the bark of the stock; the top part is then cut off square with the transverse cut in the bark of the stock, and is pressed firmly into position, previous to tying and waxing in the usual way.

It is desirable that these methods should be experimented with freely in the West Indies in order to ascertain what conditions determine success. It will be remembered that the budding of oranges, now a routine operation at many Botanic Stations in the West Indies, was thought at one time to be an operation of extraordinary difficulty in these parts, and one of doubtful utility.

INFLUENCE OF LIME ON PLANT FOOD IN THE SOIL.

Attempts to investigate the effect of applications of lime upon the availability of plant food constituents in the soil have lately been made both in New South Wales and in the Hawaiian Islands. The results of the experiments are summarized in the *Experiment Station Record* for October last.

Trials were carried out in triplicate—on light sandy soil, on garden loam, and on very stiff clay respectively. The amounts of phosphoric acid and potash in these soils which were soluble in water, and also the amounts soluble in 1-per cent. citric acid were first determined. The nitrates and nitrites present were also estimated. The soils were then treated with moderate applications of freshly slaked lime, and one month later, the determinations of available phosphoric acid and potash were again made in the same way.

As a result, it was seen that the water-soluble phosphoric acid decreased during the experiment in all three soils, and on the clay soil the amount of potash present also showed a decline after liming. The total amount of water-soluble plant food, however, was larger in the limed than in the unlimed soils, but only in sandy soil did liming increase the proportion of water-soluble phosphoric acid and potash over that originally present in the soil. There was little change in the amounts of phosphoric acid and potash soluble in 1-per cent. citric acid one month after liming as compared with the quantities soluble before lime was applied.

The examination of the soils after a period of eight months with reference to the changes in the nitrogen content showed a large increase in the proportion of nitrites in the soil that had been limed. The total nitrogen—as nitrite and nitrate—increased in all cases, although the nitrate nitrogen remained almost stationary except in the clay soil. The fact that there was no loss of the very soluble nitrates and nitrites is taken to indicate that the decrease of water-soluble potash and phosphoric acid, after the application of lime, was not due to percolation through the walls of the pots in which the experiments were carried out, so much as to conversion into less soluble forms.

CACAO CULTIVATION IN CUBA.

A statement on the subject of cacao cultivation in Cuba was published in the *West India Committee Circular* of January 5 last, this having been prepared by His Majesty's Minister in the island (Mr. A. C. Grant Duff) at the request of the Grenada Agricultural and Commercial Society, through the Foreign Office.

It appears that cacao cultivation increased considerably in Cuba during 1907-8. In this latter year there were 1,137 cacao plantations with 1,960,246 trees, as compared with 745 plantations with 1,860,306 trees in 1906-7. Owing to drought, however, the output diminished from 9,380,900 ℔. of cacao in 1906-7 to 6,023,700 ℔. in 1907-8.

Cacao is cultivated in the provinces of Santa Clara, Camaguey, and Oriente. Out of the total of 745 plantations existing in 1906-7, no less than 714 were established in Oriente province, these containing 1,829,366 trees out of the above-mentioned total.

During the last six months of 1907, cacao was exported from Cuba to the extent of 3,286,730 ℔. worth £95,520. Over half of this quantity went to the United States; France took 983,759 ℔., Spain 277,346 ℔., and Germany 241,206 ℔. None appears to have been shipped to Great Britain. The exports of cacao to the United Kingdom from Cuba have in fact steadily diminished, the amount having been 269,808 ℔. in 1903, 207,427 ℔. in 1904, 119,735 ℔. in 1905, and 81,097 ℔. in 1906.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from Grenada by the R.M.S. 'Esk' on February 23 last.

Mr. R. D. Anstead, B.A., who has held the post of Superintendent of Agriculture at Grenada since May 1905, proceeded to England by the R.M.S. 'Nile' on February 23 last, preparatory to taking up the duties of his new appointment in the Indian Agricultural Service.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. VIII. SATURDAY, MARCH 6, 1909. No. 179.

NOTES AND COMMENTS.

Contents of Present Issue.

The functions of Departments of Agriculture are discussed in the editorial.

A summary of the results of experiments with seedling and other varieties of sugar-cane carried out at Antigua and St. Kitt's during 1907-8 will be found on page 67.

Speaking generally, the cotton yield of St. Vincent for this season is expected to be somewhat low (page 68). Useful notes on the value and management of pen-manure appear on page 69.

The method of 'bud-grafting' is now recognized as the most up-to-date and rapid means of propagating the mango. This method is described, with illustrations, on page 70.

Machines for drying cacao by artificial means appear to be growing in popularity in the West Indies (page 73).

Attention is drawn to the interesting report 'Some Parasites of the Cotton Worm' which appears on pages 74-5.

Agricultural exports from Tobago reached a record figure in 1907-8 (page 77). A successful Agricultural Show was lately held at Nevis (page 78).

The Talipot Palm: A Correction.

An illustration showing two specimens of the interesting Talipot palm at Dominica was given in the *Agricultural News* of February 6 last, and, through an error, it was stated that the trees in question were to be seen at the Botanic Station of the island. It is desired to point out, however, that the palms shown in the picture are growing at the St. Aroment estate of Dr. H. A. Alford Nicholls, and it may be added that the photograph from which the block was prepared was taken by Mr. Skinner, Head-master of the Dominica Grammar School.

Several fine specimens of the Talipot palm exist at the Dominica Botanic Station, but none have yet flowered, and are not expected to do so for several years.

Velvet Bean Crop.

Very favourable reports on the results of cultivating the velvet bean (*Mucuna utilis*) for green dressing purposes, and as a forage crop for cattle, come from South Africa, more particularly from Rhodesia. In the South African colonies the crop is stated to have been grown with great success for some years past: it has given good results even on dry lands, and does not appear to suffer much from drought. A light sandy soil is best suited to the velvet bean, and on this it grows so thickly, and forms such a large mass of vegetation, that all weeds are choked out. Being a leguminous crop, this plant is naturally of high value for improving the soil. In experiments carried out at Barbados in 1900, the velvet bean came second out of thirty varieties of leguminous plants tested for the weight of produce yielded. In from two to three months a crop of vines was produced, the weight of which amounted to 12,343 lb. per acre. The velvet bean is largely grown as a cover crop in orange orchards in Florida.

Reafforestation.

Although the increasing shortage of timber has been apparent in the United Kingdom, as in other countries, for many years past, the matter has attracted but little attention. A noteworthy report on the subject however, has just been issued by the late Royal Commission on Coast Erosion and Afforestation. The Commissioners point out that in the United Kingdom there are about 9,000,000 acres suitable for afforestation, and they suggest that about 150,000 acres should be planted up annually. The return obtained in course of time would be sufficient to repay both capital and accumulated interest.

The *West India Committee Circular* expresses a hope that the above report may lead to consideration of the subject of forestry in the West Indies, and that the planting of hardwood timbers on an increased scale may result. In common with many other countries, the forest resources of these islands have been exploited too recklessly in the past, but this is additional reason why continuous effort should be made to repair the damage and prevent further destruction. The several colonies would benefit not only from a pecuniary, but also from a climatic point of view.

Starch Manufacture from Sweet Potatos.

The South Carolina Experiment Station has issued a pamphlet (*Bulletin 136*) describing investigations undertaken to determine how much starch could be recovered commercially from sweet potatos, and to test the quality of the product for the different uses to which starch is put. The discussion includes an account of the method of culture, analysis of sweet potatos, and the system of manufacturing starch from the tubers, together with other data. Investigations that have been in progress during the past two years in manufacturing starch from sweet potatos are described, and also the tests that have been made to determine the suitability of the starch for utilization on a commercial scale in laundry work and the cotton textile industries. These appear to be very satisfactory and the starch produced is undoubtedly of a high grade.

Rice Cultivation in Trinidad.

Rice growing appears to be on the increase in Trinidad, and it may possibly happen in the future that the home production will suffice for the needs of the colony. The chief Ward Unions in which the cultivation is carried on are those of Naparima, and of Tacarigua and Blanchisseuse. Rice production in Naparima has shown large increase in the past three years: 5,400 barrels (each of 160 lb.) were produced in 1905-6, 9,120 barrels in 1906 7, and in the year 1907-8 an area of 2,600 acres was planted with the crop, which yielded 13,000 barrels. of an estimated value of £8,666.

In the Tacarigua and Blanchisseuse Ward Union, it is estimated by the Warden that the quantity of rice grown may be placed at 1,235,400 lb., of the value of £7,721 5s., and there is every probability of a considerable extension of the area under cultivation.

Rice is also grown in smaller quantities in nearly all parts of the island.

Fruit Drying.

Increasing attention is being devoted in South Australia to fruit production, and to the best methods of placing the products on the market both in a fresh and in a dried state. The *Journal of Agriculture* published in the colony recently contained an article in which the system of fruit drying practised in California, where this practice has developed to a high degree of perfection, was described at some length. The fresh fruit is first fumigated by means of sulphur, then spread on trays and exposed to the sun till dry. As the weather conditions may become unfavourable, however, the larger drying grounds are also provided with elaborate drying plant, so arranged that the fruit shall be exposed to a gradually increasing temperature. The tray of fruit is placed in a gently sloping tunnel, upon which a stream of hot air from a furnace passes, and is gradually pushed downwards nearer the source of heat, as fresh trays are being put on behind. This slow drying is found to give much better results, and to yield a finer product than more rapid drying would do.

Destruction of Old Cotton at Montserrat.

In the course of the discussion that has lately taken place at St. Croix as to the proposed establishment of a 'closed' season for cotton, when no plants either old or young would be found in the island, the step that has been taken at Montserrat was instanced and referred to on more than one occasion. No legislation has been passed in the latter island for the purpose of compelling planters to destroy their old cotton by a certain date, although in view of the damage caused by the leaf-blister mite and the cotton worm, a large and representative meeting of cotton growers passed a strong resolution about the time of the planting season in 1907, urging the Government to adopt such a measure, and suggesting that the date of destruction should be fixed at a meeting of cotton growers held in March of each year.

No definite official action resulted, however, and growers realizing the importance of the question, and working together with the officers of the Department of Agriculture, arranged matters for themselves. At the conclusion of the second picking, both estate owners and peasant holders destroy, by burning, all the cotton plants on their land. As a result of this system of working, the highest average return of cotton yielded in any portion of the West Indies during the 1907-8 season was obtained at Montserrat.

Artificial Drying of Cacao.

Cacao drying by artificial means, in preference to exposing it to the sun, is being gradually adopted in parts of the West Indies, notably in Trinidad and Grenada. Gordon drying machines are reported to have become very popular at Grenada; there are now eight in the island, and the Agricultural Superintendent mentions that five more are on order.

The Gordon machine consists primarily of a large cylinder, arranged to revolve, and divided by plates extending the whole length of the cylinder, parallel to the axis, and at right angles to each other, into four sectional compartments. Each compartment has a separate door for filling and emptying. By means of a fan and a heating apparatus, a current of hot air is driven through the cylinder, which contains pipes perforated with holes, by means of which hot air is led through the cacao as the machine revolves. The air, laden with moisture, escapes through perforations in the casing of the cylinder.

These machines are made in six sizes, and take charges of from 500 lb. to 10,000 lb. of moist cacao. A fourth part of the cacao to be dried is placed in each compartment of the cylinder. The smallest machine (capacity 500 lb.) is suitable for small estates, and can be worked by hand, while the larger sizes must be operated by animal or steam power. When steam power is used, the exhaust steam can be utilized for heating purposes.

It will be seen that the great advantage of these machines is that by their use planters are rendered independent of weather conditions in the cacao-drying season.

INSECT NOTES.

Fertilizers as Insecticides.

In the Insect Notes in the last number of the *Agricultural News* (Vol. VIII, No. 178), mention was made of the experiments started at Antigua by the Entomologist on the staff of the Imperial Department of Agriculture to devise means of control for the flower-bud maggot of cotton.

These experiments include the use of commercial manures, and it is stated that 'in combating insects closely related to the flower-bud maggot it has been found that applications of mineral fertilizers have had a decidedly beneficial effect, not only from their usefulness as manures, but from the effect of the mineral salts in solution in the soil.'

It will, perhaps, be remembered by readers of the *Agricultural News* that this flower-bud maggot of cotton leaves the flower buds, either before they fall or immediately after, and enters the soil, where the period of pupation is passed. This is the only time in the whole life cycle of this insect when it exposes itself to remedial measures.

The adult insect cannot be dealt with ; the egg and the larval stages are passed inside the plant tissue, and so the pupal period of ten to fourteen days offers the only opportunity for reaching the insect with insecticides.

Vaporite is employed in the hope that the fumes or gases given off in the soil may be sufficient to cause the death of the insect while in the condition of a pupa. In like manner commercial manures such as nitrate of soda, sulphate of ammonia, sulphate of potash, superphosphate, Vi-phosphate, and salt are used in the hope that the solution of these various substances may kill by contact the pupating insect.

Some Parasites of the Cotton Worm.

Mr. Thornton, A.R.C.S., of Old Grange, Tobago, who was lately connected with the Imperial Department of Agriculture for the West Indies, recently sent to the Head Office of the Department two boxes containing insects which he had noticed to be parasitic on the cotton worm. These insects were studied and reported upon by Mr. Jemmett, and the following account is based on his report.

The boxes, on being opened, were found to contain, besides the larvae and pupae of the cotton worm, a number of flies belonging to the Sarcophagidae (flesh flies), and two species of Hymenoptera, of which one was identified as *Chalcis ovata*, Say, and the other as a species of the genus *Spirochalcis*. Most of the unhatched cotton worm pupae had Sarcophagid cocoons lying against them. These cocoons are quite conspicuous, being small, brown, barrel-shaped objects. The Hymenopterous parasites had pupated inside the cotton worm and of course could not be observed. *Chalcis ovata* has long been known to be a parasite of the cotton worm. It is a small, black insect, marked with yellow. It has four wings, with one conspicuous vein in each of the front wings ; in length the insect varies from 3 to 6 mm. ($\frac{1}{8}$ to $\frac{1}{4}$-inch). Its chief character, however, is found in the hind femora which are enormously swollen. The femora are tipped with yellow, the tibiae are yellow at each end, and the tegulae—two small cup-like scales at the base of front wings—are also yellow.

These insects were kept in a breeding cage with larvae and pupae of the cotton worm, and they were soon to be seen crawling about the cotton leaves, seeking for the host in which to lay their eggs. They were never observed to attack larvae, but could be seen attacking some of the pupae, crawling on them, and sharply inserting their ovipositors into the victims, in spite of the struggles of the latter. All the cotton worm pupae which were put into the cage emerged in a few days as moths. The younger pupae, i.e., those formed by the larvae which had pupated in the cage, were all parasitized, and from these, twelve days later, emerged, not moths, but the Chalcidae. From this it appears that it is only the young pupae which are attacked by the parasite.

FIG. 11. *Chalcis ovata* (greatly enlarged). From *Circular No. 97* ; Bureau of Entomology, U.S. Dept. of Agriculture.

This insect has been observed in cotton fields at Barbados ; most likely, it is present in all the cotton-growing West Indian islands, and probably exerts a considerable influence in lessening the numbers of this pest.

No record could be found of the other Hymenopterous insect which is referred to in these notes as a *Spirochalcis*. This insect is of slighter build than the last mentioned one ; it is yellow in colour, and has a shining or polished appearance. The abdomen, which is small and pointed, is attached to the thorax by a distinct stalk. The hind femora are swollen, as is the case with *Chalcis ovata*, and the wings and venation are also similar.

These insects were placed in a cage with cotton worm larvae and pupae, but they took no notice of these latter, remaining on the sides of the cage. A few days later, however, one was observed emerging from one of the Sarcophagid cocoons previously mentioned, and later several more of these cocoons were found to have *Spirochalcis* inside them. This insect then is shown to be a parasite on the Sarcophagid flies; that is to say, it is an example of the secondary parasites' which were discussed in the *Agricultural News*, Vol. VIII, No. 177, under the heading 'Some Beneficial Insects.' The Sarcophagidae are generally recognized as being parasitic in habit, though it is still not quite settled as to whether they will attack healthy pupae, or only those which have already been damaged in some way. In order to find out the habit of these insects, some Sarcophagid flies were put into a third cage with some healthy cotton worm larvae and pupae, and into the same cage were put specimens of *Spirochalcis*, with the idea that if the Sarcophagidae attacked the cotton worm pupae, the *Spirochalcis* would, in turn, attack the Sarcophagid cocoons. As the Sarcophagid flies did not attack the cotton worms, there were no positive results from the experiments. This trial, however, seems to strengthen the belief that the Sarcophagid flies only attack pupae which are already damaged. On the other hand, it is difficult to understand how it happens that so many pupae get damaged, as to account for the large number of Sarcophagid cocoons which are found on them.

Experiments with a Sarcophagid fly (*Sarcophaga trivittata*) were made at the laboratory of the Imperial Department of Agriculture some time ago, as follows: Pupae of the cotton worm were collected in the field and put

FIG. 12. A SARCOPHAGID FLY.

(Sarcophaga saracenia.)

Actual length indicated by hair line. Redrawn, after Washburn, from Williston's Manual of N. A. Diptera, p. 348.

into a box covered with muslin. Four days later there were 136 moths in the box. These were put into a large glass jar, which was also covered with muslin. Thirteen days after the moths were put into the jar, five flies (*Sarcophaga trivittata*) also appeared in the jar. The eggs from which these flies developed must have been deposited on or in the larvae or pupae of the cotton worm in the field, and these latter were not sufficiently injured to prevent their completing their life cycle and emerging as moths. It seems more likely that, in this case, the parent flies attacked the healthy cotton worm larvae or pupae, and that in spite of the effect of this attack, the latter were able to complete their development.

Further information in regard to the parasites of the cotton worm and other pests attacking agricultural crops is most desirable. Readers of the *Agricultural News* are asked to be on the look out for parasitic and predaceous insects of all kinds. The Imperial Department of Agriculture will always be glad to have observations and specimens from anyone who will send them in. Directions for collecting and forwarding specimens of this sort will appear in the *Agricultural News* in the near future.

RECIPE FOR WHITEWASH.

The *Journal* of the Jamaica Agricultural Society gives the following recipe for preparing a whitewash, which it describes as 'one that will not rub off':—

A first-class whitewash is made by dissolving 2 lb. of ordinary glue in 7 pints of water and when all is dissolved, adding 6 oz. of bichromate of potassium, dissolved in a pint of hot water. Stir the mixture up well, and then add sufficient whiting to make it up to the usual consistency, and apply with a brush in the ordinary manner as quickly as possible. This dries in a very short time, and by the action of light becomes converted into a perfectly insoluble waterproof substance which does not wash off even with hot water, and at the same time does not give rise to mould growth, as whitewash made up with size often does. It may be coloured to any desirable shade by the use of a trace of any aniline dye or powdered colouring, while by the addition of a small proportion of calcium sulphite, its antiseptic power is much increased.

SOME NOTES ON CALCIUM CYANAMIDE.

The method of manufacturing calcium cyanamide, a new nitrogenous manure, the nitrogen of which is derived directly from the air, was described in the *Agricultural News* of December 12 last (page 398). In this connexion it is interesting to note some experimental work lately carried out by two French investigators with this manure, and reported on in the *Annales de l'Institut Nationale Agronomique*.

Before calcium cyanamide can be utilized by plants, it is first transformed into ammonia, and then into nitrate of soda. These changes, under favourable circumstances, are fairly rapidly effected by means of soil bacteria. Nitrification is especially rapid when the manure is applied only in small quantities at once. Very large quantities of the cyanamide applied at one time, appear to paralyse the activities of the nitrifying bacteria, with the result that transformation into nitrate of soda is considerably delayed. Experiments carried out by the French investigators mentioned, showed that the retarding action was due to the influence of the cyanamide itself rather than to the caustic lime which accompanies it, and further, that although the manure should always be used with prudence, yet soils rich in organic matter can advantageously take up more of the manure than soils deficient in this constituent. The toxic effect which the manure undoubtedly exercises on the living organisms of the soil when used in large amount is reduced to a negligible quantity when employed in moderate doses.

Nitrogen does not appear to be readily lost from cyanamide on storage. When kept in sacks, and stored in a dry place, there was scarcely any loss. When the cyanamide was mixed with kainit, there was no loss even after forty-two days. With superphosphate it was otherwise, and a loss of 5 per cent. was discovered. It would therefore seem necessary to avoid making a mixture with this manure.

The paper in question contains details of a large number of manurial experiments carried out with various crops, such as wheat, oats, maize, pasture grass, vines, etc. From the results of these trials, the conclusion is drawn that calcium cyanamide is similar in effect to an equivalent amount of sulphate of ammonia. A normal quantity of the manure to apply per acre would be about 200 lb. This may be given either before, or at the time of sowing.

GLEANINGS.

It should be mentioned that the samples of Dominica lime juice, of which a report on the quality and value was summarized in the *Agricultural News* of February 6 last (p. 41), were forwarded to England from St. Aroment estate, the property of Dr. H. A. Alford Nicholls.

The Canadian Trade and Commerce returns show that the imports made from Barbados by the Dominion increased in value from $980,190 in 1904 to $1,552,428 in 1907. During the same period the value of the exports from Canada to Barbados increased from $335,313 to $496,122.

The Board of Agriculture and the Agricultural Society of Jamaica, acting in accordance with suggestions from the Government, have appointed a committee to consider the question as to what steps (if any) should be taken to encourage cotton growing in the island, more especially among small settlers.

With the object of improving the efficiency of the agricultural teaching given to boys' classes at Trinidad, it has been arranged that Mr. H. A. Nurse, one of the Agricultural Instructors, shall in future be solely engaged in giving agricultural instruction in the various schools of the colony.

Cane reaping operations were commenced in the Carib Country of St. Vincent during the last week in January. The land in question, which includes many fertile estates, has been practically abandoned since the volcanic eruptions of 1902, and this is the first sugar crop that has been obtained for seven years past. (*St. Vincent Times.*)

A note in the *Agricultural Bulletin* of the Federated Malay States suggests that a profitable use may possibly be found for cocoa-nut shells by exporting them to Europe for button manufacture. It is mentioned that natives in the Malay States make buttons from the shells, and these command a good sale locally.

Lately issued statistics place the total production of sulphate of ammonia for the whole world in 1907 at 845,000 metric tons [1 metric ton = 2,200 lb.], valued at $50,700,000. Of this, England produced 361,000 tons, and the United States 36,000 tons. The production in Germany has increased from 55,000 tons in 1896, to 287,000 tons in 1907.

In the latest report of the Woburn Experimental Fruit Farm, England, it is stated that arsenate of lead has proved a very satisfactory insecticide on fruit trees, though scorching of the leaves occurred in some cases unless great care was exercised in spraying. Calcium arsenate was also tried, and gave results almost as good as those effected by the lead salt, and at smaller expense.

A great decrease in the number of sugar factories in France has been noticeable for many years past. Thirty years ago there were 535 factories in working; these have successively declined to 375 in 1888, 292 in 1906, and 255 in 1907, the lowest total for fifty years. The decrease is attributable in a great measure to the transformation of refineries into distilleries, the production of alcohol being more remunerative than that of sugar. (*London Standard.*)

An entomologist (Mr. Muir), sent to the Malay States by the Hawaiian Agricultural Experiment Station has discovered predaceous beetles feeding on sugar-cane borers in those States. These have been successfully shipped through the half-way station established at Hong Kong, and received at Honolulu in good condition. Certain of the beetles have been liberated in districts of Hawaii where cane borers are abundant. (*Annual Report*, 1907-8.)

The fluctuations in the price of rubber that occurred during the year 1908 are described by the *India Rubber Journal* as having constituted a record. In January 1908, the market price of fine hard Para rubber was 3*s.* 2*d.* per lb., but declined in February to 2*s.* 9*d.* per lb., the lowest figure reached in the year. The highest price of the year—5*s.* 4¾*d.* per lb. for fine hard Para was reached in November, and at the close of the year the price stood at 5*s.* 2*d.* per lb.

Probably the smallest sheep in the world are those of a breed which is found in the Cameroon region of West Africa. A specimen lately sent to the Natural History Department of the British Museum is described as being only 19 inches high, though an adult ram. It had stout horns about 1½ inches long, and the coat consisted of coarse hair about 1 inch long, with no trace of wool. The general colour of the animal was chestnut-red.

In connexion with the note on cane farming in Trinidad, and the price of farmers' canes that appeared in the *Agricultural News* of February 6 last (page 35), it may be mentioned that estate owners in the south of the island have agreed to pay a *minimum* price of 9*s.* per ton for all farmer-grown canes purchased. This step, if adhered to, is expected to have a stimulating effect on the cane-farming industry. (*Port-of-Spain Gazette.*)

The latest report of the Warden, Naparima Union, Trinidad, makes reference to rubber planting on Sir Edward Tennant's estate in the Pointe-à-Pierre district. The area planted with rubber contains 18,000 Castilloa trees, and experimental plantings of Hevea and Funtumia trees are also being made. About forty trees, of seven years old, were tapped in August last, and yielded 4 lb. of dried rubber, or an average of about 1½ oz. per tree, which is considered a fair result.

In reference to the value of stirring the surface of the soil in dry weather to provide a dust mulch, the American experimenter, King, states that he found that 6·24 tons of water a day were evaporated from 1 acre of unstirred soil, while when the surface was raked or harrowed to a depth of 0·8 inch, only 4·52 tons of water were evaporated. Again, it was observed that a mulch of dry clay loam spread on the surface to a depth of 0·8 inch, saved nearly 4 tons of water per day.

STUDENTS' CORNER.

Seasonal Notes.

MARCH.

1st FORTNIGHT.

Students should make a study of the questions raised in the last issue of the *Agricultural News* (p. 57) in regard to mulching land with cane trash, and its effect on soil moisture. The subject should be carefully considered in its various aspects, and might with advantage be discussed with experienced planters or in the local Agricultural Society. Observations should also be made in the field and experiments carried out.

Cotton picking will soon cease in most places. The reasons for advocating a close season for cotton should be carefully considered and discussed. It will be interesting to search for parasites on caterpillars and pupae, and upon the black scale before the crop is destroyed.

Students in cacao-growing districts should make an effort to find out the reasons for fermenting cacao: learn also to ascertain when cacao is properly fermented.

Pruning of lime trees may still be carried on. Dead wood, together with all suckers growing in the middle of the trees should be removed and carefully burned. Now is the time to thoroughly mulch the soil with green manure, or with grass, leaves, bush, etc.

A useful purpose would be served by making a list of the varieties of sweet potatos grown in any given district with notes as to characters and quality.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What advantages are to be gained by mulching, and what kind of mulches can be used?

(2) Write a short story of the manner in which a plant obtains its nitrogen. What changes do the nitrogenous constituents of pen manure, sulphate of ammonia, and nitrate of soda undergo before the plant can absorb them?

(3) What becomes of the water which a plant absorbs by its roots?

INTERMEDIATE QUESTIONS.

(1) What is the best method of dealing with the trash on a field of young ratoon canes?

(2) Describe the insects known as (*a*) 'lady-birds' and (*b*) 'lace-wing flies.' What useful purpose do they serve?

(3) How is the cacao bean fermented and dried? What is the object of the various operations?

(N.B. In No 2 of the 'Intermediate Questions' of last issue for 'cacao pod stems' read 'cacao pod shells.')

The scheme of reading courses and examinations in agriculture lately established by the Imperial Department of Agriculture has now been adopted in the Leeward and Windward Islands, and at Barbados. The first Preliminary examination was recently held in the Leeward Islands, but in the other colonies no examination will take place until about September next.

RICE IN BRITISH GUIANA.

Messrs. Sanbach, Parker & Co., of Georgetown, issued the following report as to the conditions of the rice industry in British Guiana during the fortnight ended February 19 last:—

The weather during the fortnight has been too wet for milling, but suitable for planting and growing rice crop. Three or four days of heavy rains have been experienced, and several light showers daily. Very small quantities of cleaned rice have been received in town, and the market is almost bare of stock.

Prices have increased slightly, owing to the increased demand both locally and from the West India islands. Several small sales have been made for export, and enquiries continue to come in from all sides. Unless the weather is very much drier during the next few weeks higher prices are sure to prevail, as it is impossible for the small millers to clean their paddy under present weather conditions, and only very small quantities of rice will be received in town.

Shipments to the West Indian islands during the fortnight amount to about 3,000 bags, the bulk of it going to Trinidad.

Rice of good export quality may be quoted at 19*s.* 6*d.* to 19*s.* 9*d.* per bag of 183 lb. gross, f.o.b. Demerara.

AGRICULTURE AND LIVE STOCK AT TOBAGO.

In the latest *Annual Report* of the Warden of Tobago, the following particulars are given regarding the condition of agriculture and live stock in the island during the year 1907-8:—

The past year was unusually dry, especially in the southern portion of the island, the rainfall at the Botanic Station being a trifle under 63 inches and that at the Stock Farm 52. In the northern portion it exceeded 100 inches.

As will be seen, however, from the following return of produce exported, it was also a record year, the value of the exports amounting to £43,227 9*s.* 1*d.*, an increase of nearly £15,000 over the previous year. A portion of this increase was no doubt due to the high price of cacao, but there was also a marked increase in the quantity of produce shipped—3,857 bags of cacao against 2,642 in 1906-7; nearly 100 tons of copra against 25; 12,000 gallons of cocoa-nut oil against 10,746; 210 tons of sugar against 170; 1,636 lb. of rubber against 1,180; 3,867 lb. tobacco against 2,714; and 450 tons of vegetables, including fruit, corn, and peas, against 380.

There was a slight decrease in cotton, but now that the gin has been established, and a larger area planted under cultivation, an equal increase in quantity may be expected.

Both the Botanic Station and the Stock Farm are doing good work—the former in the sale and distribution of plants and in its experiment plots, while the grounds, being in excellent order, form a favourite place of resort, especially on Sunday afternoons; and the latter in improving the breed of stock, there being a steady increase in the number of applications for service from the donkey, bulls, and boar. The stallion, which died the previous year, was replaced in August by an imported hackney pony which ought to give a good type of horse for the island, and there is also a fair set of poultry. What scope there is for improving the breed of stock is shown by the returns, for during the year there were exported 528 cattle, 119 sheep, 2,074 pigs, 1,051 goats, 109 horses, in addition to 1,426 dozen fowls, and 2,332 dozen eggs.

AGRICULTURAL SHOW AT NEVIS.

The Agricultural Show held at St. Kitt's on January 28 last was a fairly successful one, and although in some classes the exhibits were not so numerous as in previous years, the quality on all hands showed distinct improvement. The total number of exhibits on show was 468, of which no less than 132 were in Class I (Live Stock).

After a few introductory remarks by the Hon. C. A. Shand, Chairman of the Nevis Agricultural and Commercial Society, the Show was opened by his Honour the Administrator of St. Kitt's-Nevis, who gave an interesting address. Mr. Roxburgh referred to the high quality of many of the exhibits. The live stock showed much improvement in comparison with past years, and there were some really fine animals present. His Honour also mentioned that the vegetables, fruit, and preserves were, in quite a number of instances, remarkable for their excellence. In conclusion he expressed the thanks of all to Mr. Shand, who had expended so much time and energy to make the Show a success.

The best classes at the Show were those for Live Stock and for Vegetables. The former class included no less than thirteen foals, the progeny of the stud horse 'Norman,' and six young mules the off-spring of the Jack donkey 'Bismarck' both the property of the Imperial Department of Agriculture, and which were in the past located at Nevis. These animals, in all cases, were a credit to their respective sires. The prize for the best animal at the Show was awarded to a mare three years old, the property of S. D. Malone, Esq.

In the vegetable class, there were 90 entries. A prize given by Lady Sweet-Escott for the best collection of produce was won by a peasant proprietor whose assortment included nearly twenty different vegetables, some of excellent quality.

The School exhibits were distinctly good, and were a special feature of the Show. St. George's School, Gingerland, took first prize for a collection of plants, second prize for vegetables, and second prize for pot plants.

'GAPES' IN YOUNG CHICKENS.

What is known as gapes' is a disease liable to affect chickens in all parts of the world, and the following notes as to the cause of the disorder, and methods of prevention and treatment, are worthy of attention by poultry keepers in the West Indies. They are taken from *Bulletin 87* of the Pennsylvania Agricultural Experiment Station, entitled 'Some Poultry Experiments':—

'Gapes' is a parasitic disease caused by the presence of worms in the windpipe of young chickens. A small, reddish, forked worm is attached to the mucous lining of the windpipe. Where these worms exist in large numbers the chickens die from suffocation. The disease is most dangerous to chicks from one to four weeks old

Chickens often cough up these worms. A female worm may contain several thousand eggs, and is consequently a dangerous source of infection. Healthy chickens may eat the worms coughed up by sick ones, and may swallow the eggs in food or drink. The urgent necessity of separating affected birds from the remainder of the flock is therefore at once apparent.

The most desirable method of combating the disease is to rear the young chicks on a new piece of land where no other chicks have been kept. After the chicks have become well-grown there is less danger of the trouble, as they are stronger and more able to throw the worms out of the windpipe, should any get lodged in the lining.

All coops and runs should be disinfected with a 2-per cent. solution of sulphuric acid in water, or a solution of creolin, two tablespoonfuls in each gallon of water. The bodies of all chicks that die should at once be burned. A small piece of sulphate of iron placed in the drinking water is said to prevent infection.

The worms may be extracted from the chicken's windpipe by a loop of horse hair, stripped feather tip, etc. This is a tedious operation and requires careful manipulation in order not to kill the bird. Dip the extractor in a solution of creolin (one tablespoonful to one pint of water) before inserting it in the windpipe, being careful not to have any quantity of the liquid on the instrument, or it may cause death. Insert the extractor gently into the windpipe, and withdraw with a slightly twisting motion. This will bring out most of the worms. What remain will be killed by the creolin solution.

CORNS ON HORSES' FEET.

A corn on the foot of a horse or a mule necessarily results in a certain degree of temporary lameness. If the proper method of treatment is adopted, however, the trouble can usually be got rid of in a comparatively short time, but it is important to remember that unskilful or ignorant treatment may readily increase the trouble so as to result in more serious lameness. The following sensible note on this subject is extracted from Hunting's 'Art of Horse-shoeing':—

A corn, be it remembered, is not a tumour or a growth; it is merely a bruise of the sensitive foot under the horn of the sole. It shows itself by staining the horn red, just as a bruise of the human body shows a staining of the skin above it. To 'cut out a corn' with the idea of removing it is simply an ignorant proceeding.

If a corn be slight, all that is necessary is to take off the pressure of the shoe, and this is assisted by removing a thin slice or two of horn at the part. When the injury is very great, matter may be formed under the horn, and, of course, must be let out by removal of the horn over it. Provided there is no reason to believe that matter has formed, a corn—i.e., the bruised and discoloured horn—should not be dug out in the ruthless manner so commonly adopted. Cutting away all the horn of the sole at the heels leaves the wall without any support. When the shoe rests upon the wall it is unable to sustain the weight without yielding, and thus an additional cause of irritation and soreness is manufactured. The excessive paring of corns is the chief reason of the difficulty of getting permanently rid of them.

The simplest device for taking all pressure off a corn is to cut off an inch and a half of the inner heel of the shoe. With the three-quarter shoe a horse will soon go sound, and his foot will then resume its healthy state. The saying 'once a corn, always a corn' is not true: but it is true that a bruised heel is tender and liable to bruise again, from very slight unevenness of pressure, for at least three months. All that is necessary is care in fitting, and abstention from removal of too much horn at the part. Of course, when the degree of lameness is such as to suggest that matter is formed, the horn must be cut away so as to afford an exit for it; but the majority of corns are detected long before the stage of suppuration has resulted from a bruise.

GOOD GROWTH OF PARA RUBBER TREES.

A note in the *Agricultural Bulletin* of the Federated Malay States (Vol. VII, No. 7) refers to the surprisingly good growth made by some Para rubber trees under circumstances which would usually be regarded as unfavourable.

Some Para rubber seedlings were planted in 1894 in a wood situated on the steep slope of a hill at the back of the Botanic Gardens. The tree growth around was very thick, providing considerable shade, and there was, in addition, a good deal of undergrowth. The soil was a stiff clay.

For ten years the rubber trees were forgotten, but when discovered in 1904, they had made surprisingly rapid development although crowded up with other trees. On the slope the trees lessen in girth in proportion to the steepness of the hill, the slopes of which show signs of much washing in rainy weather.

In 1904 the trees so situated varied in circumference from 24 to 38½ inches at 3 feet from the ground. The finest trees, however, were found on the top of the hill where the land was more flat. Here three trees measured 53¾, 60½, and 62⅝ inches respectively, in girth at 3 feet from the ground. The second tree was 100 feet in height, although but fourteen years of age. This is stated to be a record for *Hevea brasiliensis.*

In the past four years the trees have continued to develop, and the three at the top of the hill measured 60, 72, and 79 inches in circumference respectively, in 1908. This shows a respective increase in girth of 2·06, 2·87, and 4·06 inches per annum over the four years. The average growth in circumference of big Para rubber trees is usually about 2 inches per year. Younger trees grow faster.

The above facts were thought worthy of publication, inasmuch as the trees in question are fully twice as large as trees of the same age grown in the open, under what are generally considered good plantation conditions, in which the surrounding trees have been carefully felled, and the undergrowth cleared away.

The trees have been tapped and have given good returns of rubber.

AGRICULTURAL WORK IN INDIA.

A number of interesting subjects relating to agricultural progress, and the most suitable means of bringing it about, were discussed at a meeting of the Indian Board of Agriculture, which was held early in last year, and attended by representatives from all the provinces of India.

One of the most important among the practical questions dealt with was as to the best means of bringing the work of the Agricultural Department home to small cultivators. This is a point of great importance in all countries in which Agricultural Departments are carrying on work of investigation and demonstration for the benefit of planters and small cultivators. The poor state of primary education in India makes it especially difficult for the Department to reach the mass of the people in that country, and therefore the attempt is being made to work from the top downwards, and to bring about a gradual improvement of the agricultural industry through the medium of the bigger landholders, who are in a better position to receive instruction. It is evident that for this attempt to succeed, there must be mutual confidence between the three bodies concerned —the Agricultural Department, the larger landholders, and the small cultivators.

Although the conditions existing in the Indian provinces necessarily vary considerably from those which obtain in the West Indies, yet the methods which have been found to encourage interest in the work of the Department among the people concerned are worthy of mention.

Chief among these methods is the formation of local associations among various classes, with the stated object of introducing agricultural improvements. These associations are likely to be of most value when officers of the Department and the more prominent agriculturists of the district can maintain a close personal touch with the mass of the cultivators.

The small village associations are particularly useful to the members. In districts where these associations have been the means of introducing improvements of obvious value, their usefulness is naturally well recognized.

In view of the fact that the Indian Agricultural Department is still young, it has not yet been possible to provide definite demonstrations of proved value to agriculturists in all parts of the country, and difficulty is likely to be experienced in some parts in recommending the work of the Department to the people. So many variable factors arise in agricultural practice that progress must necessarily be slow. It is mentioned that the introduction of a new crop or variety, or of a manurial practice, though fully tested at an experiment farm, may fail unless the farm is thoroughly representative of the district. The cost has to be very carefully calculated, or a new method may be beyond the reach of a small cultivator. It must be borne in mind, too, that agricultural changes follow economic changes, instead of leading up to them. As an example of this, it is mentioned that the extended cultivation of cassava on poor hill soils was brought about in Travancore as the result of a rise in the price of grain, which drove the poorer classes to find a substitute. Unless grain had risen in price it is probable that it would have been useless to urge the small landholders to cultivate the poor hillside land.

Speaking broadly, then, the two things on which the success of agricultural associations in bringing about direct improvement depend, would appear to be confidence in the advisers, leading to their advice being carefully followed, and the provision only of carefully considered and tested improvements for demonstration, with arrangement for efficient management.

Farms have been established in many districts, and on these demonstration work, similar to that of the Agricultural Association but more under Department control, is in progress. A useful branch of activity which these farms can carry out is in the provision of good seed.

Village agencies have also been established by the Indian Agricultural Department for the sale or hire of improved implements. An especially useful feature of this work is that repairs can be arranged for by workmen employed by the Department.

Other means of disseminating agricultural information and of bringing about improvements are through the medium of agricultural publications, both in English and the vernacular, by the establishment of local Agricultural Shows, and by the provision of travelling agricultural instructors.

Some work has been done directly with small cultivators. Short courses of instruction for these people have been given on the Bombay Farm, dealing with special matters, such as cotton seed selection. The sons of cultivators are also taken for instruction for longer periods on these farms.

MARKET REPORTS.

London,—February 16, 1909, THE WEST INDIA COMMITTEE CIRCULAR; Messrs. KEARTON PIPER & Co., February 16, 1909; Messrs. E. A. DE PASS & Co., January 22, 1909.

ARROWROOT—Quiet; 1¾d. to 3¾d. for fair to fine manufacturing.
BALATA—Sheet, 2/1 to 2/5; block, 1/8 to 1/9.
BEES'-WAX—£7 10s. to £7 12s. 6d. for dark to pale.
CACAO—Trinidad, 53/6 to 70/- per cwt.; Grenada, 49/- to 57/6 per cwt.
COFFEE—Santos, 29/- per cwt.; Jamaica, no quotations.
COPRA—West Indian, £18 to £19 per ton.
COTTON—St. Kitt's, 13d. to 13¼d.; Barbados, 13¾d.; St. Vincent, 15¾d.
FRUIT—
BANANAS—Jamaica, 4/6 to 6/- per bunch.
LIMES—Not wanted.
PINE-APPLES—St. Michael, 1/3 to 3/6.
GRAPE FRUIT—11/- to 12/- per box.
ORANGES—Jamaica, 8/- to 8/6 per box.
FUSTIC—£3 to £4 per ton.
GINGER—55s. to 60s.
HONEY—Steady.
ISINGLASS—West India lump, 2/- to 2/6 per lb.
LIME JUICE—Raw, 1/4 per gallon; concentrated, £18 per cask of 108 gallons; distilled oil, 2/9 per lb.; hand-pressed, 7/- per lb.
LOGWOOD—£3 to £4 5s. per ton; roots, £2 to £3 per ton.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Slow.
RUBBER—Para, fine hard, 5s. 2d. per lb.,
RUM—Jamaica, 3/3 to 3/4; Demerara, 1/6 to 1/7, proof.
SUGAR—Crystals, 14/6 to 16/9; Muscovado, no quotations; Syrup, 13s. 9d. to 14s. 7½d.; Molasses, no quotations.

New York,—February 5, 1909. Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 11⅞c. to 14¾c.; Grenada, 11¼c. to 11¾c.; Trinidad, 11¾c. to 12½c.; Jamaica, 10c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $25·00 to $26·00; culls, $14·00 to $16·00; Trinidad, $23·00 to $24·00; culls, $13·00 to $15·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8½c.; good ordinary, 9½c.; washed, 11½c. per lb.
GINGER—9c. to 13c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
GRAPE FRUIT—Jamaica, $1·50 to $2·50 per box.
LIMES—Dominica, a limited demand at $5·75 to $7·00 per barrel.
MACE—29c. to 32c. per lb.
NUTMEGS—110's, 9¼c. per lb.
ORANGES—Jamaica, $1·50 to $2·00 per box.
PIMENTO—4c. to 4½c. per lb.
SUGAR—Centrifugals, 96°, 3·64c.; Muscovados, 89°, 3·14c.; Molasses, 89°, 2·84c. per lb., duty paid

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., March 1, 1909; Messrs. T. S. GARRAWAY & Co., March 3, 1909.

ARROWROOT—St. Vincent, $4·00 per 100 lb.
CACAO—Dominica and St. Lucia, $11·00 per 100 lb.
COCOA-NUTS—$13·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, $10·00 per 100 lb.
HAY—$1·25 per 100 lb.
MANURES—Nitrate of soda, $62·00 to $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $72·00 to $75·00; Sulphate of potash, $67·00 per ton.
MOLASSES—Fancy at 16c. per gallon; Grocery, 15c. per gallon.
ONIONS—Strings, $2·00; loose, no quotations.
POTATOS—Nova Scotia, $2·00 per 160 lb.
PEAS—Split, $6·00 per bag of 210 lb.; Canada, $3·50 per bag of 120 lb.
RICE—Ballam, $5·30 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana,—Messrs. WIETING & RICHTER, February 6, 1909; Messrs. SANDBACH, PARKER & Co., February 19, 1909.

ARROWROOT—St. Vincent, $9·00 to $9·50 per 200 lb.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
CACAO—Native, 13c. per lb.
CASSAVA—72c.
CASSAVA STARCH—$6·00 to $7·00 per barrel of 196 lb.
COCOA-NUTS—$16·00 per M.
COFFEE—Creole, 12c. to 13c.; Jamaica, 11c. to 12c. per lb., slow.
DHAL—$5·25 per bag of 168 lb.
EDDOS—$1·32 per barrel.
MOLASSES—No quotations
ONIONS—Lisbon, 5c. per lb.
PLANTAINS—16c. to 36c. per bunch, plentiful.
POTATOS—Nova Scotia, $2·40 per 100 lb.
POTATOS—Sweet, Barbados, $1·08 per bag.
RICE—Ballam, $5·80; Creole, $4·50 to $4·70; Seeta, $6·00.
SPLIT PEAS—$5·90 to $6·00 per bag (210 lb.); Marseilles, $4·25 to $4·75.
TANNIAS—$1·80 per bag.
YAMS—White, $2·00; Buck, $1·80 per bag.
SUGAR—Dark crystals, $2·20; Yellow, $3·10 to $3·25; White, $3·60 to $3·80; Molasses, $2·10 to $2·20 per 100 lb. (retail.)
Timber—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—$3·50 to $5·50 per M.
—CORDWOOD—$2·40 to $2·64 per ton.

Trinidad,—February 20, 1909.—Messrs. GORDON, GRANT & Co.

CACAO—Venezuelan, $12·25 to $12·75 per fanega; Trinidad, $11·75 to $12·50.
COCOA-NUTS—No quotations.
COCOA-NUT OIL—76c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8½c. to 9c. per lb.
COPRA—$3·10 to $3·20 per 100 lb.
DHAL—$4·65 to $4·70 per 2-bushel bag.
ONIONS—$3·00 to $4·00 per 100 lb. (retail).
POTATOS—English, 90c. to $1·10 per 100 lb.
RICE—Yellow, $5·40 to $5·60; White, $4·50 to $4·90 per bag
SPLIT PEAS—$5·75 to $6·00 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

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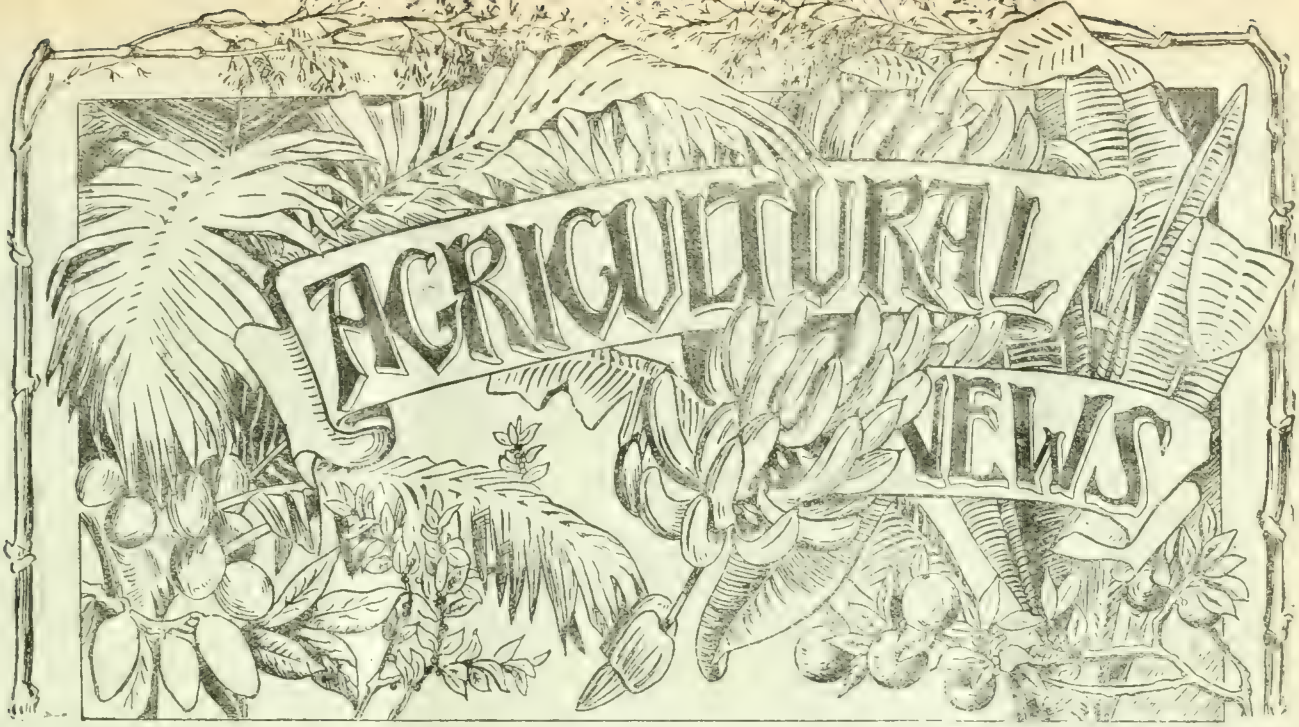

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The United States Department of Agriculture.

IN the editorial of the last issue, reference was made to the excellent organization and magnificent work of the United States Department of Agriculture. The following particulars may be of interest to readers of the *Agricultural News* as forming a general account of that Department, in reference to its organization, and some of the lines of work which it carries out.

The report of the Secretary of Agriculture occupies 138 pages of the *Year-book* of the United States Department for 1907, and from that report the following statements are chiefly taken.

The total number of persons in the employ of the United States Department of Agriculture at the close of the fiscal year (June 30) 1907, was about 9,000, of which number nearly 2,000 were in the District of Columbia (i.e., Washington), while the remaining 7,000 were stationed at other points.

The appropriations of money for the work of the Department in 1907 were \$10,118,451—without counting the Weather Bureau, which received \$1,439,240; while in 1908 the grant allotted for Agriculture increased to \$12,210,156, in addition to which the Weather Bureau received \$1,413,540, making a total for 1907 of \$11,557,691, and for 1908 of \$13,623,696.

The Secretary of Agriculture is at the head of the Department, which is divided into Bureaus and Divisions, each with its own chief and staff of workers. Each Bureau has charge of the investigations of correlated problems, or routine work connected with technical or practical agriculture. The Secretary of Agriculture is a Cabinet officer, and 'exercises personal supervision over the public business relating to the agricultural industry.'

The Bureaus and Divisions of which this great Department is composed number fifteen, each with its own definite line of investigation, and within the limits of each of these the more special problems are assigned to officers particularly qualified for their duty.

It will be realized that within the limits of a brief article, it will be possible only to mention in the briefest way a few of the sub-divisions of the Department of Agriculture and to indicate one or two of its main lines of work.

The functions of the Weather Bureau include forecasts of weather conditions; the issue of storm warnings; the display of weather and flood signals for the benefit of agriculture, commerce, navigation, etc., etc. The Bureau of Animal Industry has charge of the work of the Department relating to the live stock industry. The Bureau of Plant Industry studies plant life in all its relations to agriculture. The Forest Service has charge of the administration of the National Forests, etc. The Bureau of Chemistry investigates the methods proposed for the analysis of plants, fertilizers, and agricultural products, and makes such analyses as pertain in general to the interests of agriculture. To the Bureau of Soils is entrusted the investigation, survey, and mapping of soils, etc. The Bureau of Entomology obtains and disseminates information regarding insects injurious to agricultural crops: studies insects in relation to the diseases of man and other animals, and as animal parasites: carries out experiments in connexion with the introduction of beneficial insects, etc., etc. The Bureau of Biological Survey studies the geographical distribution of animals and plants, and maps out the natural life zones of the country, etc.

As a consequence of the large amount of printed matter—reports, bulletins, etc., issued by the Department, a Division of Publications has naturally been established, whose functions comprise the publication, printing, indexing, and illustrating of the results of the work of the Department.

The Office of Experiment Stations represents the Department in its relation to Experiment Stations, which are now in operation in all the States and Territories, and directly manages the Experiment Stations of Alaska, Porto Rico, and Hawaii. It seeks to promote the interests of agricultural education and investigation throughout the United States. It collects and disseminates general information regarding Agricultural Schools, Colleges, and Stations, and publishes accounts of agricultural investigations at home and abroad.

The foregoing represents about one half of the lines of activity that engage the United States Department of Agriculture. 'Fundamentally, the work of the Department is concerned with the production of wealth, as for example by increasing a crop yield per acre, as the result of plant breeding: the preservation of wealth, as by suppressing insect and fungous pests; and with enabling farmers to make a fair sale of their products, as by promoting co-operative selling, or by giving to the public information of the size of a crop in order that demand may be fairly adjusted to supply.'

Under the heading 'Chief Crops' in the Secretary's report, corn and hay are given first and second places respectively, as the main agricultural products of the United States on the bases of farm value, while cotton comes third, and wheat fourth.

The work of the Bureau of Plant Industry which is likely to be of special interest to readers of the *Agricultural News* is indicated below. Among other points mentioned, it is stated that a mango industry is being developed, as a result of the investigation by this Bureau of certain fine-flavoured varieties of East Indian mangos, and that local nurserymen are ready to sell, in quantity, several of these new varieties. The Experiment Stations of Porto Rico and Hawaii are taking this fruit, and the owners of private plantations are planting out orchards of these newly improved varieties.

Cowpeas have received much attention and extensive investigations have been carried out with the object of producing better and cheaper seed, and seed which will retain its vitality for more than one year. The importance of the cowpea as a soil improver and as a source of stock and human food is fully recognized. Three varieties of Soy beans have been successfully introduced into the rice-growing districts of Texas and Louisiana to be used in rotation with rice. It is hoped thus to place in the hands of the rice grower a plant which will answer the same purpose that clover, alfalfa, and cowpeas do in other localities.

A large amount of work has been done in breeding Indian corn with the object of improving the yields, and the quality of the fodder and the grain. In the work of improving cotton by means of seed selection, practical methods have been introduced for getting rid of light, inferior seed. The breeding of special strains of cotton to prevent injury by the cotton boll weevil is a problem of the greatest interest. One of the chief recommendations made by the Bureau of Entomology in the matter of boll weevil control is early planting and early harvesting of the cotton. The Bureau of Plant Industry is assisting the planters to carry out this line of prevention by attempting to breed resistant and early maturing varieties.

Satisfactory results have also been achieved in the breeding of tobacco for the improvement of yields and the quality of the leaf.

(*To be concluded.*)

Sugar Production in Cuba.

The sugar-cane industry of Cuba is a matter of very considerable interest and importance, in view of the enormous capacity of the island for sugar production, and the rapid developments that have been made in recent years.

The record year, as regards the output of sugar in Cuba was 1907, when 1,441,687 tons were produced; in 1908, however, owing to unfavourable climatic conditions, the crop fell to 961,958 tons. Conditions have now largely improved again, and prospects for a high return in the present reaping season are regarded as very promising.

The United States Consul at Havana reports that the area under cane cultivation again shows an increase, and also states that a number of the larger central factories of the island have increased their grinding capacity; cases in point are in connexion with the estates of the Cuban-American Sugar Company and the United Fruit Company. Factories financed by Americans, and worked under American management are a prominent feature of the industry. In 1907, about 30 per cent. of the total output of sugar was produced by these American mills; and in 1909 the proportion thus manufactured is expected to reach 40 per cent.

The methods adopted in cultivating the land for sugar-cane in Cuba, until quite recently, have been of a somewhat primitive character, and it would appear that it was only the great natural advantages possessed by the island as a sugar-producing country, that enabled the industry to be continued on a remunerative basis. The teaching of the Experiment Station is, however, now beginning to be felt, and the introduction of superior methods of tillage, improved implements, green dressing crops, etc., has largely tended to raise the condition of the industry.

The Decay of the Bourbon Cane.

At a meeting of the Antigua Agricultural and Commercial Society held on February 12 last, Mr. H. A. Tempany, B.Sc., F.I.C., read a paper dealing with the history of the Bourbon cane at Antigua, and its decay as the result of the severe attack of rind fungus (*Trichosphaeria sacchari*). This disease began to be felt in its most destructive form about 1894. At the end of his paper, Mr. Tempany recapitulated the information brought forward, of which the following forms a general summary:—

In the yield of cane per acre the Bourbon did not differ greatly from the varieties grown at the present time.

The effect of rind fungus is shown by the amount of rotten cane found in the field.

The juice of the Bourbon gave about 1·9 lb. of sugar to the gallon, and was somewhat less rich than that commonly met with at present.

The effect of the disease on the juice was seen in the diminution of sucrose and rise in the glucose ratio. This was severely felt in the process of manufacture.

The Bourbon was a very juicy cane, containing less fibre and giving better milling results than those grown at the present time.

No form of manurial treatment appeared to make the cane more resistant.

The break-down of the Bourbon was in the end relatively very sudden. It was not only the native Bourbon cane that showed liability to rind fungus: other related varieties and imported uninfected Bourbon stock showed equal liability to it when grown in Antigua.

It is probable that *Trichosphaeria sacchari* was originally saprophytic and has subsequently developed parasitic tendencies. It has probably existed in the West Indies for many years.

The Bourbon cane being less fibrous than the White Transparent probably possessed cell walls more easily penetrated. Consequently it is suggested that the sudden break-down of the Bourbon was due to an increase in virulence of the fungus, which enabled the hyphae to pass from cell to cell with relative ease in this cane, while the White Transparent being more fibrous offered more resistence.

Most canes grown at the present time in Antigua will, on keeping, develop the typical spores of *Trichosphaeria*.

The most generally accepted theory regarding the spread of the disease is that of pre-existing wounds infected by means of wind-borne spores. The theory of infection by means of planting infected material has, however, much in its favour; and would serve as a means admirably suited for the intensification of the parasitic habit of the fungus.

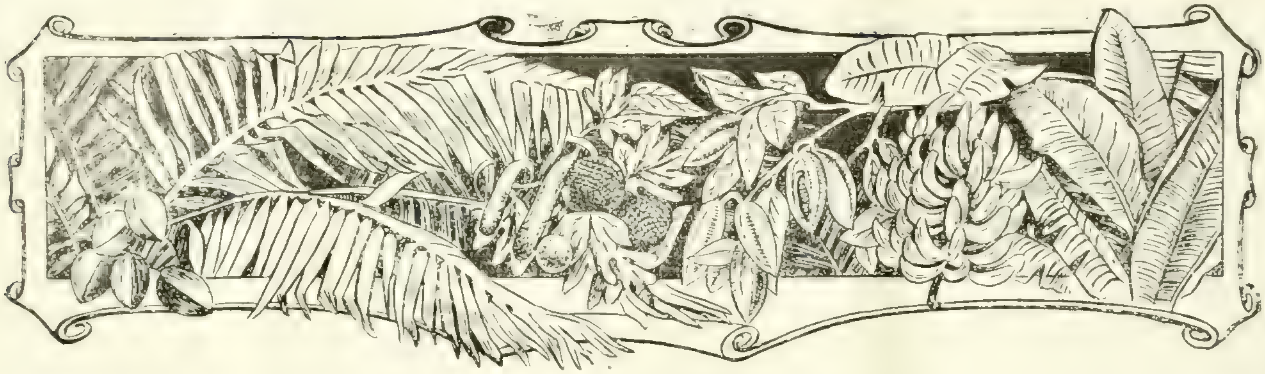
New Cane Harvester.

Although the problem of devising a cane-cutting machine has attracted a good deal of attention from inventors, little practical success has so far been achieved in this direction. The Pesson cane harvester, of which particulars were given in the *Agricultural News* of July 11 last (page 211) underwent a number of trials in Louisiana in the last reaping season, and it evidently possesses some promising features. In a late number of the Queensland *Agricultural Journal*, another cane-reaping machine, invented by a Mr. W. J. Howcroft, of Brisbane, is described. This harvester has been patented in most sugar-growing countries.

Like an ordinary corn reaper the Howcroft machine runs outside the standing crop, and the motor power sets in action a series of blades which are termed 'feelers' or 'fingers,' and which, when not in use, can be raised to a height of 18 inches above the ground. When working, the 'fingers' are lowered, and seize the canes for the purpose of holding them steady against the action of the knives, which are arranged immediately below, and rotate on a lever at a speed of some 400 revolutions per minute. It is claimed on behalf of the machine that by its means the canes can be cut an inch or more below the surface of the ground, a most important point as every cane-grower knows.

As soon as the canes are reaped by this machine, they pass on to a moveable platform, where they are automatically arranged, and come under the action of a second series of knives, by which the tops of the canes are removed.

The machine is worked by two small oil motors and, it is asserted, is capable of cutting 150 tons of cane per day, which means that an area of 50 acres, with 20 tons of cane to the acre, would be reaped in seven days. Such an achievement would be of infinite benefit to the sugar industry of Queensland, a colony in which the labour difficulty is at present severely felt.



WEST INDIAN FRUIT.

COCOA-NUT PLANTING IN HAWAII.

It is evident from the following notes, extracted from the fourth *Annual Report* of the Commissioners of Agriculture and Forestry of the Hawaiian Islands, that efforts are being made to exploit the possibilities of cocoa-nut planting in that Territory:—

The manufacture and shipment of a considerable quantity of copra from the island of Kauai, the organization of a company to start a cocoa-nut plantation on the windward side of Oahu, and the planting of numerous small groves on the other islands, all point to the development of a cocoa-nut industry.

The Hawaiian Islands lie just at the northern edge of the zone in which the cocoa-nut will thrive, but the demand for cocoa-nut products—cocoa-nut oil, copra, and coir—is so great that the outlook is full of promise. In Hawaii it takes from seven to ten years for a cocoa-nut grove to come into bearing, but as this group of islands is free from the severe storms that at intervals do so much damage in the South Seas, Hawaii is able to compete successfully with regions more favourably located for cocoa-nut growing.

COCOA-NUT PLANTING AT ANTIGUA.

Mr. T. Jackson, Curator of the Antigua Botanic Station, has forwarded the following interesting note on cocoa-nut planting in the island:—

The growing of cocoa-nuts at Antigua is limited to a great extent by the numerous droughts experienced, and in a great measure by the unfavourable condition of the land. Within the last eighteen months, however, from 90 to 100 acres have been planted in the lighter soils in the southern part of the island, and it appears probable that another 40 or 50 acres will be planted in the near future. The rainfall in those districts is somewhat greater than in other parts, being about 52 inches per annum.

Where these cocoa-nuts have been planted, the soil appears to be suitable, being deep and of a sandy nature. The seedlings were raised at the Botanic Station; cocoa-nuts were planted in beds, in which trenches had been made about 1 foot deep, care being taken when planting that the points of the nuts were slightly raised.

Apart from the area mentioned above, little or no land has been previously planted on a commercial scale. The few trees which are in the island either form avenues or are very scattered. In point of fact, the production of cocoa-nuts at Antigua is not sufficient to meet the local demand It would be interesting to ascertain if possible, the exact number of nuts annually imported into the island.

As already stated, the cultivation of this palm can only be carried on to a limited extent at Antigua, and the subsequent growth of these new plantations will be watched with interest. There are cocoa-nut trees already growing in the vicinity of the new plantings, and although the plants are attacked to some extent by scale insects, they bear annually a fair crop. The new plantations are, it is considered, growing on a more suitable soil, and thus there is hope that they will prove more successful.

In view of the revival of interest that appears to be taken in cocoa-nut planting in parts of the West Indies, e.g., at Antigua and at Nevis, it may not be out of place in this connexion to point out that cocoa-nut plantations are not costly to establish or maintain: the trees require little attention, and can frequently be grown on land that is not suitable for other economic crops. The varied uses of the different parts of the palm and of its products are also worthy of attention.

The food value of the nuts constitutes the most obvious reason for growing the palm. In some of the South Sea Islands the kernels form the chief food of the natives. The flesh of the nuts, dried in the sun, forms the copra of commerce, and is exported to Europe and America in great quantity from various tropical countries. Copra is used in confectionery to a small extent, but this product is chiefly valued on account of the large proportion of oil it contains, and which is used for cooking purposes, and in the manufacture of soap and candles. When the oil has been extracted from the copra, the residue forms a fairly nutritious cattle food.

Coir forms another very useful product from the cocoa-nut. This is the fibre obtained from the husks, and is valued at from £10 to £30 per ton, according to quality. Coir is used in the manufacture of ropes, cordage, mats, brooms, brushes, etc.

The trunk of the cocoa-nut palm is hard and durable, and is naturally utilized for a variety of purposes, such as house-building, etc. The outer wood of the trunk is known in England as 'porcupine wood,' and is esteemed for its fine grain.

'Toddy' and 'arrack' are alcoholic drinks manufactured in Ceylon from the cut flower-stalks of the palm, while the outer shells are used as drinking vessels, etc., and latterly for making buttons.

MANGOSTEEN AT DOMINICA.

So many notes on the characteristics and quality of the mangosteen fruit have appeared in past issues of the *Agricultural News* that little can be added to the information already given in regard to this interesting product.

Plants of the mangosteen (*Garcinia Mangostana*) exist in many of the West Indian islands, and the accompanying illustration (Fig. 13) represents a fine, healthy tree growing at St. Aroment, Dominica, the estate of the Hon. H. A. Alford Nicholls, C.M.G. In the 1907-8 season this tree was laden

FIG. 13. MANGOSTEEN TREE AT ST. AROMENT, DOMINICA.

with fruit, and it was estimated that about 400 fruits came to maturity. It may be mentioned, too, that a mangosteen tree, planted in 1890 at the Botanic Station, St. Vincent, fruited for the first time towards the close of 1907.

Usually, however, the tree fruits at a much earlier age than this, and has been known to bear in the fifth year from planting out. At this age it has generally attained a height of 10 feet, and a basal girth of 1 foot. With advancing years the mangosteen fruits borne increase in number (although yielded at irregular intervals), while the quality and flavour improve.

The mangosteen is a native of the Malay Peninsula. It grows well in Ceylon, but is not so successful in India. A number of plants have been raised at the Botanic Gardens of Trinidad and Jamaica, and these have fruited well. In general, however, the attempts that have been made to naturalize this tree in foreign countries have not been so successful as might be wished.

The mangosteen does best on a loamy soil, in districts where the rainfall reaches from 100 to 150 inches. The fruit of *Garcinia Mangostana* is about the size of a small apple; it possesses a thick tough rind, and when ripe, is of a reddish-brown colour. The edible portion of the fruit, which is of delicious flavour, is the white pulp (or aril) surrounding the dark-brown seeds.

The photograph from which the block for the accompanying illustration was prepared, was taken by Mr. W. Skinner, M.A., Head-master of the Dominica Grammar School.

LIMA BEANS.

The Lima bean (*Phaseolus lunatus*) is cultivated in most of the warmer parts of the earth, and is widely grown in the West Indies. The species is one which shows considerable variation in the beans (seeds) produced, but the various kinds are divided roughly into two classes, the 'red' and the 'white.' Beans of the latter class somewhat resemble haricot beans, and are frequently cooked and eaten as human food.

In Mauritius, Lima beans are cultivated on a large scale, and turned into the soil as a green manure. The plant is one which contains a cyanogenetic glucoside, i.e., a chemical compound which, under certain conditions, is capable of yielding prussic acid. These plants are, therefore, dangerous as a stock food, and many cases are reported from Mauritius and other countries of animals having been poisoned as the result of eating the green vegetation. Fatal results to stock, too, have not infrequently followed the consumption of raw seed (beans) in Mauritius and Java, and cases of poisoning among cattle in Great Britain have been traced to the use of beans of *Phaseolus lunatus*, imported from the above two countries. The beans on analysis have been shown to contain varying quantities of prussic acid.

Beans of *Phaseolus lunatus* (both red and white) are also imported in large quantities into Great Britain from Burma, the particular variety being known as 'Rangoon' beans. Although they have been fed to cattle on an extensive scale for some time past, no ill effects have so far followed their use. The beans from Burma contain prussic acid, but in much smaller quantity than those from Mauritius and Java. Burmese beans are also used as human food in many parts of Europe.

Attention is called to the poisonous properties of the beans in question in a lengthy article appearing in the *Journal* of the Board of Agriculture of Great Britain (Vol. XIV, p. 722), where the results of analysis of a large number of specimens from different sources are tabulated.

It has been stated that by cooking the beans the glucoside which yields the prussic acid is removed. This does not appear to be always the case, however, and investigations made at the Imperial Institute lead to the conclusion that no change is effected in the quantity of glucoside present even after boiling. The enzyme or ferment which liberates the prussic acid from the glucoside is destroyed, however, and as a result, no poison is formed when the beans are ground and mixed with water.

In view of the wide interests involved, the authors of the paper mentioned express the opinion that it is desirable that an extended investigation be made, to determine finally the suitability or otherwise of Lima beans as a food material for human beings and live stock.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows on March 1, in reference to the sales of West Indian Sea Island cotton :—

Since our last fortnightly report, about 200 bales of West Indian Sea Island cotton have been sold at fairly steady prices. The sales include about 80 bales from Nevis and St. Kitt's at 12½*d.* and 13½*d.*, and 10 bales from St. Vincent at 15*d.*

Seeing that the Sea Island cotton sold this year to date at Charleston amounts to 16,000 bales against 8,000 last year, spinners will not be eager buyers, having supplied their wants freely before the arrival of the bulk of the West Indian crop. At the same time, we do not think that consumers desire to see lower prices for the cotton, and if planters exercise patience, it is not likely there will be much difficulty in disposing of the crop at about the present range of prices. If, however, cotton is forced for immediate sale, it is only natural that buyers would expect to get very considerable concessions.

AGRICULTURAL PROGRESS AT GRENADA.

Some introductory notes to the latest report of the Agricultural Superintendent at Grenada summarizes the progress made in connexion with the agricultural industries of the island during 1907-8. The year reviewed has, it is stated, been one of marked activity along many lines of improvement.

Many of the larger estates in the island have established cacao experiment stations under the direct control of the Agricultural Department, and two new ones were started last year. As the result of the teaching given by the officers of the Department, unsatisfactory methods of cultivation and management are gradually being abandoned by cacao growers. As an example, the method of applying lime to the soil may be instanced. Lime has a very beneficial influence on the heavy clay soils of Grenada, but in the past it was customary merely to heap it round the cacao trees, where it rapidly caked, and did little good. The right method, i.e., spreading the lime broadcast and lightly covering it with surface soil, is now being generally adopted.

The value of mulching the soil is now realized by nearly all planters, and wherever material is available, large areas are annually mulched.

More attention has lately been paid to clean cultivation, pruning, and general sanitation of cacao orchards. The burial of cacao shells, so as to assist in preventing the spread of Diplodia and other fungus diseases has also become more general. Resin oil is rapidly displacing tar as a dressing for cuts on cacao trees.

Gordon cacao drying machines (see last number of *Agricultural News*, page 73) have become very popular at Grenada; five were erected in 1907-8, and five more are on order.

Two Prize-holdings' competitions—in St. John's and St. David's parishes—were held during the year, and it is hoped before long to hold a competition in each parish every year. This movement has been attended with very valuable results in encouraging better tillage among peasant proprietors in the island.

A popular feature of the work of the Department has been the agricultural meetings which have been held at various centres in the island for the discussion of such matters as are of special interest to planters and peasants. These meetings were, in all cases, well attended.

The cacao experiment stations on estates, which are worked by co-operation of the estate owners with officers of the Department have already been referred to. The manner in which the work is conducted ensures the interest of those most concerned, and when it has been continued for several seasons, so as to secure cumulative and reliable results, should prove most valuable. Cacao experiment plots, both at the station and in country districts, are also carried on under the supervision of the Department. These plots serve a useful purpose as points at which the Agricultural Instructor can meet the peasants and give addresses, with practical demonstrations.

Some progress has of late been made in checking 'black blight' at Grenada. General co-operation and combined effort will be necessary, however, before the 'blight' is brought under anything approaching control.

It has been demonstrated that Sea Island cotton will grow successfully and give good returns on light sandy soils near the coast.

RUBBER AT GRENADA.

Small areas of land have annually been planted with rubber at Grenada for some years past, and there is a large acreage in the mountains and on various ridges which would probably be utilized in a profitable manner by planting up with Hevea or Castilloa trees. The following notes on rubber growing in the island appear in the report for 1907-8 of the Agricultural Superintendent :—

Continued interest has been taken in rubber planting all over the island, and the majority of planters have now decided to plant *Hevea brasiliensis* rather than *Castilloa elastica.* The former grows quickly and well, and is not subject, as is Castilloa, to attack by scale insects. A large consignment of seed received from Ceylon, owing to an unfortunate delay in transit, showed very poor germinating power, but all the seed which could be supplied by the Gardens was eagerly sought for and germinated well. A large order has been again sent to Ceylon.

The trees at present in existence in the island are making rapid growth and appear in every way healthy and satisfactory.

At Tuilieries estate especially, where a large acreage of rubber, consisting of *Hevea brasiliensis, Castilloa elastica,* and *Funtumia elastica* has been planted, all the plants are doing extremely well and making remarkably rapid growth. Some Hevea plants, barely three years old, are already 20 feet high.

At the Botanic Station during the year, three plots of rubber have been planted out on the slope near the section devoted to timber trees, consisting respectively of Castilloa, Hevea, and Funtumia. The plants have made satisfactory progress, and it is hoped that these plots may be of use for experimental purposes when the trees now being planted on the estates are ready for tapping.

TOGGENBERG GOAT 'BRUCE.'

The accompanying picture (Fig. 14) represents the pure-bred Toggenberg ram goat 'Bruce,' which was imported from England by the Imperial Department of Agriculture—through the British Goat Society—in 1903.

'Bruce' was a handsome (hornless) well-grown animal, two years old at time of importation, and of excellent pedigree. A female goat of the same breed, 'Pauline,' was brought to the West Indies at the same time. Toggenberg goats are famous all over the world for their high milk-yielding capacity, and 'Pauline' fully sustained the reputation of the breed from this point of view. On one occasion, after the birth of three kids, she gave a yield of 7 pints of milk daily for some time.

FIG. 14. TOGGENBERG GOAT 'BRUCE.'

'Bruce' was kept at Halton estate, Barbados, for a considerable time, and his services were much in requisition by owners of goats in the neighbourhood. Numbers of his progeny are still to be seen in the island. In 1905, 'Bruce' was transferred to Antigua, where he died in the following year. A son of his, 'Paul,' was transferred to St. Vincent for some time. The female goat 'Pauline' had two kids when she arrived, and gave birth to five more at Barbados before she died in 1905. Two or three of these have been sent to other islands.

COVER CROPS *VERSUS* CLEAN WEEDING IN PERMANENT CULTIVATIONS.

Rubber planting is comparatively a new industry in the Malay States and Ceylon, and the methods of cultivation adopted have been, so far, necessarily experimental. In general, it has been the custom for planters to carry out the practice of clean weeding between the trees in preference to growing cover crops of any description.

In an article contributed to the *Agricultural Bulletin* of the Federated Malay States for September last, Mr. J. B. Carruthers discusses the conditions of the case, and brings forward, for the consideration of planters, the advantages of allowing the soil, in orchard cultivation of such permanent crops as rubber, to be occupied by cover crops instead of being clean weeded. This question was briefly dealt with in the *Agricultural News* of December 26 last (page 407).

The practice of clean weeding, as applied to the culture of tropical crops, was, in the case of early planters, the result of experience gained in England and Scotland, where turnips, wheat, cabbages, etc. are grown under the conditions of a temperate climate. Clean weeding is undoubtedly suitable to the conditions which prevail in Great Britain, and is recognized as being an essential part of good farming.

The principle of keeping the land free from weed growth, however, is frequently adopted by planters in the tropics who do not consider whether the practice is suited for all cultivations in all climates.

In temperate climates little damage can be done by exposing the surface soil, but in the tropics a good deal of harm may result from allowing soil in good condition to be open to the alternate effects of baking sun, and heavy downpours of rain. Further, owing to the rapidity with which plant growth takes place under tropical conditions, the amount of labour entailed in keeping the land clean is far greater than in temperate climates.

Although clean weeding promotes quick growth of the young rubber trees, it carries with it heavy disadvantages; as the result of exposure to the sun, moisture is evaporated in large quantity; bacteria also, which are largely responsible for the continuous supply of plant food, cannot exist in the sun-baked soil. Further the top soil, more especially on sloping land, is being continuously washed away during heavy rain, and this entails great loss of plant food.

Weeds and other green plants undoubtedly take a certain amount of plant food from the soil, and by their agency transpiration of moisture also goes on. Under the conditions which prevail in rubber plantations, however, such losses are more than repaid by the protection given to the soil, and the supply of organic matter provided, when the plants are turned into the land. When leguminous plants such as Crotolaria, Mimosa, Desmodium, etc., are sown or planted beneath the trees, these are of additional value, as being the means of adding nitrogen to the soil.

It should be pointed out that the above principles also hold good in relation to cacao cultivation in the West Indies.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Esk' on March 16, for a short official visit to St. Lucia. Dr. Watts is expected to return on March 23.

Mr. H. A. Ballou, M.Sc., Entomologist to the Imperial Department of Agriculture, also left Barbados on the 'Esk' for the purpose of paying a brief visit to Montserrat; and with the further object of calling at Grenada, St. Vincent, and St Lucia en route, in order to arrange the preliminary steps to be taken in carrying out a systematic investigation of scale insects and their parasites in the several islands.

Mr. C. W. Jemmett, Entomologist to the Government of Southern Nigeria who has for the past six months been attached to the scientific staff of the Imperial Department of Agriculture, proceeded to England by the R.M.S. 'Clyde' on March 9 last, preparatory to taking up his duties in Nigeria.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Messrs. Bowen & Sons, Bridgetown, Barbados. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W., and The West India Committee, 15, Seething Lane, E.C. A complete list of Agents will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The organization and some of the lines of work of the United States Department of Agriculture are briefly described in the editorial. A concluding article on the same subject will appear in the next issue.

The notes under 'Sugar Industry' (page 83) relate to sugar production in Cuba, the history of the decay of the Bourbon cane at Antigua, and a new cane-reaping machine lately invented in Queensland.

Increased interest has lately been shown in cocoanut planting at Antigua (page 84); on page 85 are one or two notes on the mangosteen in the West Indies, accompanied by an illustration of a fine mangosteen tree at Dominica.

Considerable agricultural progress was made at Grenada in the year 1907-8. The chief lines along which improvement is apparent are indicated in the articles on page 86.

The case for cover crops as against clean weeding in permanent cultivations, such as cacao, rubber, etc., is briefly stated on page 87.

The report on the first Preliminary Examination in Agriculture held in the Leeward Islands by this Department appears on page 90: the pass list of candidates and the questions set are included.

The risk of introducing new plant diseases through the agency of imported sugar-canes has attracted the attention of the British Guiana Board of Agriculture: some interesting recommendations made by the Board on the subject are reprinted on page 91.

Department Publications.

The index and title-page of Volume VII of the *Agricultural News* are published as a supplement to the present issue, so that readers can now have their numbers bound up.

The whole series of reports, for the year 1907-8, on the various Botanic Stations of the West Indies have now been issued, and are on sale by all the Agents of the Department. In the cases of St. Vincent, Dominica, Antigua, and St. Kitt's-Nevis the reports on the Botanic Station, Agricultural Experiments, etc., are published at 6*d.* each number, while the reports relating to Grenada, St. Lucia, Montserrat, and the Virgin Islands are issued at a price of 3*d.* each. As usual, the above reports contain a good deal of interesting and valuable information.

Four additions have recently been made to the Pamphlet Series of the Imperial Department of Agriculture: these comprise pamphlet reports on the Seedling and Manurial Experiments with Sugar-cane at Antigua and St. Kitt's, 1907-8 (Nos. 56 and 57, Price 4*d.* each): Insect Pests of Cacao (No. 58, Price 4*d.*), and Sugar-cane Experiments at Barbados, 1907-8 (No. 59, Price 6*d.*).

Minor Crops in the Virgin Islands.

Attention is drawn in the 1907-8 report of the Agricultural Instructor at Tortola to the possibilities that exist of cultivating a number of minor crops in the Virgin Islands; among these are cacao, coffee, onions, English potatos, limes, cocoa-nuts, and cassava.

Cacao grows well in certain districts at Tortola, and it should be possible to develop a small but profitable cultivation. About 200 cacao trees were distributed from the Experiment Station in 1907-8. Both Arabian and Liberian coffees succeed in different localities of the island. All the coffee required could be produced locally.

A plot of land at the Station was sown with onion seed in November; the seedlings were planted out, and five months later a crop of 600 lb. of onions was obtained. It was found that by careful stringing and hanging up in a cool airy place, the onions can be kept in good condition for at least six months. It is pointed out that by making two sowings—one early and one late—and stringing the produce as suggested, onions grown locally could be available all the year round, and thus there would be no further need for imported produce. English potatos planted at the Experiment Station, which is at sea-level, did not succeed, but this crop can be profitably grown in the hills at about 1,000 feet elevation. The best varieties of cassava under cultivation at the Station gave returns valued at from £6 to £7 per acre.

Some slight progress has been made in lime planting, and the Agricultural Instructor mentions that there are plenty of places in Tortola where lime trees can be successfully grown, and that it is a crop well worthy of the attention of peasant proprietors in the island.

Agricultural Bank at St. Vincent.

Some notes in the St. Vincent press contain particulars of arrangements that have been made to start an Agricultural Credit and Loans' Bank in that island.

The capital of the bank will consist of $5,000, which will be raised by the sale of 5,000 shares. It will be seen, therefore, that there can be but few among those who will probably benefit from the establishment of the bank, who cannot afford to become shareholders. The promoters of the enterprise state in their prospectus that the management of the bank will be entrusted to a Board of Directors, who shall be elected by ballot every year, and any shareholder possessing not less than ten shares shall be eligible for election. A Chairman elected by the Board will act as administrative head of the bank. Rules as to government of the bank will be made by the first Board of Directors.

The bank should prove a useful institution to small holders in St. Vincent, and its working will be watched with interest from other islands as well.

Balata Output in British Guiana.

Balata, as is generally known, is a product which more nearly resembles gutta-percha than india-rubber, and is exported from British, French, and Dutch Guianas. It is obtained from the bullet-wood tree (*Mimusops globosa*), the wood of which forms a very useful timber. This tree is indigenous to South America and to Trinidad.

The balata output from British Guiana has shown steady and very satisfactory advance of recent years. In 1904-5 the export was 501,509 lb.; the shipments increased to 634,242 lb. in 1906-7, to 973,269 lb. in 1907-8, and to no less than 1,124,958 lb. during the calendar year 1908.

In the past, licences to collect balata in British Guiana conferred this right for only one, two, or three years; licence-holders have lately obtained a more fixed tenure, however, by the extension of the period to fifteen years. This concession has been made in the hope of attracting more capital to the industry. Labour difficulties at present form the chief obstacle to further development.

Ecanda Root Rubber.

A small supply of the seed of an interesting rubber-yielding plant—*Raphionacme utilis*—or 'Ecanda rubber,' the home of which is in Portuguese West Africa, was lately received from Kew, and has been distributed to several of the West Indian Botanic Stations. The plant in question (which belongs to the order Asclepiadaceae) differs from other sources of rubber in that it does not develop into a tree, but is merely a dwarf herbaceous plant, and the rubber latex is obtained not from the stem, but from the fairly large and tuberous root. Plants of *R. utilis* are reported to exist in large quantity over the 'treeless, sandy, and alluvial tracts' that occur at altitudes of from 4.000 to 5,500 feet in certain districts of West Africa.

The particulars at present known of this 'Ecanda' plant are summarized in the *Kew Bulletin* (No. 5, 1908), from which it is seen that rubber, containing as much as 92·6 per cent. of caoutchouc has been prepared from the latex of the roots. Reports on the development of the young plants at the Botanic Stations, and the age at which the tubers may be expected to yield a supply of latex will be awaited with interest.

Good Varieties of Sweet Potatos.

Since the sweet potato is such a prominent article of diet in the West Indies, it is natural that a large number of experiments should have been carried out in different islands to determine the varieties which give the best yield. Perhaps the most conclusive trials of this kind have been those conducted at St. Kitt's and Antigua.

At St. Kitt's, on the average of from four to seven experiments, eight varieties have given yields ranging from 11,000 to 16,500 lb. per acre: the best of these are 'Spooner,' 'Blue Bell,' 'Caroline Lee,' 'White Gilkes' and 'Hug-me-tight.' The potatos were planted in June on 3-feet banks, and at distances of 2 feet apart on the banks; the crop was gathered in the following March.

In the results obtained at Antigua, the varieties 'Caroline Lee' and 'Spooner' are again well to the front with yields of 15,040 lb., and 12,320 lb. respectively. 'Hen-and-Chickens,' however, did best of all with a return of 19,200 lb. per acre; this kind was not so successful at St. Kitt's. Other varieties which were very satisfactory at Antigua are 'T. 4,' (12,640 lb.), 'T. 1' (12,160 lb.), and 'Barbados Barrel,' (11,040 lb.).

Encouragement for Agriculture in Panama.

The National Assembly of the republic of Panama lately voted the expenditure of a considerable sum of money with the object of encouraging agricultural development in that country. Labour being one of the chief needs, £2,000 are to be allotted for the purpose of assisting in the establishment of small foreign labouring colonies in districts that can most readily be opened up, and Spanish immigrants are to be specially encouraged to settle there. A further sum of £800 is assigned for the purchase and free distribution among the poorer agriculturists of light labour-saving machinery, such as light ploughs, cultivators, seed-sowing machines, corn-shelling mills, and agricultural implements in general. With the object of introducing superior varieties of grain and grasses, seeds to the value of £100 have been imported and distributed, and a further £50 has been allotted for the purchase of 'foreign agricultural journals of recognized utility,' which will also be distributed among agriculturists in the country.

The republic of Panama possesses considerable agricultural resources, large districts being suited to the production of rubber, cacao, bananas, cocoa-nuts, sarsaparilla, vanilla, etc.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The first Preliminary examination in connexion with the scheme of Reading Courses lately established by the Imperial Department of Agriculture was held at Antigua on February 15 and St. Kitt's on February 13, 1909.

Eleven candidates presented themselves for examination at Antigua and three at St. Kitt's. Of a total of fourteen, five failed to satisfy the examiners.

Of the St. Kitt's candidates two passed in the first class and one in the second, while at Antigua there were three second and three third class candidates.

The names of the successful candidates are as follows:—

AT ANTIGUA.

First Class:

Second Class:

L. W. D. Hà Court
J. Hamilton
W. A. Hewlett

Third Class:

W. F. Gore
C. J. A. Hallpike
C. O. A. Sheppard

AT ST. KITT'S.

First Class:

W. J. Howell
H. H. Walwyn

Second Class:

C. G. Goodall.

QUESTIONS.

For the written portion of the examination fifteen questions were set, and of these not more than ten were to be attempted by any candidate.

The questions were as follows:—

1. What is the atmosphere and of what is it composed? Give a brief account of its relations to animal and vegetable life.

2. What do you understand by the following terms in relation to soils:—Sand, Sandy Loam, Loam, Heavy Loam, Clay.

3. What is plant food? Name the principal plant foods and explain carefully how they are absorbed by the plant.

4. Is it necessary to drain all soils? If not, why not? On what does the necessity or otherwise for drainage depend?

5. What is the object of (*a*) Ploughing, (*b*) Harrowing? Describe the construction of some simple form of plough.

6. What is farmyard manure? What are its manurial constituents? In what respects does it differ from a complete artificial manure?

7. Explain with short notes the following terms:

Vegetable compost, green dressing, bare fallow, subsoiling, mulch, cambial layer, denitrification, balanced ration.

8. What is Carbon? What do you understand by 'Carbon assimilation' in relation to plants and how is it effected?

9. Describe (*a*) the flower, (*b*) the root, of any common plant.

10. What do you understand by fertilization of a flower? What is the difference between self-fertilization and cross-fertilization? Describe the manner in which fertilization is effected in the case of some common plant.

11. In what essential particulars does propagation by cuttings differ from propagation by seed?

12. What are leguminous crops and what is their special significance in practical agriculture?

13. What is a ruminant animal? Describe carefully the structure of the stomach of some ruminant animal with which you are acquainted.

14. Write a short account of the circulation of the blood of an animal.

15. Give a short account of the general principles underlying the proper feeding of stock.

In addition to the writing of papers in answer to the set questions, the candidates were examined orally by the examiners, who, taking each candidate in turn, examined all on the same topics. The examinations at Antigua, both written and oral, were conducted by Mr. H. A. Tempany, B.Sc., F.I.C., F.C.S., and Mr. A. H. Kirby, B.A.

At St. Kitt's, Mr. G. G. Auchinleck, B.Sc., Science Master at the Grammar School, Mr. B. A. Hardtman, and Mr. F. R. Shepherd, Agricultural Superintendent, conducted the oral or *viva voce* examination, the written examination being supervised by Mr. W. H. Mitchell, M. A., Head-master of the Grammar School.

This first examination is naturally of great interest. It reveals some of the difficulties which candidates labour under, as shown by their written papers and the answers given to the *viva voce* questions. The excellent arrangement of the subject matter for both parts of the examination in Antigua and St. Kitt's will serve as a useful basis for future examinations.

Selections from the questions on which the *viva voce* examination was based will be published in the *Students' Corner* from time to time, with the references for reading, in order to assist candidates in becoming familiar with the topics which are considered to come within the scope of the Preliminary Examinations.

In order that the duties of the examiners who conducted the oral part of the examination should be thoroughly and carefully performed, they were at pains to prepare beforehand a systematic plan upon which the work of examination was based. It is interesting to quote from the report from St. Kitt's some details of the line of action which was adopted there.

Some time previous to the examination, a series of questions was drawn up by the examiners, similar in form and subject to those which candidates would later be required to answer. These questions (for this first examination) related to four topics, viz. (1) Capillarity, (2) Plant foods, (3) The roots of plants, (4) The stems of plants. The manner in which these topics were treated in certain passages of the books that have been recommended to the students was fully considered by the examiners, so that they would be able to judge how far candidates had benefited from their reading.

This plan of grouping the questions under general topics was for the convenience of the examiners, and it was found to be of considerable advantage, since it enabled them consistently to approach the several subjects in the same way with every candidate, and to lead from one point to another without any breaks in the continuity.

It was not thought desirable to ask specific questions demanding lengthy answers, but rather to use each question as a nucleus around which to introduce discussion, the examiners endeavouring to draw out the candidates' knowledge step by step.

The examiners were at liberty to ask pertinent questions and obtain explanations of any points not clearly stated by the candidates. In this way much of the natural nervousness of the candidates was overcome and a good estimate of their knowledge arrived at.

The following is quoted from the report of the examiners at Antigua :—

'(a) The general character of the knowledge displayed emphasizes the necessity for personal guidance and instruction for the candidates, and it would be advantageous, in our opinion, if it could be found possible to extend the amount of guidance now given, at any rate in the case of Preliminary candidates.

'(b) We are of opinion that in dealing with candidates of this class the oral examination is very necessary in order to arrive at a true idea of their attainments, since in a written paper candidates often do not possess sufficient general education to give due and full expression to the facts with which they are acquainted.'

The results of the examinations may be taken as very encouraging. A good proportion of the candidates have passed, and they are well distributed in the first, second, and third classes. All who have in any way assisted in carrying out the Reading Courses and the Examinations have a much better knowledge of the general points concerning which candidates are liable to be weak or strong, and the candidates themselves are much better fitted for the next examinations, whether it be Preliminary for those who failed this time, or Intermediate for those who have been successful.

It is expected that Preliminary and Intermediate examinations will be held throughout the West Indies some six or seven months from now, and of these due notice will be given

AGRICULTURAL TRAINING FOR BRITISH GUIANA BOYS.

A circular lately issued by the Education Department of British Guiana contains particulars of a scheme for training a limited number of boys in the theory and practice of agriculture under the supervision of the Director of Science and Agriculture.

In accordance with the terms of this scheme, three candidates will be selected for apprenticeship at the Botanic Gardens in January 1910. These candidates must be over fourteen and under sixteen years of age, of good character, be able to give evidence of a fair general education, and must have received practical instruction in Nature Study in a School Garden for at least the last two years of their school career.

A probation period of three months is required before the boys are finally apprenticed ; if this is satisfactorily passed they are to be indentured for three years to the Director of Science and Agriculture.

One of the main provisions of the scheme specifies that during the apprenticeship period, the boys will be employed for half the time in the experimental fields and for the other half in the Botanic Gardens, in alternate periods at the two places. They will also attend at least one course of lectures to Student Teachers at Queen's College during the second or third year of apprenticeship.

Further opportunities for the acquirement of agricultural knowledge by these apprentices will also be provided, and they will be paid for the work done by them at the following rates :—

Not less than 16c. per day during the first year ; not less than 20c. per day during the second year ; and not less than 24c. per day during the third year.

SUGAR-CANE IMPORTATION AND INTRODUCTION OF PLANT DISEASES.

RECOMMENDATIONS IN BRITISH GUIANA.

The suggested importation by a firm in British Guiana of sugar-canes from Java has drawn the attention of the Board of Agriculture of the colony to the desirability of taking steps to ensure that no plant diseases shall be introduced by such means. This matter was discussed at a recent meeting of the Board of Agriculture, when Professor Harrison pointed out the advisability of imposing restrictions on the importation of sugar-canes and cuttings from Java, Australia, Fiji, Brazil, and the West Indian islands, on account of the prevalence of certain insect pests and fungoid diseases in the countries specified, which up to the present did not exist in British Guiana. The following resolution in reference to the subject was carried unanimously :—

The Board of Agriculture recommend, under section 2 of the 'Importation of Plant Diseases Prevention Ordinance, 1903,' to the Governor-in-Council that the importation of all sugar-canes, and cuttings thereof, from Java, Australia, Fiji, Brazil, and the West Indian islands, shall not be allowed to be imported into British Guiana in any description of earth or soil.

(2) All sugar-canes, or cuttings thereof, from the abovementioned places to be inspected by the Government Botanist before being removed from the wharf or stelling at which they are landed, and not to be removed from that place unless permitted by the Government Botanist in writing.

(3) If, on such inspection, the sugar-canes, or cuttings thereof, be found to be not free from pests or diseases of any sort already known to occur in the colony, the sugar-canes or cuttings to be treated as the Government Botanist may direct, before removal from the wharf. If they are found to be infected with any pest or disease not commonly known in this colony, the sugar-canes or cuttings to be destroyed under the supervision of the Government Botanist, or an officer of the Department of Science and Agriculture delegated for the purpose.

(4) If their removal is authorized by the Government Botanist, the sugar-canes, or cuttings thereof, to be planted in a nursery apart from the general cultivation, and separate from other varieties of canes, and to be subject from time to time, during twelve months from the date of importation, to inspection by an officer of the Department of Science and Agriculture. If the canes are found, on any inspection, to be suffering from any pests or diseases already known in the colony, they shall be treated as directed by the Government Botanist, and if suffering from any pests or diseases not commonly known in the colony, they shall be rooted out and destroyed under the immediate supervision of the inspecting officer.

The wisdom of precautions such as are indicated in the above resolution must be apparent to all who have in any way considered the matter Neglect to take steps such as those recommended has not infrequently resulted in severe and long-continued loss to agriculturists in different countries.

GLEANINGS.

The cacao crop of Grenada for 1907-8 reached 64,397 bags, which is the largest return obtained since 1904, when the record crop for the island—67,225 bags—was gathered.

Mr. F. A Stockdale, Government Botanist of British Guiana, has been appointed Deputy-Chairman of the Board of Agriculture of the colony.

The Barbados sugar market opened on March 12, when muscovado sugar sold at \$1·75 per 100 lb. Fancy and choice molasses are selling at 15c. and 16c. per gallon.

Nine selected dairy cows were recently purchased at Barbados by the Demerara Dairy Company, and shipped to Georgetown. The prices paid for these animals varied from \$50 to \$70.

A largely signed petition has been forwarded to the Governor of the Leeward Islands from the inhabitants of Montserrat, praying for the removal of the duty on cotton exported from the island.

It is estimated by the Warden that about 70,000 rubber trees have now been planted in the Savana Grande Ward Union, Trinidad. From 8,000 to 10,000 of these were tapped in 1907-8, and 3,000 lb. of rubber obtained, which fetched, on an average, 3*s*. 4*d*. per lb.

The *Demerara Argosy* reports that a company (styled the Balata and Rubber Corporation) has lately been formed in England, with a nominal capital of £160,000, for the primary object of exploiting the balata and rubber resources of British Guiana.

The Agricultural Instructor of the Virgin Islands mentions in his latest report that the coffee required locally could all be produced at Tortola without difficulty. Many Liberian coffee trees are in bearing at the Botanic Station, and the Arabian variety does well in the more hilly districts.

The apiaries existing in Cuba numbered 4,137 in 1907, and the total number of hives was 120,250. Honey was produced to the extent of 468,159 gallons, and realized an average selling price of 1*s*. 3*d*. per gallon. Wax commanded a price of 1*s*. per lb. (*British Consular Report.*)

The shipments of cacao from Trinidad in February last amounted to 6,390,202 lb. Of this quantity, 3,748,195 lb. went to France, 1,293,450 lb. to the United States, 863,577 lb. to the United Kingdom, and 142,450 lb. to Canada. The total exports from January 1 to February 28, 1909, have been 14,841,342 lb. (*Proceedings of Trinidad Agricultural Society.*)

The Vanilla beans grown at Hope Gardens, Jamaica, are not exported as gathered, but are dealt with locally, essence of vanilla being prepared from them. This product sells at 20*s*. per gallon, which is equal to 10*s*. 6*d*. per lb. of cured beans. (*Journal of Jamaica Agricultural Society.*)

One ton of sugar, and 2,816 puncheons of molasses, the produce of the present season's crop, had been shipped from Barbados up to March 11, as compared with 387 tons of sugar and 3,461 puncheons of molasses exported to the same date in 1908.

Farmer-grown canes to the extent of 56,537 tons, valued at \$121,615, were produced in the Naparima Ward Union, Trinidad, in 1907-8. Large areas in this Ward Union are being planted with cacao by purchasers of Crown lands, and it is estimated that about 4,000 acres are now under the latter crop. (*Warden's Annual Report.*)

A recent British *Consular Report* states that the average agricultural wages paid in Cuba are as follows : For a foreman, about £7 12*s*. 8*d*. per month ; for a labourer (presumably more or less skilled), about 3*s*. 6*d*. per day, and for an ordinary 'farm hand,' about 2*s*. 11*d*. per day. The cost of board for a labourer is placed at about 9*s*. per week.

In recommending that eucalyptus trees be more extensively planted on sugar estates in the West Indies, the *Journal* of the Jamaica Agricultural Society mentions that the leaves possess a property which makes them useful for cleaning purposes. If a quantity of leaves is placed in a boiler and boiled, the resulting decoction will soften any incrustation of lime that may have formed, so that it can easily be removed.

Manurial experiments with rice, carried out in Hawaii, indicate that nitrogen in the form of sulphate of ammonia is especially suitable for this crop. Fish guano also gave good results. Next to these two substances superphosphate seemed to be most available to the plant. The best combination of manures for the rice crop was sulphate of ammonia and superphosphate.

The Government of Martinique are making praiseworthy efforts for the encouragement of agriculture in the island. Three experiment stations have been established, from which economic plants are distributed free of charge to residents of the colony. In 1906-7, plants to the number of 85,000 were sent out, and for the year ended June 30, 1908, no less than 103,000 were supplied.

The 'mealy bug' scale insect (*Dactylopius citri*) was reported to have increased very considerably on cacao trees at Grenada towards the end of 1908. This is possibly due to the drought that has been experienced in the island. The attack is chiefly on the leaves, and also to some extent on the cacao pods and pod stems. Spraying with kerosene emulsion, whenever possible, is recommended for this pest.

Experiments with the new nitrogenous manure, calcium cyanamide, reported upon in the *Journal of the Board of Agriculture* (Great Britain) lead to the conclusion that 'this manure, as now manufactured, can be stored for a reasonable time, under ordinary conditions, without loss of its fertilizing properties, and that the calcium cyanamide can also be mixed with superphosphate, without difficulty or resulting loss.'

INSECT NOTES.

Fruit Fly at Bermuda.

The accompanying account of the ravages of the fruit fly at Bermuda, and of the measures that have been adopted for the extermination of the pest, has been received from Mr. T. J. Harris, Superintendent of the Botanical Department in that colony:—

The Mediterranean fruit fly (*Ceratitis capitata*, Weid.) has been at work at Bermuda since about the year 1864, and is supposed to have been introduced into the islands through the medium of some peaches brought from Madeira. Up to that time, all the fruits of both the temperate and tropic zones of the East and West grew and yielded in abundant profusion, while the unique climatic conditions of Bermuda imparted to them a distinctive flavour, and developed

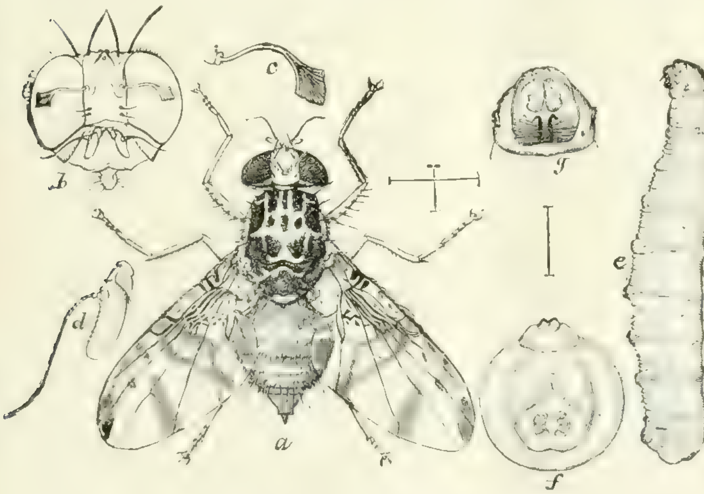

Fig. 15. Ceratitis capitata.

a. adult fly ; *e.* larva ; both enlarged.

(Reproduced from *Year-book* of U.S. Department of Agriculture, 1897, page 537).

unusually large and luscious fruits. Peaches were the first fruits to be attacked, but the fly soon began to attack other kinds of fruit, and so serious have the ravages of this insect become that quite 90 per cent. of the trees have been cut down and destroyed

When the Fruit Fly Destruction Act was passed in March 1907, these flies were so numerous that they could be seen in great numbers crawling over the fruits then in season—loquats, citrus fruits, sweet peppers, cherimoyas, Surinam cherries (*Eugenia Micheli*), Barbados gooseberry (*Pereskia aculeata*), guavas, sapodillas, papaws, and young peaches.

A study of the life-history of the insect disclosed the fact that it cannot reproduce itself without the aid of a growing fruit, and that the female deposits her eggs—by means of a strong, horny ovipositor—within the flesh of a fruit, injecting at the same time a poison (formic acid?), which kills the adjacent tissues, and commences the rotting which accompanies the hatching of the eggs into maggots. It would appear that most of the food eaten by the fruit fly is consumed while the insect is in the larval stage, for the adult flies are never seen except when busy ovipositing, or sheltering from heavy rain under the leaves.

The policy at first pursued at Bermuda was to collect all ripening fruits, and to sink these in bags in the sea, continuing to collect until the existing flies had deposited all their eggs. It would not do to have suddenly deprived the flies of all fruit, for in one place where this was done they immediately began to lay eggs in the bananas which previously had been exempt from attack.

An Inspector was appointed for each parish, with several labourers, under the direction of the Botanical Department, to do all the work of collecting, and pruning back, to prevent the trees fruiting for some time, recording where fruit trees were found, what they were, and making a diary of work done at each place. The work was at first very difficult, but all soon fell into line, until at the time of writing we find the flies reduced from millions to a dozen or so. We have now changed our tactics and are endeavouring to give these few their final quietus by depriving them of all the kinds of fruits now known to be affected ; and as they habitually remain about where they are bred, they will die without having found fruit in which to deposit their eggs.

In an article which lately appeared in the *Agricultural News*, the use of kerosene in small flat trays is mentioned. We tried this, even put some on the inside of the breeding cage, first on one side and then on the other. The flies very carefully avoided it and flew to the other side. Some trays of oil placed in the trees failed to catch a greater proportion than of moths and other flies. The high humidity of the climate may have interfered with the diffusion of the oil vapour.

About a year ago some guavas from Dominica were seized at the port of Hamilton, and found to contain fruit fly maggots. These were bred out and forwarded to Dr. Howard of the U. S. Department of Agriculture for identification. They proved to be *Anastrephas acidusa*, Weid., a much larger fly than *Ceratitis capitata*, very much like *Trypeta ludens* in regard to the thorax and head, but with a less abnormal abdomen. I have found maggots in mangos at Jamaica on several occasions, and have the impression that the later finds were the worst, though I did not attach very much importance to it at the time. I sincerely trust that no other colony will be allowed to suffer from the fruit fly pest to the extent that Bermuda has done during the past forty years.

Lecture on Scale Insects at Jamaica. Professor R. Newstead, of the Liverpool School of Tropical Medicine, in the course of his recent visit to Jamaica, delivered an interesting lecture on the subject of 'Scale Insects' to members of the Jamaica Institute. The lecturer gave a brief history of the research work carried on in the past which has led up to our present knowledge of this group of insects ; investigators have been busy in the United States, France, Italy, England, etc., but the first monograph on the scale insects was published so recently as 1877. The study of the West Indian forms of these insects was commenced by Mr. T. H. D. Cockerell, a former curator of the Jamaica Institute. Although much good work relating to the economic side of the question is now in progress in many parts of the world, all countries were largely indebted to the Bureau of Entomology of the U. S. Department of Agriculture for the elaborate and extensive experiments which the Bureau have established.

AGRICULTURAL SHOW AT ST. KITT'S.

A very interesting and successful Agricultural Show was held in the grounds of the Grammar School, St. Kitt's, on February 11 last, under the joint auspices of the Imperial Department of Agriculture, and the St. Kitt's Agricultural and Commercial Society. The Show was opened by his Honour T. L. Roxburgh, Administrator of St. Kitt's-Nevis.

In welcoming the Administrator, the Hon. S. L. Horsford, President of the Agricultural Society, referred to the large number of exhibits on view at the show, which was a most satisfactory and encouraging feature. Whereas at the show of 1908, there were only about 400 entries, this year the number reached nearly 800. Special prizes had been offered for competition by his Excellency Sir Bickham Sweet-Escott, K.C.M.G., Lady Sweet-Escott, Colonel the Hon. R. S. Cotton (owner of Stapleton's estate), and by Mr. A. M. Lee (owner of Stone Fort and Ottley's). Mr. Horsford added that the success of the show was largely due to the zeal and energy of the Honorary Secretary, Mr. F. R. Shepherd.

Mr. Roxburgh, in the course of his speech, alluded to the admirable arrangements that were evident in everything connected with the show, and extended a welcome to the large number of visitors present, not only from St. Kitt's, but also from Nevis. The value of such competitions was apparent to all. Planters and cultivators from different parts were afforded an opportunity of comparing varieties of agricultural produce obtained under different methods of treatment, and of discussing the results of these methods. Unsuccessful competitors were stimulated by the results obtained by their successful neighbour to improve their own produce, while the prize-winning exhibitor should not be content next year merely to repeat what he had achieved on the present occasion, but should endeavour each year to advance, until the highest standard was reached. This was the third annual show held at St. Kitt's, and there were already distinct signs that the exhibitions of the past two years were beginning to exercise an influence on the thoroughness with which agricultural products were being prepared.

The total number of exhibits on view (including those not for competition) was 786. These were made up as follows: 99 exhibits in horses, mules, asses, and cattle; 38 in small stock, such as sheep, goats, and pigs; and 35 in feathered stock and rabbits; 40 in sugar-cane and its products; 60 in fruits; 149 in vegetables; 111 in preserves; 47 in meals and starches; 72 in industrial and miscellaneous; 26 in plants and flowers; 4 in school exhibits; 26 exhibits in painting and drawing, and 20 not for competition.

The animal section is mentioned as being especially good, and formed the largest collection of live stock yet seen at a show in the Presidency. Mr. J. R. Yearwood's native Zebu bull was easily first in its class, and was awarded the Champion prize. In the horse class two fine animals, the property of Mr. A. S. Davis, were prominent. Some very creditable mules from Pond and other estates were entered for competition, and the donkey stallion 'Bismarck,' the property of the Imperial Department of Agriculture, was on view. The Indian goat 'Rajah', also the property of the Department, was included among the live stock, although not entered for competition.

The first prize for cotton lint was awarded to Conn Phipp's estate, and the first prize for seed-cotton to Buckley's estate.

It is estimated that over 1,200 people visited the show during the day.

PEN MANURE AND ALLIED MANURES.

In one of the reports on the Sugar-cane Experiments in the Leeward Islands (1905-6, Part II), there occurs an appendix, under the above heading, which is of very general interest, and to which the attention of planters may well be drawn. It deals not only with pen manure, but with the preparation of compost heaps, and the economical utilization for manurial purposes of all available vegetable matter that can be accumulated on estates. A table is also given, showing the results of analysis of a large number of these substances, from which the quantities of organic matter, nitrogen, phosphoric acid, and potash added to the soil by average samples of pen manure, rotted megass, vegetable compost, sea-weed, cane tops, cotton seed, etc., can be seen at a glance. This subject is the more deserving of consideration, since the manurial experiments carried on at Antigua and St. Kitt's have emphasized the importance of pen manure, etc., in the cultivation of plant canes.

The view is sometimes held among a few older planters, that pen manure contains more plant food material than the food stuffs and bedding from which it is derived. This, however, is obviously a fallacy, since the animal retains some portion of the food supplied in building up the tissues of its body.

This being so, it holds good that the same quantity, or more, of fertilizing material is conveyed to the soil by burying the grass, cane tops, etc., without first feeding them to the animal. It should be pointed out, however, that as the result of the modifications in the character of the feeding stuffs brought about in passing through the alimentary tract, the organic material becomes more readily combined with the soil, and is available for plant food in a much shorter space of time. The liquid and solid excreta voided by the animals kept in enclosed pens, and also the bacteria from the intestinal tract are further means by which the rapid decay of accumulations of litter is hastened.

The following notes are quoted directly from the appendix referred to:—

The practice of keeping animals for the purpose of making manure is sound in principle, in that a certain number of animals are desirable for bringing the manure into good condition without loss of time; but it may be carried to excess. A limited number of animals can be made to hasten the decay of much more material than they eat, and thus may be employed to prepare large quantities of manure. One point has to be guarded against in practice. The attendants are disposed to give to the animals only as much as will serve as food, whereas every effort should be made to give the animals a large excess of food material, part to be eaten and the remainder to be rotted.

In procuring manure for estates the greatest care should be taken to accumulate all available grass, bush, cane tops, and vegetable matter of all descriptions, which should be piled into compost heaps. In the absence of animals, this material in process of time will rot down and form useful manure, equal in value to pen manure. It is advantageous to spread layers of earth at intervals through the heaps, for the earth absorbs valuable constituents which might otherwise be lost, and at the same time it promotes decay.

If animals are available, the best results are obtained by combining the method of the compost heap with the feeding of animals.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London spice and drug markets during the month of January :—

The hoped-for improvement in the drug and spice markets at the commencement of the year has now been fully realized, but it must be borne in mind that the extension of the Christmas holidays, or rather the after-effect, is felt for at least a fortnight after the season itself. Indeed, the first drug sale of the New Year was held on January 14— a period of six weeks having elapsed since the previous sale. Though the supply of drugs at this auction was large and well assorted, the demand was only up to a fair average. The articles that attracted the most attention during the month have been those affected by the terrible earthquake in Sicily, and notably the essences of lemon and bergamot. West Indian products have not commanded any special attention, as will be seen by the following notes :—

GINGER.

At the spice auction on January 6, the offerings amounted only to 160 bags of Japan, 2*s.* 6*d.* per cwt. being paid for slightly wormy and limed. No Jamaica or Cochin was brought forward, but private sales of washed Cochin were said to have taken place at 35*s.* A week later, Jamaica was offered to the extent of 246 barrels, 65 of which sold without reserve at from 48*s.* to 49*s.* for fair bright Cochin. Calicut ginger was represented by some 500 packages, all of which were bought in at the following prices : 52*s.* 6*d.* for unsorted native cut, 42*s.* for bold brown Calicut rough, and 35*s.* to 36*s.* for washed rough Cochin. Nothing was offered at the later auctions.

NUTMEGS, MACE, AND PIMENTO.

Little attention has been given to either of these spices during the month, and for nutmegs and mace there were practically no quotations. Pimento, at the first sale, was offered to the extent of 203 bags, all of which were bought in at from $2\frac{1}{16}d.$ to $2\frac{1}{8}d.$ per ℔. On the 13th, out of 300 bags brought forward, 115 were sold at 2*d.* per ℔. for fair ; and again a week later, 120 bags of the same quality found buyers at the same price.

ARROWROOT.

The dealings in this article have maintained a quiet tone throughout the month, the quotations for St. Vincent ranging from $2\frac{1}{4}d.$ to $3\frac{5}{8}d.$ per ℔., according to quality.

SARSAPARILLA.

At the first drug auction on January 14, 16 bales of genuine grey Jamaica were offered, and all disposed of at prices ranging from 1*s.* 4*d.* to 1*s.* 6*d.* per ℔. for ordinary good grey. Eleven bales of Lima-Jamaica were offered, and all sold at from 1*s.* 2*d.* to 1*s.* 3*d.* Nineteen bales of native red were also brought forward, 13 of which were sold at 10*d.* to 1*s.* per ℔. for dull to fair red, and 9*d.* for sea- and water-damaged. At the last sale on the 28th, 44 bales of grey Jamaica were offered, 42 of which found buyers at 1*s.* 5*d.* for good, and 1*s.* 3*d.* to 1*s.* 4*d.* for slightly coarse and dark. Thirteen bales of native Jamaica were offered, and all sold at from 10*d.* to 1*s.* for dull yellowish to good red. Of Lima, 14 bales were offered, and 7 sold at from 1*s.* 1*d.* to 1*s.* 2*d.* per ℔.

KOLA, LIME JUICE, OIL OF LIME, ETC.

Of Kola, 3 bags of fair Jamaica were offered in the middle of the month and sold at 1*s.* 4*d.* per ℔., and another 5 bags of good quality realized 2*s.* 4*d.* per ℔. Eight bags of Ceylon, ranging from fair to sea-damaged, fetched from $1\frac{3}{4}d.$ to $1\frac{1}{2}d.$ per ℔. At the close of the month 2 barrels of mouldy dark Jamaica were offered and sold at $1\frac{1}{4}d.$ per ℔. On the 13th, 4 puncheons and 6 hogsheads of West Indian lime juice were disposed of from at 1*s.* to 1*s.* 2*d.* per gallon, and a week later, fair pale raw West Indian was offered at 1*s.* 3*d.* per gallon. It was announced that 46 hogsheads had arrived from Dominica. In the early part of the month oil of lime was reported to be in good demand, realizing from 2*s.* 8*d.* to 3*s.* per ℔. for West Indian. A week later, 4 cases of fair distilled West Indian sold at 2*s.* 9*d.* per ℔., and for another 3 cases, with slightly rusty tins, 2*s.* 1*d.* was paid. At the last auction, oil of lime was still in steady demand, 4 cases and 14 bottles of West Indian distilled finding buyers at 2*s.* 9*d.* per ℔. On the 13th, 6 barrels of sweet West Indian orange oil were offered, and all were bought in at 15*s.* per ℔., an offer of 13*s.* being refused. Nineteen bales of *Canella alba* were offered on the 14th, 3 only being sold at 50*s.* per cwt. for fair pale.

RICE, LIMES, AND SISAL HEMP IN BRITISH GUIANA.

Returns lately placed before the British Guiana Board of Agriculture by the Director of Science and Agriculture show that the area planted with rice in the colony for the crop of 1908 amounted to 37,851 acres, as compared with 29,700 acres in the previous year. The total yield of paddy was returned as 962,679 bags of 120 ℔. each, or an average crop of 25·4 bags per acre.

There are naturally considerable differences in the yields per acre obtained in different districts ; the figures vary from 17 bags on the Abary Creek to 30 bags on the East Bank of the Demerara river. In some cases two crops were obtained in the course of the year, and then the total yield was considerably higher ; in North Essequebo, for instance, the yield was 57 bags, or 34 bags from the first crop and 23 from the later ; in South Essequebo the total return from two crops was 39 bags.

A regular trade in British Guiana rice may now be said to be established with the West Indian islands. The Governor of British Guiana in a recent address to the Court of Policy pointed out the importance of maintaining a high standard in regard to the exported grain, and suggested that it may become necessary at no distant date to fix a standard, and to appoint an inspector for the purpose of preventing injury to the trade by the shipment of rice of inferior quality. It is estimated that the imports of rice into the colony, which have gradually fallen from 13,290,000 ℔. in 1904-5, to 2,126,560 ℔. in 1907-8, will in the present year probably not exceed 990,000 ℔.

The cultivation of both limes and sisal hemp has also been started in British Guiana, and the future development of these industries will be watched with interest. An area of land at Agatash was sold to the Demerara Development Company for purposes of lime growing, and of this, 200 acres have already been planted up. A scheme for growing this fruit on a large scale has also been started in Berbice, where at present about 70 acres are under the crop.

Sisal hemp cultivation may possibly prove to be a remunerative industry on lands not suited to other economic crops. A large area (7,000 acres) in the neighbourhood of Kalacoon, Essequebo, has been leased to the Bartica Agricultural Estates Company for planting sisal.

MARKET REPORTS.

London,—March 2, 1909, The West India Committee Circular; Messrs. Kearton Piper & Co., March 2, 1909.

Arrowroot—Quiet; $1\frac{3}{4}d.$ for fair to fine manufacturing.
Balata—Sheet, 2/2 to 2/4; block, no quotations. (?)
Bees'-wax—£7 12*s.* for dark to pale.
Cacao—Trinidad, 57/- to 70/- per cwt.; Grenada, 51/- to 59/6 per cwt.
Coffee—Santos, 32/9 per cwt.; Jamaica, no quotations.
Copra—West Indian, £19 per ton.
Cotton—Nevis and St. Kitt's, $12\frac{1}{2}d.$ to $13\frac{1}{2}d.$; Barbados, no quotations; St. Vincent, 15*d.*
Fruit—
Bananas—Jamaica, 4/6 to 9/- per bunch.
Limes—Not wanted.
Pine-apples—St. Michael, 1/6 to 4/-.
Grape Fruit—5/6 to 9/- per box
Oranges—Jamaica, 6/- to 9/- per box.
Fustic—£3 to £4 per ton.
Ginger—55*s.* to 60*s.*
Honey—24*s.* to 26*s.* per cwt.
Isinglass—West India lump, 2/2 to 2/6 per lb.
Lime Juice—Raw, 1/- to 1/2 per gallon; concentrated, £18 7*s.* 6*d.* per cask of 108 gallons; distilled oil, 2/3 per lb.; hand-pressed, 7/- per lb.
Logwood—£3 to £4 5*s.* per ton; roots, no quotations.
Mace—Firm.
Nutmegs—Steady.
Pimento—Quiet.
Rubber—Para, fine hard, 5*s.* 2*d.* to 5*s.* $2\frac{3}{4}d.$ per lb.
Rum—Jamaica, no quotations; Demerara, 1/6 to 1/7, proof.
Sugar—Crystals, 14/3 to 16/9; Muscovado, 12*s.*; Syrup, 14*s.*; Molasses, no quotations.

New York,—March 5, 1909.—Messrs. Gillespie, Bros. & Co.

Cacao—Caracas, 12c. to 13c.; Grenada, $11\frac{3}{4}$c. to $12\frac{1}{2}$c.; Trinidad, $12\frac{1}{2}$c. to $13\frac{3}{4}$c.; Jamaica, $10\frac{1}{4}$c. to $11\frac{1}{2}$c. per lb.
Cocoa-nuts—Jamaica, select, \$26·00 to \$27·00; culls, \$16·00 to \$17·00; Trinidad, select, \$26·00 to \$27·00; culls, \$16·00 to \$17·00 per M.
Coffee—Jamaica, ordinary, 8c. to $8\frac{1}{2}$c.; good ordinary, $9\frac{1}{4}$c.; washed, up to 12c. per lb.
Ginger—$8\frac{3}{4}$c. to $12\frac{1}{2}$c. per lb.
Goat Skins—Jamaica, 55c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
Grape Fruit—Jamaica, \$2·00 to \$2·50 per box, \$4·25 to \$5·00 per lb.
Limes—No quotations.
Mace—29c. to 33c. per lb.
Nutmegs—110's, $8\frac{1}{2}$c. to 10c. per lb.
Oranges—Jamaica, \$2·75 to \$3·25 per barrel.
Pimento—No quotations.
Sugar—Centrifugals, 96°, $3·73\frac{1}{2}$c.; Muscovados, 89°, $3·23\frac{1}{2}$c.; Molasses, 89°, $2·98\frac{1}{2}$c. per lb., duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Leacock & Co., March 15, 1909; Messrs. T. S. Garraway & Co., March 15, 1909.

Arrowroot—St. Vincent, \$3·90 to \$4·00 per 100 lb.
Cacao—Dominica and St. Lucia, \$10·00 to \$11·00 per 100 lb.
Cocoa-nuts—\$13·00 for unhusked nuts.
Coffee—Jamaica and ordinary Rio, \$9·50 to \$10·00 per 100 lb.
Hay—\$1·20 to \$1·50 per 100 lb.
Manures—Nitrate of soda, \$62·00 to \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$72·00 to \$75·00; Sulphate of potash, \$67·00 per ton.
Molasses—No quotations.
Onions—Strings, \$2·25 to \$3·00 per 100 lb.; loose, no quotations.
Potatos—Nova Scotia, \$2·00 to \$2·75 per 160 lb.
Peas—Split, \$6·00 per bag of 210 lb.; Canada, \$3·30 per bag of 120 lb.
Rice—Ballam, \$5·40 to \$5·45 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—No quotations.

British Guiana,—Messrs. Wieting & Richter, March 6, 1909; Messrs. Sandbach, Parker & Co., March 5, 1909.

Arrowroot—St. Vincent, \$9·00 to \$9·50 per 200 lb.
Balata—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
Cacao—Native, 13c. to 14c. per lb.
Cassava—60c.
Cassava Starch—\$7·00 per barrel of 196 lb.
Cocoa-nuts—\$12·00 to \$16·00 per M.
Coffee—Creole, 12c. to 13c.; Jamaica, $12\frac{1}{2}$c. to 13c. per lb., slow.
Dhal—\$5·00 per bag of 168 lb.
Eddos—\$1·68 per barrel.
Molasses—No quotations
Onions—Madeira, 5c. to 6c. per lb.
Plantains—20c. to 44c. per bunch, plentiful.
Potatos—Nova Scotia, \$2·40 per 100 lb.
Potatos—Sweet, Barbados, \$1·20 per bag.
Rice—Ballam, \$5·50 to \$5·60; Creole, \$4·70 to \$4·80.
Split Peas—\$5·50 to \$5·60 per bag (210 lb.); Marseilles, \$4·00
Tannias—\$2·64 per bag.
Yams—White, \$2·16 per bag; Buck, no quotations.
Sugar—Dark crystals, \$2·25 to \$2·50; Yellow, \$3·10 to \$3·20; White, \$3·60 to \$3·80; Molasses, \$2·30 to \$2·40 per 100 lb. (retail).
Timber—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—\$3·75 to \$5·75 per M.
Cordwood—\$2·40 to \$2·64 per ton.

Trinidad,—March 6, 1909.—Messrs. Gordon, Grant & Co.

Cacao—Venezuelan, \$12·30 to \$12·75 per fanega; Trinidad, \$12·00 to \$12·75.
Cocoa-nuts—\$22·00 per M. f.o.b. for selected pealed in bags of 100 lb.
Cocoa-nut Oil—72c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to $8\frac{1}{2}$c. per lb.
Copra—\$3·10 to \$3·20 per 100 lb.
Dhal—\$4·65 to \$4·70 per 2-bushel bag.
Onions—\$3·00 to \$4·00 per 100 lb. (retail).
Potatos—English, 90c. to \$1·10 per 100 lb.
Rice—Yellow, \$5·00 to \$5·25; White, \$4·50 to \$4·90 per bag.
Split Peas—\$5·75 to \$6·00 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. VIII. No. 181. BARBADOS, APRIL 3, 1909. PRICE 1*d*.

CONTENTS.

The United States Department of Agriculture.

FROM the summarized account which was given in the editorial of the last issue, some idea will have been gained of the general organization and extent of the operations of the United States Department of Agriculture. It will now be interesting to consider in fuller detail the special work of the Bureau of Chemistry, and the Bureau of Soils.

The Bureau of Chemistry has been busily occupied recently in investigations relating to foods, its energies being largely directed to the problem of securing wholesome food supplies. The lines of investigation have been extremely numerous.

An immense amount of work has been done in organizing a system of food inspection, and of investigating and detailing methods of examination for the detection of adulterated or unwholesome foods, the great activity in this direction being rendered necessary by the introduction of new and far-reaching legislation on the subject.

All this has involved the examination of a vast number of food substances of the most varied kind, resulting in information valuable not only to the Bureau in question but to the world at large.

This Bureau has, amongst many other lines of work, investigated the effect on the human system of various substances used as preservatives of foods. During the year 1907 attention in this connexion was largely centred on the question of the use of sulphur as a bleaching agent in the preparation of foods, and of sulphurous acid and sulphites as preservative agents. With regard to sulphurous acid and sulphites, experiments carried out on twelve young men by this Bureau, show unmistakably the injurious effect of these preservatives, especially in reducing the number of red corpuscles in the blood.

The Bureau of Soils is an offshoot of the Bureau of Chemistry, the enormous extent and importance of the work relating to soils justifying the creation of a separate Bureau, which now has in hand some of the most important questions ever dealt with by investigators.

The growth of the population of the United States demands that new land shall be available for agricultural development, and one of the most important duties of this Bureau, therefore, has been the organization of a soil survey which shall indicate the character and potentialities of large areas, including both land already occupied and that yet awaiting development. In this way up to June 1907, there had been surveyed 139,247 square miles or 89,118,080 acres. This has resulted in a knowledge of the soil resources of the country far beyond what was ever conceived of before.

Soil maps and reports are prepared for each section of country examined and these are finding application in the most varied manner: the War Department, the Post Office Department, Life Insurance companies, as well as farmers, nurserymen, seeds-men, and agricultural implement makers find in them valuable stores of information.

The knowledge thus acquired has been of immediate and direct benefit to many agricultural industries. The production of fine-textured tobacco wrapper leaf in the Connecticut Valley has been rendered an assured possibility. In Texas and Alabama, it is now found that fine cigar tobacco of the Cuban type can be grown, while the tobacco industry of the States of New York, Ohio, and Virginia has been markedly improved by the knowledge rendered available.

The development of the dry lands of the West, the possibilities of irrigation schemes, the introduction of new crops, all depend largely on the work of the Bureau of Soils, and, proceeding with assurance as to the knowledge supplied, are adding rapidly to the wealth of the country.

Special investigations relating to viticulture, to rice growing, to apple growing, to fruit and truck farming, to the reclamation of swamp land, to timber raising, are all resulting in striking additions to knowledge—additions which mean development and increase of wealth, and an avoidance of waste which must—and indeed is—exerting a most important influence on the country at large.

In order that the knowledge so acquired may be brought home to the people interested, officers of the Department have organized a system of educational tours; over 100 meetings have been held in the different States, so that these tours with their meetings have made immediately available much information which might have taken a considerable time to diffuse by means of publications alone. In addition to this, special officers are detailed to advise farmers with regard to their crops and the best methods of dealing with their lands.

In certain districts, areas which were formerly under arable crops are reverting to less valuable pasture, or are being abandoned. The reasons for these changes, the capabilities of the land, and the possibilities of using land to good advantage are being carefully studied so that much waste will be avoided.

Much time and work have been expended in investigating problems relating to soil fertility, and some striking theories have been put forward. It is claimed that the infertility of soils is very frequently due to the presence of bodies deleterious to plant growth, and that these bodies may arise as excreta from the roots of growing plants, or from the decay of organic matter in the soil. It is claimed that these deleterious bodies may be removed or rendered harmless by such operations as tillage, draining, and manuring, and that in a large measure the beneficial effects of these operations are dependent upon their relation to these deleterious bodies. Only passing reference can be made here to the interesting line of investigations thus opened up, the ultimate outcome of which it is not yet possible to forecast.

In new countries, one of the greatest dangers confronting the farmer is the loss of his land by erosion. When the forest is cleared, or the surface conditions altered in a manner necessary to bring the land under cultivation, it not uncommonly happens that storm water, or even the water of moderate rains forms channels and gullies whereby the soil is carried away to an alarming and dangerous extent. It may indeed be claimed that practically all arable land is undergoing more or less erosion, but in new countries this erosion often takes on unexpected forms and threatens to ruin otherwise promising areas. Problems incident to this phase of agriculture are receiving the careful attention of the Bureau of Soils, and as a result, sound advice and explicit instructions are given to the farmers throughout the country, while special attention and help are afforded in aggravated cases. Here again is the possibility of avoiding enormous waste.

Few problems in Agriculture escape the activities of the Bureau of Soils, which stands—with the other similar organizations of the Department of Agriculture—as a striking example of the application of scientific methods of research to industrial needs.

SUGAR INDUSTRY.

Manurial Experiments with Sugar-cane in the Leeward Islands, 1907-8.

The manurial experiments conducted with sugar-cane in the Leeward Islands have already demonstrated, so far as plant canes are concerned, that artificial manures are not remunerative, provided that adequate supplies of pen manure or manures of a similar nature are obtainable. Manurial experiments with plant canes have, therefore, been discontinued, and such trials are now conducted only with ratoon canes. Pamphlet No. 57, in the series issued by the Imperial Department of Agriculture, entitled 'Manurial Experiments with Sugar-cane in the Leeward Islands, 1907-8,' has just been published, and gives in a brief form the results of the experiments conducted with the crop which was reaped last year. This work consists of the thirteen-fold repetition of the thirty-three experiments adopted since 1900 for use at the Experiment Stations in Antigua and St. Kitt's. The investigations relate to ratoon canes only, the plant canes which preceded the ratoons not having received any artificial manures, since the object of the experiments was to ascertain what artificial manures, if any, will prove remunerative with ratoon canes under the conditions obtaining in ordinary agricultural practice in the two islands in question. The work was conducted at four stations in Antigua and three in St. Kitt's, and in every instance, except one, the experiments were carried on in duplicate. There were thus about 400 experiment plots.

The results obtained on each of these 400 plots will shortly be published in the full report on these experiments that is about to be issued. The present pamphlet simply deals with the average results obtained on the plots as a whole.

The experiments comprise control plots receiving no manure, plots receiving pen manure, and plots receiving nitrogen, potash, and phosphates in various combinations. The results are given in the form of both tables and diagrams, and show the weight of cane obtained in each of the thirty-three plots, the increment due to the use of manure, the cost of the manure, the value of the increment, and the consequent profit or loss. It is to be noted that in every instance during the season 1907-8 the use of manure has increased the yield of cane, but not always to a profitable extent. As the profit depends upon the value of the cane, the profit or loss is calculated on two assumed values for canes, viz., 10*s.* 10*d.* per ton, a value formerly adopted for the purpose of comparison in these experiments; and 15*s.* 10*d.* per ton, a value approximating to that paid by the Antigua sugar factory for canes during the reaping season 1908.

For the details of the experiments the reader is referred to the pamphlet, but it may be here stated that, on the whole, nitrogenous manures in a quick-acting form, such as sulphate of ammonia or nitrate of soda, are necessary for the growth of ratoon canes, but that several factors control the question of profit. These factors are rainfall, cultivation, and disease; and upon these the successful use of manure is dependent. At St. Kitt's the soil is friable and easily kept in order, while root disease is not prevalent. The growth is therefore largely determined by the rainfall, and may be also largely influenced by manuring. At Antigua in many places the soil is stiff, and requires much effort to keep it in good tilth, while root disease is wide-spread. These factors, as well as an irregular rainfall, exert a profound influence on the yield of canes, and may entirely mask the effect of manure.

The experiments support the view, which is in accord with the experience of planters, that under average conditions of soil and rainfall, it is desirable, in order to ensure profitable returns, to manure ratoon canes with either sulphate of ammonia or nitrate of soda. When circumstances are such as are likely to result in moderate growth of the canes, it will be sufficient to use about 2 cwt. of sulphate of ammonia or $2\frac{1}{2}$ cwt. of nitrate of soda; but when there is a prospect of considerable growth, the quantity may be increased to 3 cwt. in the case of sulphate of ammonia, or $3\frac{3}{4}$ cwt. of nitrate of soda.

The growth of the ratoon canes is largely dependent on the thorough preparation of the soil and its manuring with pen manure when the plant canes are being planted.

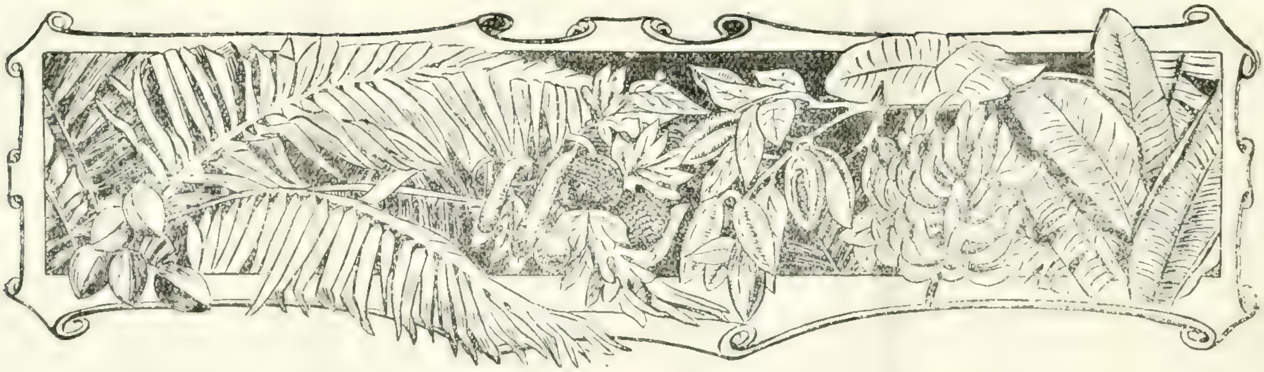
After discussing the results derived from the experiments, brief reference is made to the growth of the canes at the seven individual stations, and it is seen that these seven stations present marked differences, and corresponding differences are observable in the effect of the manures. In order to study these, reference must be made to the full report alluded to above, the issue of which may be expected shortly.

The experiments reported upon during the year under review amply support the view that nitrogenous manures are both remunerative and necessary. It is desirable to emphasize this, because previous results obtained in this series for three years afforded information which threw considerable doubt on the value of manures for ratoon canes.

When reporting on the results of these three years it was observed that the yields were seriously influenced by drought, and this circumstance, there is no doubt, gave rise to the apparent want of value exhibited by the manures under trial. It is satisfactory to observe, that the experimental work now reported upon shows clearly that, in average seasons, manures are of considerable use and value. All these experiments are therefore closely in accord with the practical experience of the planters, who are well aware that in bad seasons manures produce but little influence on ratoon canes, while in good seasons they are eminently beneficial.

In addition to the report on the influence of manures, the writers raise some pertinent questions relating to the effect of the operations of tillage commonly given to ratoon canes; these will be referred to in the next issue.

From statistics lately published in the *Official Gazette* of British Guiana, it is seen that the areas under rice cultivation, and the average returns per acre in the three counties are as follows:—Berbice: area under rice, 16,097 acres; average return, 23·1 bags per acre; Demerara: area under rice, 13,202 acres; average return, 21·2 bags per acre; Essequibo: area under rice, 8,552 acres; average return, 36·3 bags per acre. The higher average return obtained in Essequibo is due to the fact that two crops of rice were grown during the year over an area of about 4,000 acres in that county.



WEST INDIAN FRUIT.

COCOA-NUT CULTIVATION.

Cocoa-nut cultivation as a commercial industry can hardly be said to exist in the West Indian islands. apart from Trinidad and Jamaica—a matter which is somewhat surprising. in view of the good returns that are frequently obtained from cocoa-nut groves with the expenditure of very little outlay. The cultivation of this crop in Porto Rico was lately discussed by Dr. D. W. May. Director of the Experiment Station of the island, in an article appearing in the *Porto Rico Horticultural News*. Although cocoa-nut planting is not carried out on a systematic or extensive scale in Porto Rico at present, many good groves are in existence, and Dr. May appears to regard the industry as one of the most promising in the island. The following details have been abstracted from his article :—

In planting cocoa-nuts it is important to select only fine, ripe seed nuts, the produce of healthy, well developed trees, of good bearing capacity. The ripe nuts are first set out at distances of 1 foot from each other in holes 2 feet deep, and with about 2 inches of the surface of the nut exposed. It is important that this seed bed should be kept moist but not wet. After a period of from four to six months, the young seedlings will have reached a size at which they can be transplanted to the ground in which the trees are to grow. The seedlings should be set out at distances of 30 feet each way. It is a good plan to keep the soil around the young trees mulched with leaves and trash, as this has a helpful effect on the growth of the palms.

The cocoa-nut palm responds well to cultivation and applications of manure. The practice of green manuring is frequently recommended for cocoa-nut groves, and it is found that by growing crops of beans between the trees, and digging the vegetation into the ground, growth of the palms is considerably hastened.

Cocoa-nut palms bear transplanting well, and it is recommended that if the young trees do not appear to be flourishing, they may be taken up, some manure and trash worked into the hole, and the trees replanted.

The period at which the cocoa-nut palm begins to bear fruit varies from five to ten years, depending largely upon the location and the care given to it.

The fact that cocoa-nut palms are so commonly seen growing along coast-lines and sea-beaches indicates that the trees will do well in sandy soils. Probably, however, they flourish best of all on deep alluvial lands, such as those found near the mouths of rivers. A clay soil is very unsuitable for this crop. Since the saline surroundings of the sea-coast is so congenial to the palms, it is customary in many countries when the trees are planted inland, to place several pounds of salt in the holes in which the seedlings are set, with the object of making up for the want of saline constituents.

A good cocoa-nut tree should yield an average of 100 nuts per year, and under favourable conditions, 200 have been obtained. Taking the whole island of Port Rico, however, a return of sixty-five nuts per tree is probably about the average figure obtained, and no doubt conditions are very similar in the British West Indian islands. This low return indicates the general want of care and attention from which the industry is suffering.

The cocoa-nut palm will continue in bearing for so long as seventy or eighty years. During the early years of its growth, catch crops of various kinds, as provision crops, etc. may be planted between the tree or, better still, leguminous plants, as cowpeas or velvet beans.

PINE-APPLE CULTURE IN THE HAWAIIAN ISLANDS.

Pine-apple cultivation has been found to be highly profitable in the Hawaiian Islands, and at present some 3,000 to 4,000 acres are under the crop. The area is expected to increase, and Mr. Jared G. Smith, the Officer-in-charge of the Hawaiian Experiment Station, anticipates that there will be at least 10,000 acres planted with pine-apples in the next five years. Some of the fruit is consumed locally, a good proportion canned and exported, while the remainder is shipped in the fresh state to San Francisco, and other markets on the Pacific coast of America. In a paper entitled 'Agriculture in the Hawaiian Islands,' recently published by Mr. Smith, the accompanying details are given as to the methods of pine-apple cultivation followed in Hawaii :—

Clean cultivation is practised by growers of pine-apples in these islands. The land, if virgin soil, is ploughed, cross-ploughed, and harrowed, and is planted with suckers or tops. The plants are set out at the rate of from 4,000 to 10,000 per acre. Three methods of planting are in vogue. Where the object is to grow fresh fruit for shipment, the plants are set out in rows 6 feet apart, and at distances of from 20 to 24 inches in the row, or at the rate of about 3,600 plants per acre. This distance between the rows permits the cultivation of the crop with horse or mule labour and machinery, and leads to the production of large attractive fruits. Plants set out at this rate of spacing often produce fruits averaging from 6 to 9 lb. each.

For canning purposes, smaller fruits are more desirable, and smaller size is to a certain extent ensured by closer planting. The plants are therefore set out in rows 4 feet apart, and at distances of about 2 feet from plant to plant, which requires about 6,000 plants per acre ; or, at distances of 2½ feet by 2 feet, when 10,000 plants per acre are required. If there is a good stand, and the plants are in a healthy condition, about 90 per cent. may be counted on to bear fruit in from eighteen to twenty-four months after planting.

When an acre of land is planted with 6,000 pines, the first crop will average about 10 tons. The second, or ratoon crop, will be somewhat higher, because many of the plants produce two suckers, both of which bear fruit. The yield of the ratoon crop of pines has run as high as 20 tons per acre under exceptionally favourable conditions.

The cultivation consists in keeping the soil between the rows in good condition and free from weeds. The pine-apple is a crop that gives best results with perfectly clean cultivation. Where the plants are set in rows 4 feet apart, all of the cultivation for the first twelve or fifteen months may be done with horse or mule labour. When the plants flower, and as they begin to ripen their fruits, the leaves of the plant spread out, so that it is no longer possible to take machinery between the rows, and after that time hand labour is necessary. The cost of production in the Hawaiian Islands varies from $10 to $15 per ton of pine-apples, and at the canneries, prices of from $20 to $27 per ton are paid for the fruit. If the fruit is shipped fresh to the Pacific or Eastern markets, prices as high as from $200 to $240 per ton may be realized.

The chief variety of pine-apple cultivated in Hawaii is the Smooth Cayenne, which is the kind grown in the Azores, and the one which commands the highest price in the London market. This variety does not do well in the West Indies, where the Red Spanish is the most popular and satisfactory kind to grow. The Red Spanish is also grown to a small extent in the Hawaiian Islands. It may be added, that the experiments in shipping pine-apples, conducted by the Hawaiian Experiment Station, have shown that this fruit, if carefully handled and packed, can be shipped successfully to distances of at least 5,000 miles.

THE PLANTING OF FRUIT TREES.

Although it might seem that the results of experiments as to methods of cultivation conducted under English conditions can have little bearing on the problems presented by tropical agriculture, yet the experimental work carried out at the Woburn Fruit Farm of the Duke of Bedford, in England, includes investigations, which have more than a local interest, and are indeed, in some cases, of universal importance. Such an investigation is one lately described in the ninth annual report of the Woburn Fruit Farm. This deals with the methods of planting fruit trees, and it is notable that the results of the work point to conclusions that are in direct opposition to principles which have long been accepted without question by fruit growers in many countries. The following particulars have been abstracted from a review of the experiments in question which appeared in *Nature* of February 25 last:—

Fruit growers in England and other countries have long held the belief, which, however, does not appear to be based on any experimental investigation of the matter, that fruit trees must be planted in a somewhat elaborate manner, and according to certain fixed principles if success is to be attained. The soil is thoroughly prepared ; a wide, but not deep hole is made in which the roots are spread out in all directions, and arranged near the surface, with a slight upward bearing at the ends. It has always been customary, too, to observe many precautions in filling in the soil. Small quantities of finer earth are first worked in among the roots, hollow places caused by archings in the stouter roots are filled up, and then the rest of the soil is put in, trodden carefully down, and the whole left to the compacting influence of rain.

The investigations made at the Woburn Fruit Farm, and in one or two other districts, by the same experimentors, point to the conclusion, however, that all the elaborate precautions mentioned above, are not only useless, but actually detrimental to the best development of the young tree, and especially of its root system. The experiments, which seem convincing enough, indicate that the proper way to plant a fruit tree is to double the roots up anyhow, and stick the tree in, throw in the soil, and ram it down as if one were fixing a gate-post.

According to the figures given in relation to the experiments, the results in the case of 59 per cent. of the trees were in favour of ramming down the soil, 27 per cent. showed no difference (i.e., all the elaborate detail of the ordinary way of planting was simply a waste of time), and in only 14 per cent. of the cases were the results unfavourable to ramming.

Examination of the trees shows that ramming has led to a copious development of fibrous roots. Direct experiments showed that the fibrous and small roots produced in the nursery before lifting play no great part as roots during the subsequent life of the tree ; the important point is to induce fresh root formation, and the ramming does this more rapidly than the orthodox method of planting. No harm was done, and sometimes even good resulted, when the old roots were deliberately damaged before planting.

These results of the Woburn work have, of course, not been received altogether favourably by fruit growers in England, but their publication will undoubtedly lead to further investigation on the subject. The points elicited are commended to the notice of persons who are planting or about to plant fruit trees in the West Indies.

Curators of Botanic Stations especially, would be well advised to make experiments, if only on a small scale, similar to those described. In order to test the application of the Woburn results to the planting of oranges, limes, mangos, cacao, etc., in these islands, it would be sufficient to set out a short row of each kind of tree, alternate trees in the rows being planted according to the old and the new methods, respectively. Where space is not limited, these trees need not be regarded as part of the permanent crop, but may be dug up later, in order to compare the effects of the two methods of planting upon the development of the roots.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows, under date of March 15 last, in reference to the sales of West Indian Sea Island cotton :—

During the past fortnight a good business has been done in West Indian Sea Island cotton, and prices are steady. The sales include Anguilla and St. Croix at $12\frac{3}{4}d.$ and $13d.$; Barbados, $12\frac{1}{2}d.$ and $13\frac{3}{4}d.$; Virgin Islands, $13d.$; St. Kitt's and Nevis, $13d.$ and $14d.$; and St. Vincent, $14\frac{3}{4}d.$ and $16\frac{1}{2}d.$ The total sales amount to about 560 bales, of which quite a half were St. Vincent.

Although the Charleston stock is now reduced to about 1,000 bales, the large quantities sold have simply been transferred into spinners' hands for stocking purposes. We therefore think that prices, although not likely to go lower, will probably not advance materially this season. Unless trade improves considerably, consumers can afford to be indifferent about the market for some time to come.

COTTON CULTIVATION BY PEASANT PROPRIETORS.

Praiseworthy efforts are being made by the Nevis Agricultural and Commercial Society to encourage the peasant holders of the island to cultivate their cotton plots according to the most approved methods.

For this purpose, in the past season a special competition was arranged among the peasant proprietors, and money prizes of 30*s.*, 20*s.* and 10*s.* respectively, were offered for the three best cultivated cotton plots. Over twenty entries were made in this competition, the prizes for which were awarded at the Agricultural Show held at Nevis on January 28 last.

The Agricultural Instructor at Nevis (Mr. John O. Maloney) supervised the laying out and planting of the cotton plots, and the final judging to determine the prize cultivations was made by Mr. Maloney and Mr. Mills, an experienced planter.

The judges stated that the competition had a stimulating effect on the amount of care and attention given to their plots by the small holders. Every effort was made to adopt and carry out the most rational methods of cultivation, and the results were so generally satisfactory that it was difficult to discriminate between the several claims for the prizes. Finally, it was decided to divide the second prize into two equal parts, so that one prize of 30*s.* was awarded, together with three prizes of 10*s.* each. The prize-winners were: 1st prize, Henry Scarborough; 2nd prize, divided between John Hanley and James Brown; 3rd prize, John Stanley.

It is hoped that the effects of this competition may not be confined only to the past season, but that, since the peasant proprietors have had an object-lesson in the good results of careful methods of cultivation, they may be induced to continue these methods in the coming year.

COTTON GROWING AT JAMAICA.

The evidence elicited by the Committee on Cotton Growing lately appointed at Jamaica is unfavourable to the proposition that any encouragement should be given by the Government to stimulate the industry. The unsuitability of the climatic conditions which prevail in many parts of the island where cotton growing has been tried, the lack of knowledge on the part of the peasantry as to the best methods of cultivation and treatment, the prevalence of insect pests, and the fact that the land might, in preference, be utilized for crops which demand less attention and give more profitable returns, were all brought forward as arguments against any effort being made to encourage cotton growing in the colony.

The conditions at Jamaica are not altogether comparable with those that exist in some of the smaller West Indian islands, and agriculturists in the former island possess the advantage that they have a larger choice of crops at command than planters and small holders at Antigua, St. Vincent, Barbados, etc. Not only sugar-cane, but bananas, oranges, cocoa-nuts, cacao, coffee, cassava (for starch manufacture), ginger, pimento, etc., are grown on a commercial scale, and since they all offer a more or less profitable return to the planter and peasant holder, they are preferred to a new cultivation like cotton. It is apparent, too, that in districts of the island where it was at first hoped to establish cotton growing on an extended scale—as in Vere—the weather conditions lately have been peculiarly unsuitable for the crop.

It was pointed out that the peasant settlers of Jamaica frequently cultivate plots of land situated some distance from their homes, and often do not visit their holdings more than once a week. This fact made them unwilling to grow cotton, a crop which needed a good deal of attention, and which demanded more frequent visits, and necessitated greater care than they were in the habit of giving to their plots.

Stress was also laid upon the fact that settlers and others who took up cotton growing in the past had suffered from lack of instruction, and that if any steps were taken to encourage the industry, one of the first things necessary would be to provide facilities for giving teaching and demonstration as to the best methods of cultivation and treatment.

At a meeting of the Board of Management of the Jamaica Agricultural Society held on January 28 last, the above evidence was considered, and although its discouraging nature was recognized, it was decided to expend a sum of £10, in the coming financial year, on experiments in cotton growing carried out on peasants' plots, under the guidance of the Agricultural Instructors, in suitable parts of the island.

Although present conditions in regard to this matter may not now appear promising at Jamaica, yet, undoubtedly, no pains should be spared, and every effort made to ascertain the possibilities of Sea Island cotton cultivation in the island, before deciding to abandon all attempts to establish so valuable an industry.

GUANO.

The varying prices at which guano may be purchased on the market indicate the varying quality of the material, and this form of manure is one which should only be purchased on the results of analysis.

Guano—as is generally known—is the more or less dried excrement of sea birds, and the largest deposits of this valuable fertilizing agent are found on the coasts of Peru and of the adjacent islands. Guanos are also found on certain islands off the south-west coast of Africa. The manure in question is peculiarly useful, in that the best grades supply not only phosphates to the soil, but also nitrogen and a small proportion of potash. The original deposits always contained a fairly rich percentage of nitrogen. If the guano was deposited in the dry, rainless districts of Peru, the nitrogenous matter remains indefinitely in the excrement, but in rainy regions, this is decomposed and washed away in course of time, and the resulting material is, of course, insoluble, and valued almost solely for the phosphate content.

In passing, it may be said that the best Peruvian deposits of guano have been exhausted, and as a consequence, the grades now exported are inferior to those shipped twenty and thirty years ago. As already indicated, the composition of the manure varies greatly; and present imports from Peru may contain from 2 to 10 per cent of nitrogen, 10 to 30 per cent of phosphoric acid, and from 0·2 to 3·4 per cent of potash. Such material as sand may exist in the manure to from about 8 to as much as 30 per cent.

In a nitrogenous guano, the nitrogen present exists in a number of forms, e.g. uric acid, and the ammonium salts of oxalic, uric, sulphuric, phosphoric, and carbonic acids, etc., as well as in compounds of organic nature. As a result of this complexity of composition, it follows that while some of the contained nitrogen is immediately available as plant food, other compounds will have to undergo bacterial changes in the soil before becoming available for this purpose. This peculiarity renders nitrogenous guano a manure especially well suited for application to a crop for which it is desirable to provide a supply of nitrogen that will gradually become available as the growing plants require it.

What is known as 'equalized' or 'rectified' guano represents an attempt on the part of manufacturers to bring up the composition of guanos of lower grade, more especially those from which the soluble nitrogenous constituents have been washed out by rain, to that of the richer grades deposited in dry districts, by the addition of nitrogen compounds such as sulphate of ammonia. Such manures, while containing nitrogen in good forms, cannot entirely substitute the original guanos, owing to the impossibility of adding forms of nitrogen identical with those existing in the natural product, and which, as already indicated, give a peculiar value to the best guano, by their gradual availability.

The phosphates in this manure are chiefly present as phosphates of calcium. In nitrogenous guanos, however, a proportion exists as ammonium phosphate, which is a salt readily soluble in water.

Since the great proportion of the calcium phosphate present is the insoluble, tribasic form, guanos are frequently treated with small quantities of sulphuric acid. In the 'dissolved guano' which results, the phosphate is changed into the soluble form, similar to that which exists in superphosphate. The nitrogen, too, has become fixed as sulphate of ammonia, and is in no danger of being lost by passing off as a gas.

Commercial Peruvian guano should be in a dry, finely-divided state, and if squeezed in the hand should not cling together in a sticky mass. The colour should be rather light, and the smell not very pungent, for if so, a loss of ammonia is taking place.

LIME AND CACAO EXPORTS FROM DOMINICA.

In the course of the address given by the Administrator of Dominica (Hon. Douglas Young, C.M.G.) to the Legislative Council of the island on March 18 last, it was mentioned that the year 1909 had been a prosperous one for Dominica, and that there were abundant signs of the steady development of the island's fertile resources. The total trade had increased from £252,893 in 1907 to £265,127 in 1908. There had been an advance in value of £19,621 in the imports for local consumption, while the exports of local produce showed a falling off of £26,462 compared with the previous year. This decline in value of the export shipments is explained in the following extracts from the address:—

Of the exports from Dominica in 1908, lime products represented £50,954, and cacao, £30,362. The reduction from £77,407 in the previous year in the value of the lime products shipped is not due to a less yield in 1908, but to the reduced market prices obtained during that year compared with 1907, when the price of lime juice was exceptionally high. The average figure realized for concentrated juice in 1907 was about £22 per hogshead, while in 1908 it fell to about £15 per hogshead.

The lime crop of Dominica for 1908 reached about 310,000 barrels, an increase of 38,000 barrels on the previous year. To no small extent may this increase be attributed to the yield of increased areas under cultivation. As in previous years the value of the shipments has been computed at the time of export on the net estimated value of the produce, but if the price realized in the overseas market be taken, the lime products of Dominica for the past year may be valued at £80,000. The citrate of lime industry shows a small advancement on the previous year. During 1908, 2,520 cwt., valued at £8,164, were shipped abroad.

The amount of cacao exported from Dominica in 1908 was 9,820 cwt., compared with 11,628 cwt. in the previous year. The Administrator was not prepared to say that the shortage thus shown is entirely due to a short crop for the year. The crop was not so full as that of 1907, but it is thought that the lateness of the 'Christmas' crop is partly responsible for the shrinkage, and that in consequence a part of the 1908 crop will be included in the export of the present year.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The chief lines of work, and the most important problems that are receiving the attention of the Bureau of Chemistry and Bureau of Soils of the United States Department of Agriculture are briefly discussed in the editorial.

On page 99 will be found a review of the results of manurial experiments carried out with ratoon canes at Antigua and St. Kitt's in 1907-8.

Cocoa-nut cultivation, and the methods adopted in pine-apple growing in the Hawaiian Islands, are dealt with on page 100. Some interesting experiments on the planting of fruit trees are reported on page 101.

A competition among peasant cotton growers at Nevis is expected to have useful results. At Jamaica cotton growing is not at present regarded with much favour(page 102).

Useful information as to the composition and character of guano appears on page 103. Under 'Insect Notes' (page 106) it will be seen that a new theory is brought forward to explain the absence of the Anopheles mosquito from Barbados.

Attention is drawn to the articles dealing with transmission of disease by milk, and 'foot-and-mouth' disease, that appear on pp. 109 and 111, respectively.

Agricultural Bank at St. Vincent.

The new Agricultural Bank at St. Vincent, to which reference was made in the last number of this journal, was started on March 3 last. It would appear, however, that but a comparatively small number of the 5,000 shares which it is proposed to issue has so far been taken up.

The number of shares in the Bank which a single individual may hold has been limited to 100, and the management will be entrusted to a Board of Directors, consisting of seven persons, who will be elected yearly by the shareholders. Any shareholder possessing not less than ten shares will be eligible for election as a Director.

It is hoped that this new enterprise will prove a success, since such an institution may undoubtedly prove to be of great benefit to the small holdings class of the island.

Lemons in the United States.

West Indian lime growers and others interested in the possibilities of the industry, should receive encouragement from the figures showing the annual imports of lemons into the United States, since it is admitted on all hands that the lime is, at the least, equal to the lemon for all purposes for which the fruit can be utilized. The United States now import each year about 150,000,000 lb. of lemons, most of which come from Sicily. Lemon production has, however, undergone considerable development in California of recent years, and latest estimates place the annual output from that State at about 100,000,000 lb. The fruit is stated to be of high quality, and to be in great demand in the States in preference to the Sicilian product. An article dealing with various phases of lemon culture in California, and the methods of picking, washing, colouring, curing, and storing the fruit was published in the *Year-book* of the U. S. Department of Agriculture for 1907.

Colonial Fruit Show in London.

The Colonial Fruit Shows held in London by the Royal Horticultural Society have done much to make West Indian products better known in Great Britain. Last year three shows were held, but only one exhibition has been arranged for 1909, which will take place in December next. In this connexion the *West India Committee Circular*, of March 2 last, says: 'The dates of the show—December 1 and 2—should suit the West Indies extremely well, as there is a Royal Mail Steamer due to arrive at Southampton on the previous Monday, November 29. It is hoped, therefore, that several of the West Indian colonies will decide to take part in the exhibition, and that the Permanent Exhibition Committees will communicate with the Secretary of the West India Committee, who will be glad to make the necessary arrangements on their behalf. There is no charge whatever for space. On the first day of the show, Professor Robert Newstead, who recently visited Jamaica, is to read a paper on "Some West Indian Insect Pests."'

Supports for Yam Vines.

The practice of 'staking yams,' i.e., of providing stakes or other supports on which yam vines may climb, is commonly followed in islands where the existence of abundant woodlands renders the stakes easily obtainable. It is evident that 'staking' is especially instrumental in increasing the yield on retentive soils, and where the rainfall is heavy. When supports are provided for the vines, closer planting can be adopted, and the land economized in this way. An experiment bearing on this point was carried out last year at the St. Lucia Agricultural School. Two kinds of yams—'Lisbon' and 'Bottle-neck Lisbon'—were grown both staked and unstaked. The 'Lisbon' yam yielded at the rate of 3·2 tons per acre when unstaked, and 6·7 tons when staked. The staked plot of 'Bottle-neck Lisbon' gave at the rate of 4·3 tons per acre, and the unstaked plot only 2·4 tons. The deficient yield from the unstaked plants is due to the fact that, when planted at ordinary distances, the yam vines are produced in such profusion that it is impossible for light and air to have proper access, and hence full development cannot take place.

Good Varieties of Yams.

Experiments with a number of varieties of yams have been carried on annually for many years past both at Antigua and St. Kitt's, and as a result, several kinds have now definitely proved themselves to possess a crop-yielding capacity above the average. Among these are 'Light Red,' 'Sealed Top,' 'Bottle-neck Lisbon,' 'Bugle Horn,' and 'Cush Cush.'

At Antigua the yields have been as follows, on the average of the past five years: 'Light Red,' 10,780 lb. per acre; 'Sealed Top,' 7,700 lb.; 'Bottle-neck Lisbon,' 7,326 lb.; 'Cush Cush,' 6,314 lb., and 'Bugle Horn,' 6,182 lb. It should be mentioned that these results are in every case, the average from two plots, one of which was manured, while the other was unmanured. On the whole, however, there was little increase in the crop consequent upon manuring.

The order of merit of the different varieties has been very similar at St. Kitt's to that at Antigua, but higher yields have been obtained in many cases. Thus, 'Light Red' gave a return at the rate of 14,626 lb. of yams per acre, 'Sealed Top,' 13,849 lb. per acre, and 'Cush Cush,' 8,781 lb. per acre.

Cotton Seed Selection Experiment.

An experiment in seed selection, the results of which should be of interest to cotton growers, is described in the last annual report of the Curator of the Montserrat Botanic Station.

It is known that clean, black cotton seeds invariably bear a lint which is poor and wasty in character. Further, it has been observed that the character of the seed in the case of any given Sea Island cotton plant is uniform, i.e., clean, black seeds and 'fuzzy' seeds are not found on the same plant. It was desired to ascertain, therefore, whether the clean black, and the 'fuzzy' seeds reproduced themselves true to type or not. Two plots were prepared, and one was sown with clean, black cotton seeds, while the second was planted with seeds having an average amount of 'fuzz.' The results were that, on the first plot, out of 170 cotton plants, 120 bore seeds which were of a clean black character, and similar to those sown; forty-five plants had seeds with a slight amount of fuzz, and five plants with a fair amount of fuzz. On the second plot (sown with fuzzy seeds), out of 150 plants, 134 bore seeds similar to those planted, in that they had an average amount of fuzz. The remaining sixteen plants yielded seed having little or no fuzz.

This experiment shows the advisability of removing all clean, black cotton seeds before planting, as in this way only a small percentage of such seed may be expected from the resulting plants.

'Black Blight' at Grenada.

'Black blight' is probably in more general evidence on numbers of different trees and plants at Grenada than in any other of the West Indian islands. The so-called 'blight' itself, it will be remembered, is rather a symptom than a cause of damage to plants on which it is noticed, since the fungus is found in association with scale insects, on the excreta or 'honey-dew' of which it feeds, doing no direct harm to the trees.

The Agricultural Superintendent at Grenada reports that much has lately been done by individuals in the island in the way of clearing their estates of blight. Useless trees attacked with it have been destroyed, others have been lopped and white-washed, while in a few instances some spraying has been done. The great difficulty experienced—as in all matters of this sort—is to command any co-operation in attacking the pest, and work done on certain estates is often spoiled by neighbours who will do nothing.

Cows and Their Milk Yield.

Experimental work carried out in many parts of the world have now thoroughly established the fact that the milk-yielding capacity of a cow is practically pre-determined by the breed and strain of the animal, and that while the milk yield may vary in quantity or quality within narrow limits as the result of different systems of feeding, yet food is a factor of secondary importance in this connexion. The most plentiful and well-balanced rations will not enable a Holstein cow to give the rich milk of a Jersey, and, on the other hand, if Guernsey or Jersey cows are fed on a poor diet, although their milk may decrease in quantity, yet the amount given is still rich in butter-fat. Food has a greater influence upon the quantity than the quality of milk yielded. Every cow has a certain maximum capacity which, as already mentioned, is dependent on its strain and natural character. Under proper conditions, and with suitable feeding, this maximum is reached, and beyond that, food has no influence. This indicates the importance of good breed and strain in milking cows.

INSECT NOTES.

A Parasite of the Cotton Worm.

The letter which is published herewith from Mrs. Patterson, of St. Vincent, is a response to a recent article in the *Agricultural News*. The specimen referred to in the letter has proved to be the same as that discussed in the article mentioned.

It would be very useful if other readers would make careful observations on the habits of insect pests and their natural enemies, and communicate their observations to the Head Office of the Imperial Department of Agriculture. The following is Mrs. Patterson's letter:—

The article 'Some Parasites of the Cotton Worm' on page 74 of Vol. VIII, No. 179, of the *Agricultural News*, reminds me that in the season 1906 some parasites were hatched here, which, from the specimen sent, you will see were *Chalcis ovata*, Say.

As far as my observation went, the method of attack was somewhat different from that described by Mr. Jemmett. Certain larvae of the cotton 'worm' at the end of the larval period were seen to be of a red purple colour, and it was these which after pupating yielded the *Chalcis* imago. I hope to verify this during the coming season.

Millions and Malaria.

The following notes which have been communicated by Dr. C. W. Branch, M.B., C.M., of St. Vincent, may be of interest to the readers of the *Agricultural News*.

Dr. Branch refers to the theory which has been advanced that the millions, on account of their habit of feeding on mosquito larvae, are wholly responsible for the absence of the malarial mosquito from Barbados.

It will be seen by reference to the *Agricultural News*, Vol IV, pp. 127 and 138, that this theory was strongly advocated by a correspondent in 1904-5. As a result, considerable interest has since been excited in connexion with the part played by millions as the natural enemies of mosquitos.

This Department was called upon for information with regard to the habits of millions, and the possibility of transporting them to other colonies and other countries, and the booklet referred to by Dr. Branch (Pamphlet Series, No. 55, Imperial Department of Agriculture) was prepared in answer to this demand for information, and not in support of any theory. The statement is made that millions are very efficient natural enemies of mosquitos, and that they will probably be found useful in reducing the numbers of mosquitos wherever they can be established.

The Department of Agriculture has lately issued a booklet on 'Millions and Mosquitos,' which seems to have had its origin in the suggestion that the 'millions' are to be credited with the absence of anopheline mosquitos, and consequently of malaria, from Barbados.

This idea has perhaps been somewhat hastily accepted without full consideration of the bionomics of the animals concerned, and a dangerous sense of security may be engendered. 'Let him that thinketh he standeth take heed lest he fall.' Notwithstanding free immigration, Mauritius was free of malaria till the year 1866, when the population was afflicted with an epidemic which, it has been estimated, killed one-fifth of the population. It is presumed that anophelines must have been introduced just before that year.

Millions undoubtedly devour all mosquito larvae (anophelines included) that they can get, and are therefore useful for stocking all permanent collections of water which cannot be screened—ponds, artificial basins, uncovered reservoirs, etc. In Barbados such waters will breed *Culex fatigans*, which in spite of millions is too common, and does considerable harm as an intermediate host for *Filaria bancrofti*, the parasite of 'fever-and-ague' and 'Barbados leg.' *Stegomyia fasciata* will not usually breed in such large collections of water, but, as is recognized, prefers bottles, tins, and holes in rocks and trees.

The malaria bearer of these parts, *Cellia* [Anopheles] *argyrotarsis*, breeds in small puddles of dirty water with green algae, such for instance as occur on the margins of streams in dry weather, in the beds of occasional water-courses, and in swampy ground; in fact, in places where millions do not naturally occur, and in which they cannot conveniently be put. Mr. W. Patterson of the Agricultural Department in this island [St. Vincent], has actually found *Cellia* in a puddle 4 inches wide and 2 inches deep.

In countries where the malaria bearers breed in suitable water, millions no doubt will limit the prevalence of malaria, but they will not do so in the West Indies.

The absence of *Cellia* from Barbados must be ascribed to some other cause than the millions. Possibly some voracious aquatic insect is particularly abundant in the puddles which suit *Cellia*. But it must be feared that such alone cannot absolutely exterminate a species of mosquito.

The truth no doubt lies in the oscillations of the Antillean continent. Barbados on the coastal plateau has been often completely submerged and only slowly regains a fauna. By luck, the *Cellia* has not been introduced since the last submergence. The fauna and flora of Barbados are limited in comparison with those of the neighbouring lofty islands which have never been completely submerged.

It is 'up to' the Barbadians to see that *Cellia* is not accidentally introduced by means of imported cases of plants. The fumigation demanded by the Department of Agriculture is their protection.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from St. Lucia on March 23 last, by the R.M.S. 'Esk.' Mr. Ballou also returned from Montserrat by the same vessel.

The Commissioner left Barbados on March 30, by the R.M.S. 'Eden,' for a visit to Dominica. He will leave the latter island on April 5, and proceed to Antigua by the C.L.S. 'Ocamo.' Dr. Watts is not expected to return to the Head Office until April 20.

FLOWER AND FRUIT STRUCTURE IN THE PAPAW.

Among the papers summarized in the *Experiment Station Record* of November last is one which was published in the *Bulletin of the Torrey Botanical Club* (No. 3, 1908), and deals with a study that has been made of the papaw (*Carica papaya*) to determine whether the development and structure of the fruit might be correlated with the structure of the flower.

In this study notes were taken in relation to a number of flowers on the same tree. In this connexion it may be mentioned that the papaw plant is normally dioecious, i.e., male flowers only are produced on some trees, and female flowers only on others; in rare cases, however, perfect or bisexual flowers are produced on either male or female trees.

There was found to be a distinct correlation between the formation and size of the fruit and flower characters. Where the ovary was small and slender, with rays in the stigma nearly aborted, the fruits grew comparatively small, cylindrical, almost solid, with exceedingly small seed cavity, containing few seeds; while where the pistil was normal or nearly so, the fruit grew large, more or less angular, with the apical end distended, and the cavity containing a large number of seeds.

The author thinks that—looking at the matter from the commercial point of view—the form of papaw flower with small, slender ovaries is to be preferred, since it yields a fruit that is more easily packed. Under the usual methods of propagation, a large production of seedlings is not considered profitable, and an attempt to originate a distinct variety of papaw would probably necessitate hand pollination, inbreeding, and rigid selection for several generations.

CHINESE VEGETABLE TALLOW.

An interesting tree, which is native to China and Japan, but which has been introduced into many other parts of the world, as India, Cochin-China, South Carolina, the Soudan, etc., is *Sapium sebiferum*. It will be remembered that one or two species of the Sapium genus are indigenous to British Guiana, Trinidad, etc., (e.g. *S. Jenmani*, *S. aucuparium*), and are valuable on account of their rubber-yielding properties. *S. sebiferum* also has an economic value, this being due to the fatty matter surrounding the seeds, which is utilized for a number of purposes. The following interesting information is taken from an article which appeared in a former number of the *Indian Agricultural Ledger*:—

The Chinese tallow tree is from 24 to 30 feet high, with a whitish-grey bark. The tree is ornamental in appearance; the leaves are dark-green, which redden before they fall. Flowers are borne in red terminal spikes, and seeds are produced about November and December. *S. sebiferum* is readily propagated by cuttings, and is cultivated on a large scale in China, where the leaves are reported to be used in the preparation of a black dye.

The fatty or waxy matter obtained from the layer surrounding the seeds of *S. sebiferum* is used in China in place of animal tallow for the manufacture of candles, soap, and in cloth-dressing. The candles made from this vegetable fat with a small admixture of insect wax are reported to be white in colour, and to burn with a clear, inodorous flame, without smoke. This vegetable tallow melts at a temperature of about 40°C. It is hard, brittle, and almost colourless, and does not leave a grease spot on paper.

In addition to the solid fat surrounding the seeds, a brownish-yellow oil is obtained from the endosperm or kernel, which is used as a burning oil, and also in the preparation of varnishes, on account of its drying properties. This oil is extracted by heating after the outside tallow has been removed; it is light and strong-smelling, and turns a yellowish colour on standing.

The mixture of the two fats—the outside tallow and the oil from the kernel—has a melting point of from 26° to 32° C., and is stated to be a good substitute for lard for industrial purposes.

Vegetable tallow is exported from China in hard, white cakes, weighing about 1 cwt. These shipments have shown a large increase of late years, having advanced from 48,735 piculs [1 picul=133⅓ lb.] in 1905, to 127,296 piculs (valued at £187,220) in 1907. Of this latter quantity, about half went to the United Kingdom.

It may be added that the vegetable tallow tree has been introduced into Cuba, Porto Rico, and Martinique, and numerous specimens are to be seen in those islands. It is hoped to obtain cuttings or seeds of this interesting tree for propagation in the Botanic Gardens of the British West Indies.

TAPPING PARA RUBBER TREES.

Considerable difference of opinion still exists as to the most suitable method by which the tapping of Hevea rubber trees should be regulated. What is required, of course, is a simple and practical method which will reduce to a minimum the time required for recovery of the tree, and at the same time assure a large yield and low cost of manipulation.

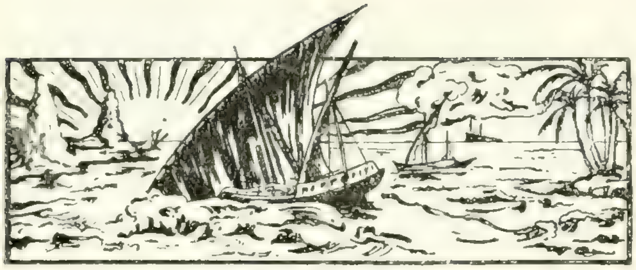
This matter was discussed some time ago in the *Journal d'Agriculture Tropicale*, where the opinions of different authorities on the subject were quoted.

Mr. J. C. Willis, of Ceylon, states that tapping should not take place until the tree measures 18 inches in girth at 3 feet from the ground, and should then only be done lightly. Mr. Herbert Wright, however, would have the minimum circumference at the time of tapping, to be 2 feet or more.

Various observations have been made also as to the time for the full recovery of the bark after tapping. This is placed at from two to four years by different authorities. Tapping every other day is generally regarded as being better than daily tapping. No definite conclusions appear to have been arrived at as to the possible advantages of allowing still longer intervals to elapse between tappings. There is need of experiment work also to settle the question as to whether the frequency of tapping would best be varied in the wet and dry seasons respectively, or should take place at regular intervals throughout.

The different systems under which the cuts are made for drawing off the latex (herring-bone, half-spiral, spiral, and V cuts, etc.) are described. It does not appear that any decision is arrived at with regard to the respective merits of these different methods, but it is pointed out that the full spiral is most likely to affect the vitality of the trees.

In all cases of tapping for rubber, the point to be guarded against is damage to the cambium. This is far more prejudicial to the trees than the mere removal of latex.



GLEANINGS.

Sweet potatos have lately been selling at as low as 1s. 3*d*. per 100 lb. on the Barbados market. It is suggested that this is in consequence of restricted exportation due to quarantine.

It may be of interest to mention that Mr. Smith of Yorks estate, Antigua, has for disposal a cotton gin, baling-press, and horse gear for two horses, none of which have been used so far.

The receipts from the sale of plants, seeds, fruit, etc., at the Grenada Botanic Station during 1907-8 amounted to £54 2*s*. 3*d*. A total of 1,154 economic plants were distributed locally, consisting chiefly of cacao and rubber.

Ten or twelve pine-apple canning factories are in operation in the Hawaiian Islands and others are in course of erection. The demand for Hawaiian pines in the United States is stated to be at present greater than the supply, owing to the superior quality of the fruit.

The latest figures available in relation to sisal hemp cultivation in the Bahamas show that the industry is continuing to expand. In 1908, the bales of sisal hemp exported from those islands numbered 12,884, as compared with 10,080 bales in 1907, and 3,467 bales in 1906.

The United States Consul at Santiago reports that the orange crop of Cuba this year will be the largest in the history of the island, and will reach 500,000 boxes. It is believed that in another year the industry will have progressed sufficiently to be able to supply the local demand for the fruit.

From the commencement of cane reaping at Barbados up to March 26 last, 82 tons of sugar and 6,158 puncheons of molasses have been exported from the island, compared with 865 tons of sugar and 6,296 puncheons of molasses shipped during the corresponding period last year.

The Trinidad Agricultural Society has passed a resolution calling upon the Government to again take steps to reduce the number of mungoose in the island by the payment of 60c. per head for each mungoose destroyed.

The St. Lucia Agricultural Society are taking steps to obtain a supply of mungoose for that island, since snakes have been observed to be increasing in number in one or two districts. Sixty mungoose were recently imported into St. Lucia from Barbados, and it is proposed to get an additional supply of 100 from Barbados or Trinidad, and to distribute them in the island.

Some plants of jippi-jappa (*Carludovica jamaicensis*), the leaves of which are utilized in Jamaica for making the well-known 'jippi-jappa' hats were in 1907 obtained for the Grenada Botanic Station. These plants are now reported to have become well established, and one clump flowered in 1908.

The export of sugar from British Guiana to Canada increased from 51,217 tons in 1906-7 to 87,708 tons in 1907-8. On the other hand, no sugar at all was sent from British Guiana to the United States in 1907-8, although the latter country imported 38,522 tons from the colony in 1906-7.

In the fiscal year 1908, the United States imported cane sugar to the value of $133,000,000. Of the total quantity, the proportion contributed by Cuba was valued at $58,000,000, the imports from the Hawaiian Islands at $40,000,000, those from Porto Rico at $19,000,000, and those from the Dutch East Indies at $11,000,000. (*Cuban Review*.)

Some trial shipments of oranges have lately been made to England from South Africa, and it would appear that the trade is likely to increase. A shipment of navel oranges sent over last November, was described as 'the finest that had been seen at Covent Garden market during the season.' The fruits comprising this lot realized 29*s*. $2\frac{1}{2}$*d*. per 100, or about $3\frac{1}{4}$*d*. each.

A new process of sterilizing milk has lately been patented by a Danish inventor, Dr. Budde. This process depends on the existence in the milk of an enzyme 'catalase,' which decomposes hydrogen peroxide, with the liberation of oxygen. The milk is heated to 120° F., and a small quantity of hydrogen peroxide added. As a result of the reaction which takes place, the pathogenic organisms are destroyed after a short time. The milk is then run into sterilized bottles, fitted with air-tight stoppers.

The fact that every available plot of land at Grenada is planted with cacao by the holders results in a general scarcity of locally grown food-stuffs. This is referred to in the latest report of the Agricultural Superintendent, who suggests that it would tend to more general prosperity among peasant holders in the island, if cacao were less exclusively grown, and more attention given to the cultivation of fodder and provision crops.

A Commission has lately been appointed in British Guiana for the purpose of considering and reporting upon labour conditions in the colony. The Commission is to enquire whether or not the existing labour supply is insufficient for the development of the resources of the colony, and for the maintenance of established industries; and, if it be insufficient, to suggest in what way the supply can best be augmented. The Hon. Robert Duff, Immigration Agent-General is to be Chairman of the Commission.

Quite a number of goats of good pedigree were recently purchased in Barbados by the manager of a British Guiana plantation The animals bought included a son of the Toggenberg billy 'Bruce' (see last issue of *Agricultural News*, page 87) and three ewes of the same pedigree; also an Indian ram goat, the son of 'Rajah'—imported some years ago by this Department; a ewe, and four kids of the same family. The Toggenberg ram thus taken away from Barbados was the animal which was awarded first prize at the Agricultural Show held at Mount, St. George, in December last.

STUDENTS' CORNER.

Seasonal Notes.

April.

1st Fortnight.

Cane reaping will now be in progress. Note the varieties which ripen early, and those which mature late. As the canes are carted to the mill observe which varieties show good powers of resistance to root fungus, and rind fungus, and which kinds are badly attacked.

Search fields of young cane for 'dead hearts.' Examine them, and keep some of the caterpillars and pupae of the moth borer in a box (ventilated) in order to observe their metamorphosis.

Cotton picking is now almost over, and in many cases the fields are being cleared. What is the best way to dispose of the old plants? Discuss the merits of (1) burying the plants in the soil, with the object of increasing the humus in the land, and (2) burning the plants. In islands where leaf-blister mite exists, observe to what extent the operations of 'picking,' and dusting the leaves with sulphur and lime have kept this pest in check.

Discuss the question of providing shade in cacao orchards. What are the points to be chiefly considered in regard to this matter? Discuss the subject of wind-breaks, and their influence on the development and yield of a cacao plantation. What is the best method of treating wounds on cacao trees, which may either be the result of accident, or caused by pruning?

Lime nurseries should now be receiving attention. Lime trees in nursery beds are likely to be suffering from drought in some districts. These seedlings can be greatly assisted by keeping up a mulch of fine loose soil on the surface. Be careful to get a clear knowledge why it is that this operation prevents, to a considerable extent, the evaporation of soil moisture. Consider the possibility of using Bordeaux mixture, in cases where there is any liability to loss from 'damping-off.'

Questions for Candidates.

Preliminary Questions.

(1) What are the conditions necessary for proper germination of seeds?

(2) How does colour affect the capacity of the soil for absorbing heat?

(3) State the natural and artificial manures useful for adding nitrogen to the soil. How are the artificial nitrogenous manures obtained, and in what quantities are they usually applied to crops grown in the West Indies?

Intermediate Questions.

(1) What is the meaning of the term 'rotation of crops,' and what are the advantages connected with rotation, as opposed to growing one crop continuously? Mention a rotation suitable for the district in which you live.

(2) What is meant by 'inversion' of cane sugar? Compare the inversion in (1) the muscovado, (2) the vacuum pan, and (3) the triple effect processes. How may the amount of inversion be minimized in the muscovado process?

(3) What action has green manure or humus upon (*a*) a clay soil, and (*b*) a sandy soil?

TRANSMISSION OF DISEASE BY MILK.

Milk has long been recognized as an agent by which the bacteria of certain diseases may be carried from one person or animal to another. This is largely due to the highly nutritious nature of the fluid, which renders it eminently suitable as a medium in which bacteria may propagate with great rapidity. Hence, if but a few of those organisms which are the causative agents of typhoid fever, diphtheria, scarlet fever, tuberculosis, etc., obtain access to milk, they rapidly multiply if the conditions of temperature are favourable, and the liquid at once becomes a source of danger. The milk is infected with the bacteria either from some person managing the cows, or handling the milk, or they may come from the body of the cows, or be introduced by means of the water used in washing the dairy utensils, or by insects. The whole question of bacteria in milk, the various kinds, and their action either in bringing about changes in the milk, or in causing disease, is discussed in an article appearing in the *Year-book* for 1907 of the United States Department of Agriculture.

As a result of the fact that certain diseases are sometimes disseminated through milk, an epidemic may appear suddenly and last for a comparatively short time, or the infection may be continued for a long period, and the development of the disease be so slow and obscure that the source is unknown.

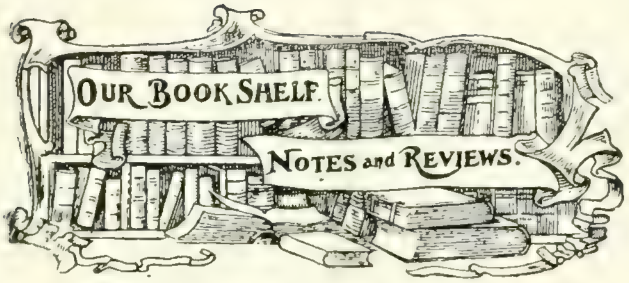
Cows suffer from tuberculosis of the lungs, and a good deal of evidence exists in support of the view that the tuberculosis of cattle and that of human beings are one and the same disease. Although all investigators are not disposed to accept this conclusion, the tendency is, among those who are studying the question, to regard milk as a serious source of danger.

A number of epidemics of scarlet fever and diphtheria have been traced to the milk supply. In such cases the milk is infected either by someone suffering from the disease, or by someone who has been in contact with the patient.

Typhoid fever is a disease that is usually considered to be transmitted through the drinking water, which may be contaminated by sewage, but occasionally it is disseminated through the food. Milk may become infected with the organisms causing this disease in various ways. Contaminated well or spring water may find its way into the milk through milk pails, cans, or bottles which were not thoroughly scalded after rinsing with cold water; the cans or bottles may be left to cool in contaminated water, and become inoculated by the accidental addition of even a few drops of water; the cows may wade in water or mud containing the typhoid bacillus, and the small drops of muddy water which dry on the animal's flank may carry the organisms to the milk, or flies may pass directly from the sick room to the milk or milk utensils.

It is well known, too, that uncleanly, contaminated milk is the cause of intestinal troubles suffered by very young children, and which help to swell the death rate of infants, more especially in crowded cities.

If milk is heated to a suitable temperature, the dangerous bacteria are destroyed. For ordinary purposes, it will be sufficient to heat to 150° F., keeping the liquid at that temperature for twenty-five minutes. This may well be effected by setting the bottle of milk in a vessel containing water, and heating the water until the milk reaches about 150° F. It may then be removed from the stove, and allowed to stand from twenty to twenty-five minutes, after which it should at once be chilled, and kept cold until required for use.



SUGGESTIONS FOR SCHOOL GARDENS. By J. R. Williams, M.A. *Jamaica: Issued at the Government Printing Office.*

Mr. Williams is Inspector of Schools at Jamaica, and in the discharge of his duties he is well known to have taken a great deal of interest in the starting and development of the School Garden and Nature Study movement in the island; he is, therefore, perfectly familiar with the conditions under which such work can best be carried out at Jamaica.

The book issued by Mr. Williams comprises 148 pages, and was prepared at the request of the Jamaica Board of Agriculture, a body which recognized the great assistance that might be afforded to teachers by a small hand-book of practical information and suggestions on the subject of School Gardens. The above volume abundantly fulfils the required object, being thoroughly practical in conception and in its treatment of the subject-matter, well arranged, and, written in a clear and interesting manner. In every section, the purely horticultural information is supplemented with helpful hints that indicate a personal acquaintance with the difficulties that are likely to arise.

The book may be regarded as being divided into two parts. In the first part (62 pages) are discussed the various phases of school garden work as it presents itself to the teacher from the commencement. The choice of tools, their cost, uses, and methods of handling receive due attention. It is mentioned that a sum of about 50*s.* should provide sufficient equipment for a good-sized school during the first year, and a small annual expenditure for supplying losses, etc. is all that will be required later. Methods of clearing the ground and erecting fences are also described, with an eye to the fact that the children should themselves carry out as much of this work as possible. It is pointed out that as soon as the boundaries of the plot have been fixed it will be found most useful and instructive to draw a plan of the garden showing the arrangements of beds, crops, paths, etc., this plan to be hung in the schoolroom for reference. Three diagrams showing possible arrangements for school garden plots are included in the book. The important matter of laying out the garden is next discussed, and instructions are given as to lining out the different beds, formation of paths, digging drainage trenches, etc. Tillage methods, drainage, mulching, and the uses of manures are all considered as means whereby the soil is brought into the best condition for plant rearing. Reference is made to the importance of compost heaps in School Gardens.

Further sections of the book deal with the care of seeds, preparation of seed beds, raising of seedlings in boxes as well as in beds, treatment of seedlings, methods of transplanting, care of plants (i.e., by watering, weeding, pruning, etc.); the propagation of plants by budding, and grafting, as well as by raising from seed, and the rotation of crops.

An especially interesting section is that entitled 'The Friends and Enemies of the Garden.' In this, reference is made to the work of earthworms, ants, etc. in aerating and lightening the soil, that of lizards in destroying numbers of insect pests, and above all to the assistance rendered to the gardener by birds which destroy vermin and small forms of animal life that do damage to the crops. An appeal is made to the teacher to lead the children to recognize the help thus afforded, and also the duty of protecting those friends of the garden. Many insect pests are also described, together with suitable methods for holding them in check.

The second part of the book (pp. 63-148) consists of a number of appendices which deal in considerable fulness with the cultivation and preparation of the chief West Indian agricultural crops that may be grown in more or less quantity in the school garden, e.g., provisions, green vegetables, cacao, coffee, bananas, ginger, pine-apples, oranges, cotton, vanilla, etc. The information thus provided has been drawn from a number of reliable sources.

Mr. Williams' book was written as a companion volume to Dr. Watts' 'Nature Teaching,' the generalizations of which it is intended to expand, and it excellently fulfils its purpose. The manner in which it is written reveals an intimate acquaintance with the problems and requirements of elementary school life in Jamaica, and, incidentally, of most West Indian colonies. The style in which the facts are presented should be most helpful to teachers, while its occasional references to the ethical aspect of agricultural work and teaching indicate how important a place this work may be made to occupy in efforts to mould the characters of children. Paragraphs 129-30 from which the following quotations are made, illustrate this: 'You should never lose sight of the opportunity for mental, manual and moral training that School Garden work offers. The opportunity is worth what you make of it, like other opportunities. Not only may it add to the childrens' knowledge—their direct first-hand knowledge—of the things that surround their daily life, in the easiest and most interesting way, by observation and through incidental teaching, and in the way by which knowledge is most permanently acquired, but practice in doing things will certainly increase the ability to do things, and the monotony of the children's school work is certain to be relieved when it takes the form of using a line, or working a saw, of measuring and weighing their own products, of calculating what they cost, and how much they are worth.

'It is not a natural Science that you are called upon to teach, nor even Agriculture, but rather Nature Study, and the observation and understanding of surroundings, and the intelligent use of small opportunities. And although scientific training is a pretentious name to give to this, yet it is the training that science affords, to be made to observe accurately as well as readily, to report correctly, to learn to draw principles from observation, and to trace the relation of causes and effects, of success and failure, even in the humblest matters of ordinary life.'

The book fulfils admirably the purpose for which it is written, and should be found in every elementary and secondary school in the West Indies where any effort is being made to introduce sound teaching by means of Nature Study.

Several pupils at the St. Lucia Agricultural School who will have completed a three years' course of training in May next desire situations as junior overseers or assistants on estates. Estate owners and managers who may contemplate offering employment to these pupils should write to Mr. J. C. Moore, Agricultural Superintendent, St. Lucia.

LIVE STOCK RAISING AT TOBAGO.

In the year 1907-8 live stock to the value of £7,723 were exported from Tobago. Cattle formed the most important class of animals shipped, the exports being worth £3,168, while pigs (£1,555), and horses (£1,326) came second and third on the list.

The Tobago correspondent of the *West India Committee Circular* refers to the advantages possessed by Tobago, which make it especially well suited for live stock rearing. Guinea grass (the cultivation of which is an expensive matter in Trinidad) grows wild in the island, and thousands of acres of land could be utilized which are now lying waste and of little value. Cacao, rubber, and cotton planters should find in stock raising a useful auxiliary industry, as apart from the direct financial return, the manure provided by the animals would be of great value. Trinidad offers a convenient market for cattle, sheep, etc. reared in Tobago.

'FOOT-AND-MOUTH' DISEASE.

Attention has been called, by the public telegrams, to the outbreak of a disorder, which was at first thought to be foot-and-mouth disease, among cattle in St. Mary's parish, Jamaica. Although subsequent reports have indicated that the trouble is, happily, less serious than was originally feared, the following details relating to foot-and-mouth disease may not be without interest to stock owners. They have been abstracted from the hand-book 'Diseases of Cattle,' issued by the Bureau of Animal Industry, U.S. Department of Agriculture :—

Foot-and-mouth disease is a highly contagious fever, of a specific nature, characterized by the eruption of vesicles or blisters in the mouth, around the coronets of the feet, and between the toes.

A peculiarity of foot-and-mouth disease, which is liable to occur both in temperate and tropical climates, is the large number of species attacked. Cattle are the chief sufferers, then come hogs ; while sheep and goats are also attacked in large number. Horses, dogs, cats, and poultry are not infrequently sufferers, and even human beings are not exempt from infection. The mortality from this disease is not great, being generally about 1 to 3 per cent., but in severe outbreaks may reach 5 per cent. The more fatal cases are among young animals that have been fed on infected milk, and death is directly caused in the majority of these cases by gastro-enteritis. Although the proportion of deaths is so low, yet when the disease exists over extensive areas, serious loss often results to the stock-raising interest, since the milk yield of dairy cows is largely diminished, and the animals rapidly lose condition. Such loss is especially felt in districts where cattle are being fattened for the butcher. An English veterinary surgeon of high repute has stated as his opinion, that a loss of about £4 is sustained by the owner in the case of every milking cow or fattening bullock which has been attacked, but recovered from the disease. It was estimated that an attack of foot-and-mouth disease which occurred in England in 1883 cost the stock-owners of the country about £1,000,000.

Foot-and-mouth disease is not a difficult disorder for a stock-owner to recognize. The disease makes its appearance in from three to six days after exposure of an animal to infection. A chill first sets in, which is followed by high fever, the temperature frequently rising as high as 106° F. This is accompanied by vesicular inflammation of the mouth, which gives rise to pain when the animal attempts to eat ; loss of appetite ; a hot, painful, swollen condition of the feet, and in from twenty-four to forty-eight hours numerous small vesicles, varying in size from a pea to a hazel-nut appear on the udder and feet, and in the mouth.

The infection of foot-and-mouth disease is spread by a number of means, which accounts for the rapid manner in which the disorder frequently occurs on neighbouring holdings. Animals may be infected by direct individual contact, or by means of solid and liquid excreta, saliva, by infected hay, litter, and drinking vessels. Human beings can also carry infection on their clothes and transmit it to animals when milking. Milk in an unboiled state, when fed to animals, may also be the means of transmitting the disease.

Should an outbreak occur, a stock-owner would, of course, call in a good veterinary surgeon, and follow his advice in regard to methods of treatment, at the same time giving his personal co-operation to the matter of preventing the spread of infection. Every effort should be made to keep other animals, more especially dogs, cats, and poultry, from coming in contact with infected stock. Persons from other farms should also be prevented from visiting the cow-houses. Animals that have died or been slaughtered must always be deeply buried with lime, or their bodies burnt. The cow-houses should be disinfected and covered with a coat of limewash containing 4 oz. of formalin per gallon of lime-wash, and all the utensils and fittings cleaned by the application of a solution containing 6 oz. of crude carbolic acid per gallon of water.

Although no disorder of cattle closely resembles foot-and-mouth disease, yet the similarity of one or more symptoms with other troubles may lead to a mistake in the diagnosis. In mycotic stomatitis, the entire lining of the mouth is inflamed and peels off in a few days, while inflammation of the thin skin between the toes may also be present. Ergotism, and 'foul foot' or 'ground itch' have also been temporarily mistaken for foot-and-mouth disease.

HORSES AND MULES IN THE UNITED STATES.

A publication has lately been issued by the Bureau of Statistics of the United States Department of Agriculture, which contains the latest available data as to the number and value of farm animals in the United States.

From this it is seen that the estimated number of farm horses existing in the country on January 1 of the present year, was 2,064,000—an increase of 608,000, or 3·2 per cent., as compared with the figures for the previous year. It is interesting to note that the value per individual horse has increased considerably of recent years. The average value per head over the whole of the United States on January 1, 1909, is placed at $95·64 each, as against $93·31 a year ago, and $60·25 per head in 1898.

The figures relating to mules also show an increase in number. It is estimated that the total number of mules in the United States now reaches 4,053,000, as against 3,869,000 early in 1908, thus indicating an increase of 4·8 per cent. The average value of a mule is placed at $107·84, which is practically identical with the figure of a year ago. In 1898, however, the average value of mules in the United States was but $72·30 per head.

MARKET REPORTS.

London,—March 16, 1909. The West India Committee Circular; Messrs. Kearton Piper & Co., March 16, 1909.

Arrowroot—Quiet; 1¾d. to 3¾d. according to quality.
Balata—Sheet, 2/2 to 2/4; block, no quotations. (?)
Bees'-wax—£7 12s. for dark to pale.
Cacao—Trinidad, 57/- to 70/- per cwt.; Grenada, 51/- to 59/- per cwt.
Coffee—Santos, 32/3 per cwt.; Jamaica, no quotations.
Copra—West Indian, £18 to £19 per ton.
Cotton—Nevis and St. Kitt's, 13d. to 14d.; Barbados, 12½d. to 13¾d.; St. Vincent, 14¾d. to 16½d.
Fruit—
Bananas—Jamaica, 4/6 to 9/- per bunch.
Limes—Not wanted.
Pine-apples—St. Michael, 1/6 to 4/-.
Grape Fruit—5/6 to 9/- per box
Oranges—Jamaica, 6/- to 9/- per box.
Fustic—£3 to £4 per ton.
Ginger—55s. to 60s. Quiet.
Honey—24s. to 26s. per cwt.
Isinglass—West India lump, 2/2 to 2/6 per lb.
Lime Juice—Raw, 1/3 per gallon; concentrated, £18 per cask of 108 gallons; distilled oil, 2/2 per lb.; hand-pressed, 5/6 per lb.
Logwood—£3 to £4 5s. per ton; roots, no quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Quiet.
Rubber—Para, fine hard, 5s. 1¾d. per lb.
Rum—Jamaica, 3/1 to 3/3; Demerara, 1/6 to 1/7, proof.
Sugar—Crystals, 14/3 to 16/9; Muscovado, no quotations; Syrup, 1s. 3d. to 14s.; Molasses, no quotations.

New York,— March 19, 1909.—Messrs. Gillespie, Bros. & Co.

Cacao—Caracas, 12c. to 15¼c.; Grenada, 11¾c. to 12¼c.; Trinidad, 12c. to 13c.; Jamaica, 10¼c. to 11½c. per lb.
Cocoa-nuts—Jamaica, select, \$26·00 to \$27·00; culls, \$16·00 to \$17·00; Trinidad, select, \$26·00 to \$27·00; culls, \$16·00 to \$17·00 per M.
Coffee—Jamaica, ordinary, 7¾c. to 8¼c.; good ordinary, 9¼c.; washed, up to 12c. per lb.
Ginger—9¾c. to 11c. per lb.
Goat Skins—Jamaica, 55c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
Grape Fruit—Florida, \$1·50 to \$2·25 per box.
Limes—No quotations.
Mace—No quotations.
Nutmegs—110's, 12c. per lb.
Oranges—Florida, \$1·50 to \$2·00 per box.
Pimento—4¾c. per lb.
Sugar—Centrifugals, 96°, 3·92c.; Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., duty paid

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Leacock & Co., March 30, 1909; Messrs. T. S. Garraway & Co., March 30, 1909.

Arrowroot—St. Vincent, \$3·90 to \$4·00 per 100 lb.
Cacao—Dominica and St. Lucia, \$10·00 to \$10·50 per 100 lb.
Cocoa-nuts—\$13·00 for unhusked nuts.
Coffee—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb.
Hay—\$1·50 per 100 lb.
Manures—Nitrate of soda, \$62·00 to \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$72·00 to \$75·00; Sulphate of potash, \$67·00 per ton.
Molasses—Fancy, 16c.; Grocery, 16c. per gallon.
Onions—Strings, \$2·25 to \$3·00 per 100 lb.; loose, no quotations.
Potatos—Nova Scotia, \$2·60 to \$2·75 per 160 lb.
Peas—Split, \$6·00 per bag of 210 lb.; Canada, \$3·40 per bag of 120 lb.
Rice—Ballam, \$5·45 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—Dark Crystals, 96° \$2·15; Muscovado, 89° \$1·75.

British Guiana,—Messrs. Wieting & Richter, March 6, 1909; Messrs. Sandbach, Parker & Co., March 19, 1909.

Arrowroot—St. Vincent, \$9·00 to \$9·50 per 200 lb.
Balata—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
Cacao—Native, 13c. per lb.
Cassava—60c.
Cassava Starch—\$7·00 per barrel of 196 lb.
Cocoa-nuts—\$16·00 per M.
Coffee—Creole, 12c. to 13c.; Jamaica, 13c. to 13½c. per lb., slow.
Dhal—\$4·90 per bag of 168 lb.
Eddos—\$1·68 per barrel.
Molasses—No quotations
Onions—Lisbon, 5c. per lb.
Plantains—20c. to 44c. per bunch, plentiful.
Potatos—Nova Scotia, \$2·50 per 100 lb.
Potatos—Sweet, Barbados, \$1·20 per bag
Rice—Ballam, \$5·80; Creole, \$4·50 to \$4·75.
Split Peas—\$5·50 to \$5·60 per bag (210 lb.); Marseilles, \$4·00
Tannias—\$2·64 per bag.
Yams—White, \$2·16 per bag; Buck, no quotations.
Sugar—Dark crystals, \$2·25 to \$2·50; Yellow, \$3·10 to \$3·20; White, \$3·60 to \$3·80; Molasses, \$2·30 to \$2·40 per 100 lb. (retail).
Timber—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—\$3·75 to \$5·75 per M.
———Cordwood—\$2·40 to \$2·64 per ton.

Trinidad,—March 20, 1909.—Messrs. Gordon, Grant & Co.

Cacao—Venezuelan, \$12·75 to \$13·00 per fanega; Trinidad, \$12·75 to \$13·00.
Cocoa-nuts—\$22·00 per M. f.o.b. for selected pealed in bags of 100 lb.
Cocoa-nut Oil—70c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 8½c. per lb.
Copra—\$3·20 per 100 lb.
Dhal—\$4·65 to \$4·75 per 2-bushel bag.
Onions—\$2·50 to \$3·00 per 100 lb. (retail).
Potatos—English, \$1·30 to \$1·40 per 100 lb.
Rice—Yellow, \$5·00 to \$5·25; White, \$4·50 to \$4·90 per bag.
Split Peas—\$5·75 to \$6·00 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.

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AGRICULTURAL NEWS.

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OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Bureau of Entomology, U.S. Department of Agriculture.

IN recent editorials in the *Agricultural News* the work of the United States Department of Agriculture, as a whole, and of several of its Bureaus, has been considered.

The Bureau of Entomology deals with all problems arising from the attacks of insects on agricultural crops, on forests, on domestic and other animals, and even on man himself.

One of the most destructive insects which has ever appeared as an enemy to agricultural crops is the Cotton Boll Weevil. This insect made its way into the United States from Mexico in 1894, and for most of the years since that time the Bureau of Entomology has carried on investigations as to the best methods of controlling it. In spite of the fact that this work has been most carefully carried out, and that trained Entomologists have been engaged in it, the Boll Weevil has steadily progressed across the cotton-growing area of the United States. In 1908, it was found to have crossed the Mississippi River, and it is not likely that anything can be done to prevent its spread to the Atlantic sea-board, thereby infesting the entire cotton belt. But although it has not been found possible to stop the spread of this insect, cultural methods have been worked out, by means of which good crops of cotton may be grown even within the limits of the infested territory. Early planting, the growing of early flowering varieties, and the complete destruction of all the cotton stalks in the early fall, together with the collection and destruction of the infested bolls after they have fallen, have resulted in considerable profits to the farmer. Much also has been done in the study of the parasites and other natural enemies of this insect, until now practical application can be made of the knowledge thus gained.

In connexion with the work on the Gipsy Moth and the Brown Tail Moth in the Eastern United States, the Bureau of Entomology has been instrumental in importing beneficial (parasitic or predatory) insects from Europe, the native home of these two destructive moths. Altogether thirty-five species of these beneficial insects have been imported, and it is believed that many of them have become established, and will in a short time exert a considerable influence in the control of the two moths.

Another very serious pest is the small dipterous insect known as the Hessian fly. This insect, which attacks wheat and other cereals in many parts of the United States, is closely related to the Flower-bud Maggot, and the Red Maggot of cotton. In dealing with this insect also, the Bureau of Entomology has devised cultural methods for its control, and it has found that it is possible to use, in a practical way, certain parasites of the fly. The Hessian fly is one of the most destructive in the United States, the losses to the farmers sometimes amounting to as much as $10,000,000 per annum. Any results which effect a saving of a fair proportion of this loss will easily be seen to be of great benefit to the country. The introduction of these parasites into districts where they had not previously been found was followed by markedly good results.

The White fly, which attacks citrus fruits in Florida has also been under investigation. A special agent with ample assistance was located in Florida, and life-history studies of the pest were made. Experiments were carried out in the introduction of parasitic insects, and in the encouragement of fungus diseases which affect the white fly, as well as in the use of insecticides and gases, and much information of distinct value has been gained.

The insects affecting tobacco, those damaging deciduous fruit trees, and others injurious to vegetable crops have all been the subject of special investigations during the past year. Bee culture, especially the problems connected with the prevention and cure of bee diseases, and silk culture have also been studied by experts in these particular branches.

In connexion with insects injurious to forests, information of practical value has been acquired and disseminated amongst those most interested.

The insects which carry diseases to man and domestic animals have been the subject of special investigations. In recent years, since the relation between insects and the spread of certain diseases has come to be better understood, mosquitos and flies have been of greatly increased interest, and consequently have come in for more thorough study than ever before. The Bureau of Entomology is stated to have nearly finished a complete account of the mosquitos of North America.

The life-history of the Texas cattle tick has been continued in co-operation with State Entomologists, and many important points having a direct bearing on the methods of control of the tick and of Texas fever have been obtained. A parasite of one of the ticks has been found, which offers hope that natural methods of decreasing the abundance of ticks may yet be learned.

It will be seen from what has already been said that the Bureau of Entomology interests itself in all lines of investigation and research where insects are concerned.

The Bureau of Biological Survey, among other interesting lines of investigation, has carried on important researches as to the value of birds in their relation to agriculture. It has been found, in this connexion, that birds generally are of considerable value to the agriculturist. It is only rarely, and in the case of certain species, that birds do more damage to fruit and other growing crops than is compensated for by the numbers of injurious insects that they destroy. Not only are the larger insects destroyed, but it has been found that there are some fifty-seven species of birds in the United States which feed upon scale insects.

Other subjects which come under the range of investigations of this Bureau include the traffic in cage birds, the study of rats, rabbits, field mice, wolves, etc., and the protection and introduction of game.

The Bureau of Biological Survey also makes a study of the geographic distribution of the fauna and flora of the country, and life zones and crop zones have been mapped, each characterized by certain conditions of temperature, and by the presence of particular species of mammals, birds, reptiles, and plants.

Carriacou. The figures given in the *Annual Report* of the Commissioner of Carriacou show that the value of the exports in 1908 (excluding shipments of produce marketed in Grenada), was £16,447, or an increase of over £5,000 compared with the returns for 1907. The chief items were cotton (Marie Galante and Sea Island varieties), £11,571; cotton seed, £2,896; goats and sheep, £690; and poultry, £564. The greater value of the exports compared with the previous year is stated to be chiefly due to the increased output of Sea Island cotton.

Reference is made by the Commissioner to the very satisfactory growth made by lime trees at the Experiment Station. Some of these trees, which are no more than four and three-quarter years old, are from 20 to 25 feet high, and have already borne fruit for two years. On one estate at Carriacou (that of Mr. Tom Archer), about 50,000 lime trees have been planted out and are well established.

SUGAR INDUSTRY.

Cultivation of Ratoon Canes.

The tillage operations given to ratoon cane crops in the West Indies appear to vary considerably from island to island, and the amount and character of cultivation which may be carried out with advantage depend possibly upon the nature of the land on which the ratoons are growing. This matter is discussed in the pamphlet report on Manurial Experiments with Sugar-cane in the Leeward Islands, 1907-8, lately issued by this Department, and also received attention at a late meeting of the Barbados Agricultural Society, when Dr. Francis Watts, C.M.G., gave a brief address on the subject.

In the Leeward Islands, it would seem that tillage operations in connexion with the growth of ratoon canes are much more generally carried on than at Barbados, where, on the majority of estates in the ratooning districts, the land is simply trashed after removal of the plant cane crop, but little or no cultivation is done. At Antigua and St. Kitt's, on the other hand, it is a common practice to break up the soil between the young ratoon stools to a considerable depth, when the cane shoots are in a stage of vigorous growth, and have reached a height of 2 or 3 feet, with the object of bringing the land into good tilth. Either the plough or the fork is used for these operations. The cultivation thus given is more than a mere surface tillage to provide a dust mulch; it involves *deep* tillage, and the soil is turned over and broken up.

Planters who cultivate their ratoons in the manner mentioned, state as a reason for these operations, that they are necessary on account of the degree in which the soil has consolidated and hardened, but if the land was thoroughly tilled and prepared previous to setting out the plant cane crop, it should seldom require the treatment referred to on the removal of the first crop. On heavy classes of land, where two or three crops of ratoons are grown, some amount of tillage may be advantageous for the purpose of lightening and aerating the soil, but these operations would best be carried out as soon as possible after the previous crop has been reaped. If deferred until an extensive growth of shoots and roots has taken place, the injury to the young roots may entail considerable damage, and further, the loss of moisture which is involved by inverting the soil is more harmful than at an earlier stage of growth, although, of course, always to be avoided, if possible. Loss of moisture during the period of vigorous growth is a very serious matter, and may entail a check on the young ratoons, from which they will not easily recover.

Before the work of tillage between the rows of ratoons is proceeded with, planters would do well carefully to examine their fields by actually digging across the banks which they propose to fork or plough, in order to satisfy themselves that the soil is in as great a need of tillage as they imagine, and to assure themselves also that the operations which they perform improve the soil as much as they think. On turning over the beds of trash underlying a young crop of ratoon canes of satisfactory appearance, the soil below will usually be found in a condition suitable to promote good growth.

The following notes on this matter are quoted from the pamphlet on Manurial Experiments with Sugar-cane in the Leeward Islands, already referred to. It is mentioned in the report that the notes are submitted for consideration and discussion, rather than as direct recommendations:—

It would appear that the soil when well covered by the trash from the recently cut plant canes is frequently in fair tilth, and not unduly compact. If kept covered, it retains both its tilth and its moisture. If the trash is removed, and the soil is turned up to a considerable depth, and afterwards exposed to the sun, it loses moisture, and sets back into a harder condition than before. If, however, the tilth is imperfect, and cultivation is regarded as essential, the soil should be stirred as soon as possible after the plant canes are cut, and before the ratoons begin to grow to any appreciable extent. Following this, the rough soil should be harrowed at once to break any lumps, and should then be covered with trash, or should be constantly stirred to a depth of about 2 inches in order to form a dust mulch.

When, after the cutting of the plant canes the soil is in fair tilth, good results may often follow from spreading the trash evenly on the banks, and leaving the soil unstirred. The amount of trash so spread should be sufficient to keep down weeds. If the trash in a field is insufficient to keep down weeds, it should be distributed over a portion of the field only, say on alternate banks, but in such thickness as is necessary to effect the desired object. The remaining clear portion, i.e., the banks which alternate with those that have been trashed, should be stirred frequently to a depth of about 2 inches in order to create and maintain a dust mulch, which will go far to supply the effect of trashing in conserving moisture in the soil.

Much of the cultivation now given to ratoon canes is possibly injurious.

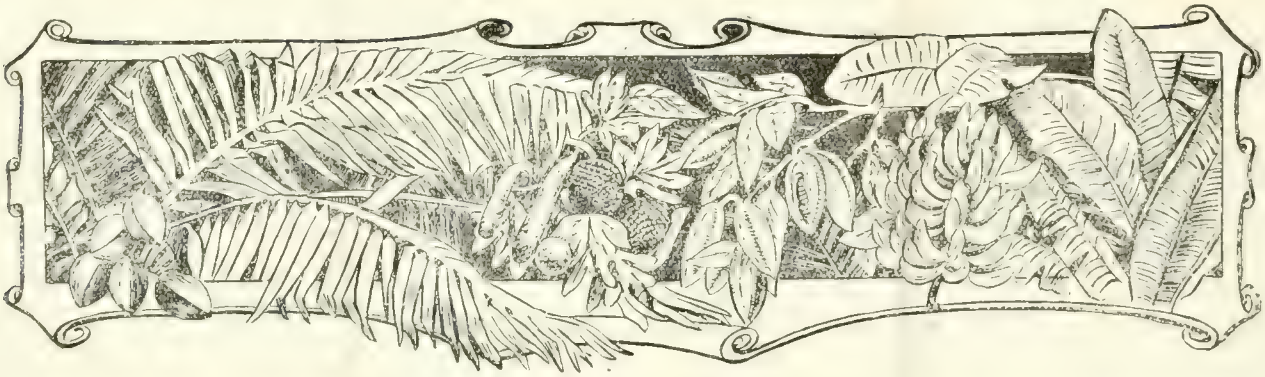
It is repeated that these remarks are intended to draw attention to the problems to which they refer, and are not here given as rules for practice. It is hoped that planters will discuss them, and that next season a number of co-operative experiments will be laid out in order to demonstrate the soundness or unsoundness of the suggestions made.

Experiments of the kind required are easily arranged, and it is hoped that when the crop of 1909 is being reaped, planters and officers of the Department of Agriculture will consult together, and plan several useful series.

As already mentioned, this subject was brought forward at a recent meeting of the Barbados Agricultural Society, when an interesting discussion took place.

Dr. Watts referred to his observations made at Antigua. No hard and fast rule on the matter could be laid down, and it was important that the planters should make experiments for themselves on their own estates. The real facts in this case, as in every other line of agricultural work, could only be learnt by daily observation. The loss of soil moisture was a very serious matter, and he had investigated this point at Antigua in connexion with the cultivation of ratoon canes. He had invited planters to have a part of the trash turned up where the soil had been cultivated a few days previously, and in every case it was seen that the breaking up of the land had caused the loss of moisture, which would not have been lost had the soil been left undisturbed.

In conclusion, the Commissioner urged planters who grew ratoons to carry out experiments on the matter discussed. They might arrange to set apart certain sections of their fields, and treat these by other methods than those commonly adopted. The results would certainly be useful to themselves, and if they were communicated to the Imperial Department of Agriculture, they might be made useful to a wider community.



WEST INDIAN FRUIT.

THE LITCHI.

It is noticed that among the plants lately introduced into the United States from foreign countries, by the Department of Agriculture, are included specimens of the litchi, brought from China. The litchi (*Nephelium Litchi*) is an important fruit tree belonging to the natural order Sapindaceae, which grows wild in Southern China and Malaya, and is also largely cultivated both in those countries and in British India. Specimens are to be found in a few of the West Indian Islands, notably in the French islands of Guadeloupe and Martinique, and at the Botanic Gardens of Jamaica, Trinidad, and Dominica. It was introduced into the last-named island from Guadeloupe in 1898. The fruit of the Litchi consists of a nut, containing one seed, surrounded by a fleshy aril.

The Litchi tree is a handsome evergreen, which is propagated by layering or circumposition. It flourishes best in a moist alluvial soil. In the East this tree yields large crops of fruit annually, but the few specimens under observation do not appear so satisfactory in this respect in the West Indies. A Litchi at Dominica flowered and fruited in 1905-6 and again in 1906-7, however, and in this connexion, Mr. Jones wrote: 'The difficulty with this tree in the West Indies is to get it to fruit annually. On one of the small litchi trees, where a number of branches were being propagated by circumposition, it was noticed that nearly every shoot so treated produced flowers. This seems to afford a hint that if branches of the trees had a ring of bark removed about October or November, the check given might probably cause the trees to flower and fruit early in the following year.

The litchi has been long established at Guadeloupe, and specimens are to be seen in many parts of the island. According to Duss's 'Flore des Antilles françaises,' the trees flower in January or February.

Reports on the growth and productiveness of the litchi in the East refer to it as a most hardy and fruitful tree. A point insisted upon in connexion with its growth is the need of a good water supply, as the trees are apt to suffer from drought.

According to Watt's 'Dictionary of the Economic Products of India,' this fruit is grown and consumed in large quantity in Bengal. It is stated that 'when fresh, the great bunches of litchis look like bright, pinkish strawberries, but they rapidly lose their bloom, and assume a dirty, brownish colour.' The fruit is nearly round, and about 1½ inches in diameter. The edible portion is the bitter-sweet, jelly-like pulp or aril which covers the seed, and the whole is enclosed in a thin reddish, or brownish, brittle shell. The fresh fruit has a very pleasant, acid flavour.

Litchi fruit are dried in China and Cochin-China, from whence they are exported to the United States, and England. Dried litchis bear no resemblance to the fresh fruit, but are by no means unpalatable. In appearance and taste they are not unlike raisins.

If this tree could be well established in the West Indies, and got to fruit regularly, it would prove a desirable addition to our list of fruits.

CACAO IN JAVA.

In response to enquiries from various quarters, the United States Consular Department lately published a report on the methods of cacao cultivation adopted in Java.

As in the West Indies, some attention has, of late, been paid to propagating cacao by grafting and budding, and these efforts, it is stated, have been fairly successful. The soil in Java on which this crop does best is a rich, sandy loam, situated at an altitude of from 1,600 to 1,800 feet above sea-level. In some districts however, the trees thrive well on light sandy soil.

Permanent shade trees are planted among the cacao; the soil is kept free from weeds, and one or two cultivations given annually, around the cacao trees. A first crop is usually obtained in from three to five years after planting.

The time for harvesting cacao in Java varies according to altitude. At higher levels picking commences about May, and lasts until July or August Plantations nearer the sea-level frequently yield two crops, the first being gathered about March, and the second in October. The annual crop yield appears to vary from about 4½ to 9 cwt. of cacao per acre. The pods are opened in the plantations, the husks buried beneath the trees, and the beans taken to the factory for fermentation—a process which occupies from forty-eight to sixty hours. During fermentation the beans are turned every twelve hours or so. Washing and drying follow. Drying by artificial means is preferred to exposure to the sun.

The cacao is shipped in sacks of about 100 lb. In 1907, the prices obtained for Java cacao varied from \$18·89 to \$25·22 per 136 lb.

CACAO FERMENTATION.

A German scientist, A. Schulte, lately published a bulletin giving an account of studies and experiments conducted in Cameroon, in Germany, and in St. Thomé. The pamphlet contains directions for harvesting, fermenting, drying, and shipping cacao, and also includes a number of suggestions relative to the practical application, on a commercial scale, of processes similar to those used by the author in his experiments. Herr Schulte's booklet was reviewed in the *Experiment Station Record* for January last, from which the following summary of the investigations relating to cacao fermentation are extracted :—

As a result of these investigations, cacao fermentation is divided into two stages : (1) the alchohol and acetic acid fermentation, and (2) oxidation. The author bases the production of good cacao upon the correct execution of both stages. During the alcohol and acetic acid fermentation, the seeds are freed from the pulp, and the shells softened, thus favouring oxidation. The oxidation of the astringent substances is the important feature of cacao fermentation. An oxidation temperature of from 40° F. to 45° F. appears to be most favourable for the quality of the product, and a moisture content of 15 per cent. was found to be most favourable to oxidation, and at the same time unfavourable to butyric acid fermentation and the formation of mould.

When the oxidation process is conducted satisfactorily, a delicate white efflorescence forms on the beans, and the appearance of this may be taken as an indication that the cacao has been properly oxidized. Oxidation should be continued only until the majority of the beans have taken on a brown colour, as if the process is continued until all the beans are brown, the flavour and aroma are weakened.

The proper length of time for oxidation can only be determined by experience, and may vary in different cacao districts, and with different kinds of cacao, as well as with different harvesting methods.

MAIZE CULTIVATION.

In the West Indies, maize cannot be considered as a crop of first-rate importance, and is usually grown as a 'catch crop,' previous to planting sugar-cane. Regarded from this point of view, the cultivation and manuring given to fields planted with corn are generally insufficient to result in the production of a full return, and instead of crops of from 25 to 70 bushels such as are commonly reaped in the United States under superior conditions of tillage and manuring, the planter in these islands usually obtains yields much smaller in quantity.

In view of the large quantities of maize annually imported into these colonies, and the extent to which this cereal is used as a constituent of foods both for human beings and for animals, it is a matter worthy of consideration whether a larger supply could not be profitably produced in the West Indies, either by extending the acreage, or—through the introduction of improved varieties, and superior tillage—by increasing the yield per acre.

The varieties of maize are extremely numerous, many hundreds having been recorded. The differences between the varieties are great, so that there is abundant scope for the exercise of judgement in selecting and adapting the kind best suited to a given locality and soil.

The best soil suited for this crop is a deep sandy loam ; it should contain a good supply of humus, and be retentive of moisture, although satisfactory drainage is essential. Stiff clays are not well adapted for maize culture. The depth of the soil and the content of humus are important factors, as determining the feeding area of the long roots of the plant, and influencing the supply of moisture, of which this crop requires a liberal quantity.

In order to ensure good growth, seed selection is very necessary in maize cultivation. This operation is very generally practised among maize growers in the Southern United States, and the manner in which it is performed considerably influences the yield obtained in the next crop. Only the best cobs of the best stalks are used for seed purposes, these being selected in the field ; and all cobs that are at all poor in size, shape, or fulness are passed over and rejected.

The land should be ploughed deeply, and afterwards cultivated to a fine tilth preparatory to planting maize ; these operations undoubtedly result in bringing about a better crop. Seeds are planted in rows—either by hand labour, or by means of an implement such as the 'Planet Junior' cultivators. The rows are from 3 to 4 feet apart, and two or three seeds are planted at distances of 3 to 3½ feet from each other in the rows ; the more fertile the land, and the greater the supply of moisture, the more closely can the plants be allowed to grow. It will, of course, be borne in mind that if the stalks stand thickly in the rows, the crop is more likely to suffer from drought than when planting is done more thinly.

Cultivation between the rows—in order to keep down weeds, and to provide a dust mulch for the conservation of moisture in the soil—should be started early, and maintained throughout the growing period of the crop. Weakly plants are thinned out, and the soil is earthed up around the growing plants at an early stage.

Maize demands a good supply of plant food, and gives profitable returns as the result of thorough manuring. It has been calculated that a crop of 50 bushels of shelled corn per acre, with the accompanying stalks removes from the soil, on the average, 80 lb. of nitrogen, 29 lb. of phosphoric acid, and 55 lb. of potash. This is a far greater quantity of fertilizing constituents than is withdrawn when a crop of Sea Island cotton is grown. The smaller corn crops of the West Indies remove, of course, only a proportionate quantity, but the above figures show the need of manuring when maize is grown. Phosphate may be given, partly as superphosphate and partly as bone meal, while nitrogen may usefully be supplied in the organic form, as cotton-seed meal, etc.

DEPARTMENT NEWS.

The Secretary of State for the Colonies has approved of the appointment of Mr. F. W. South, B.A., Honours in Natural Sciences, in Part I and Part II of the Tripos, of Emmanuel College, Cambridge, to be Mycologist and Lecturer in Agricultural Science on the staff of the Imperial Department of Agriculture for the West Indies, in succession to Mr. F. A. Stockdale, B.A., F.L.S. Mr. South arrived at Barbados on April 12 by the R.M.S. 'Orinoco.'

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows under date of March 29, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, a fair business has been done in West Indian Sea Island cotton, and prices remain steady. About 300 bags have been sold, nearly half of which are St. Vincent at 15*d.* to 16*d.*, the remainder being composed of Barbados at 13½*d.* to 14*d.*; Nevis at 13*d.* to 14*d.*; Montserrat at 13*d.* to 13½*d.*; St. Kitt's at 13*d.* to 14*d.*; and St. Croix at 13*d.*

There has recently been a recount in Charleston of cotton in stock and on shipboard, with the result that 1,394 bales have been added for correction. Most of this has been sold, and only about 700 bales remain; but the buyers, we are afraid, have put it into stock for a long period, which will make them more or less independent.

CASTOR OIL PLANT CULTIVATION.

Some enquiries have lately been received at the Head Office of the Imperial Department of Agriculture as to the cultivation of the castor oil plant, and the value of the produce.

It would appear that towards the end of the eighteenth century, castor oil was exported from Jamaica to England in fairly considerable quantity. To-day, however, practically all the oil required is obtained from India and the East Indian Islands where, it is stated, 330,000 acres were devoted to the cultivation in 1890. Castor oil plants are grown more or less extensively in many parts of the United States, and latterly some attention has been given to the crop in South Africa.

A leaflet issued from the Royal Botanic Gardens, Ceylon, describes the method of cultivation adopted in Madras. There, after rain, the land is ploughed or dug over twice, and the seeds are dropped into the furrow, or into holes, and covered. A month later, when the young plants are about 1 foot high, the space between the rows (which may suitably be about 4 feet apart) is again ploughed.

A somewhat different system of cultivation is followed in Hawaii, according to *Press Bulletin No. 2*, issued by the Agricultural Experiment Station. According to the Hawaiian method, the land is well prepared, and the seeds are planted at the extreme distances of 15 feet apart, in rows that are 20 feet from each other. This allows only 150 plants per acre. When the plants are about 2 feet high, the terminal buds are pinched off to encourage branching, and the lateral shoots thrown off are in turn 'topped.' These operations result in bringing about a short, bushy plant, with a good number of bearing shoots. The plant begins to flower when from eight to nine months old, and the seed matures in about ten months. It is important that the crop should be kept cultivated during the growing period.

It would not appear that the profits from the cultivation of castor oil plants are very great. The yield of seeds varies very much, and, in the United States, from 12 to 20 bushels per acre appear to represent the general crop return. The beans are worth from 75c. to $1 per bushel. In Madras, the crop gathered is usually very small in quantity, but in the Hawaiian Islands, a return of as much as from 2,500 to 3,000 lb. of beans per acre is frequently obtained. The gross value of such a crop is stated to be about $75 to $80 per acre. In the West Indies, it is believed that from 10 to 15 cwt. per acre would represent an average return of beans. Since the castor oil plant demands good soil, it will be seen that, in the majority of cases, the planter will be able to select more profitable cultivations. Castor oil beans from the West Indies have frequently been submitted to brokers in London for valuation and report, and it would appear that the market price for such beans varies from about 7*s.* to 14*s.* per cwt. A sample of beans grown at the Grenada Botanic Station last year was valued in England at £12 per ton. It has been suggested that the crop might be useful as shade for young cacao.

It may be pointed out that a good deal of valuable organic and mineral matter is returned to the soil in the form of stalks, leaves, pods, etc., when a castor crop is grown. If the existence of an oil mill in the neighbourhood gives facilities for expressing the oil locally, the resulting 'press-cake' will also be available for manurial purposes; and since only the oil has been removed, in this way matters would be so arranged that no fertilizing constituents are taken from the soil, but a considerable addition is made to the organic matter in the land.

From an analysis lately made at the Barbados Government Laboratory, it is seen that an acre of castor oil plants, utilized as green manure, conveyed 2,323 lb. of organic matter to the land. In addition, this quantity of plants contained 33·3 lb. of phosphoric acid, and 53·2 lb. of potash, which had, of course, been previously withdrawn from the soil.

'FOWL CHOLERA' AND ITS CAUSE.

A discovery of considerable importance to poultry fanciers in the East is recorded in the *Agricultural Journal of India* for October last, by the Inspector General of the Indian Civil Veterinary Department.

The discovery in question relates to 'fowl cholera,' one of the most destructive diseases found in India. While engaged in microscopic investigation relating to the 'surra' disease in camels, an official of the Department had the curiosity to examine the blood of some ducks which were dying off rapidly from the malady known as 'cholera.' In all cases it was found that the blood was swarming with a specific organism of minute size and spiral thread-like structure, which was responsible for the death of the fowls.

Further investigation revealed the fact that the agent of the disease was spread from bird to bird by means of the common fowl tick (*Argas persicus*) which is very difficult to destroy. The best method of dealing with the tick is to destroy old hen-roosts and nests, but scraping the walls of the fowl houses, painting them with hot coal tar, and brushing the feathers of the birds with paraffin have all been found efficacious. Now that the disease has been traced to this parasite, the field of attack has been narrowed considerably, and no doubt suitable methods of control will soon be devised.

TETANUS OR 'LOCKJAW.'

The Central Agricultural Station of Cuba has recently issued a small pamphlet (*Circular No. 31*), written by two officials of the Department of Animal Industry in the island, which deals with the disease of tetanus or 'lockjaw,' as it is popularly termed.

It is stated that tetanus (the bacillus or causative organism of which is wide-spread, and found in temperate as well as tropical climates) is a very common disease in Cuba, and causes serious losses of horses and mules. The cause, manner of infection, period of incubation, symptoms, and methods of treatment of the disorder are all discussed in simple language in the above-mentioned pamphlet. The following summary of information on the subject appears at the end:—

Tetanus or 'lockjaw' is a germ disease that is common in horses and mules. It also attacks man.

The disease is usually caused by the germs getting in a wound. The soil about stables and corrals that is contaminated with animal excretions is liable to contain the germ of tetanus.

The symptoms of tetanus are contractions of the muscles that makes movement difficult or impossible.

Tetanus can usually be prevented by injecting a bottle (30 grammes) of veterinary antitetanic serum as soon as the wound is discovered, or before a surgical operation.

Many cases of tetanus can be cured by injecting 30 grammes of veterinary antitetanic serum. This should be followed in twelve hours with another dose, and then one dose every twenty-four hours until the animal improves. In the absence of antitetanic serum, or in conjunction with it, inject hypodermically, 5 grammes every six hours for the first two days, of a solution of 25 grammes pure carbolic acid, 25 grammes glycerine, and 50 grammes distilled water. After the first two days inject 5 grammes every twelve hours.

Clean the wound twice daily and apply thoroughly a solution of 5 grammes of pure carbolic acid dissolved in 100 grammes of water. Give the animal soft laxative food and all the fresh water it can drink. Keep the animal quiet in a clean place and do not give medicines by the mouth or nose.

ARROWROOT PRODUCTION IN QUEENSLAND.

About 200 acres are given over to arrowroot cultivation in Queensland, from which about 600,000 lb. of arrowroot are produced annually, the yield varying from 15 to 30 cwt. per acre. The plant thus grown for its starch product is not the West Indian and Bermuda arrowroot plant (*Maranta arundinaceae*), but that known in the West Indies as 'Tous-les-mois'—*Canna edulis*—from which arrowroot is also produced in some of these islands.

The *Queensland Agricultural Journal* for January last, in the course of an article on this subject, mentions that the price of the product has increased from about £10 to £20 per ton (in the Queensland market) during the past two years. This is because the arrowroot is becoming more largely used as starch for laundry purposes, and is replacing the higher-priced imported starch for use in this way. The demand for the product is expected to largely increase.

The West Indian arrowroot plant is also cultivated on a small scale in Queensland, where it is known as 'white arrowroot' to distinguish it from the product of *Canna edulis*, which is referred to as 'purple arrowroot.' The Maranta plant is less popular among growers, however, because the crop yield given is considerably less than that of Canna, while no higher price can be obtained in Queensland for the product.

Chemical analysis shows but little difference in composition between West Indian and Queensland arrowroots. The percentage of starch—which is the important ingredient—is much the same in both cases. There is a little more moisture in the Canna arrowroot, and more fibre in that from Maranta. Yet, on the London market, the best Bermuda arrowroot commands a price of 2*s*. 6*d*. per lb., while the Queensland or Canna product will fetch no more than 3*d*. per lb.

Rhizomes of *Canna edulis* are planted out in Queensland during the period from September to December. They are set in rows, which are about 6 feet apart, and with a distance of 4 feet from plant to plant in the row. The crop takes from six to eight months to come to maturity.

The mature bulbs are dug up, carted to the mill, washed, and grated to pulp in a grinder or perforated revolving wooden drum. This pulp is then transferred mechanically to a sieve of perforated metal, and washed with a stream of cold water. The farine is carried through while the fibre and other impurities remain behind. Other similar devices are adopted for further purification, and finally the arrowroot is dried on calico cloths in the sun. The whole process, from the digging of the rhizomes to drying the prepared arrowroot, occupies about twenty-four hours.

It will be seen that a chief essential for arrowroot production is an abundant supply of good, clean water.

DEMONSTRATION FARMS IN THE UNITED STATES.

An interesting feature of the educational work organized by the United States Department of Agriculture is that which is carried on by means of the 'demonstration farms' of the Department.

These farms were started with the object of showing by numerous practical examples over a large area the advantages of improved methods of agriculture. The depredations of the Mexican cotton boll weevil, which threatened the entire destruction of the cotton crop in many districts, was one of the chief reasons which led to the starting of this work.

Since 1904, a grant of £15,500 has been made annually by Congress, and this was supplemented in 1907 by a grant from the General Education Board of £13,800; so that, together with some local contributions, a sum of about £33,500 was available in 1907-8. Agents have been appointed throughout Texas, southern Arkansas, Oklahoma, Louisiana, and a portion of Mississippi, and the work is also being carried on to a more limited extent in Alabama, Virginia, Carolina, and Georgia. Altogether, 143 agents are employed, and with this force about 12,000 demonstration farms had been established, and, in addition, 20,000 farmers had agreed to co-operate and make reports on results.

The term 'demonstration farm' is used to designate a portion of land on a farm that is worked strictly according to instructions. This is visited by an agent once a month to see that these instructions are carried out, and to give further advice if necessary. The farmers who co-operate and give reports on results also agree to cultivate their crops according to instructions, but are not visited regularly by the agents.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

Some of the chief problems and lines of investigation that have occupied the attention of the Bureau of Entomology, U. S. Department of Agriculture, are discussed in the editorial.

An interesting article dealing with the question of cultivating ratoon canes will be found on page 115.

Specimen trees of the litchi exist in many of the West Indian islands. Some particulars in relation to this fruit are given on page 116. A brief article on maize cultivation appears on the following page.

Castor oil plants may sometimes form a useful crop in these islands (page 118). About 600,000 lb. of arrowroot are produced annually in Queensland from *Canna edulis* (p. 119).

Rosin wash has proved an especially useful spraying mixture for thrips on cacao trees at St. Lucia (page 120).

An article dealing with the parasitic and predaceous enemies of scale insects which occur in the West Indies will be found on page 122.

Agriculture and trade in the Leeward Islands have shown great improvement in the past five years (page 123).

A resolution in favour of the establishment of an Imperial Department of Tropical Agriculture was lately carried unanimously by the Associated Chambers of Commerce of Great Britain (p. 125).

Queen of Flowers.

A number of specimens of the 'Queen of Flowers' (*Lagerstroemia Flos-Reginae*) are included among the collection at the Dominica Botanic Station, and about sixty young plants of this beautiful and showy flowering tree were distributed in 1907-8.

Referring to this in his last annual report, the Curator of the Botanic Station mentions that the seeds of this tree require special treatment, or are not likely to germinate satisfactorily. If collected when the fruit capsules show signs of bursting, and sown in boxes filled with river sand instead of soil, a very fair percentage of the seeds will be found to germinate. When the seedlings are large enough to handle, they should be potted in bamboo or other pots with good soil.

Cotton at Montserrat.

Latest reports from Montserrat state that the frequent rains of January were very harmful to the second picking of cotton, and a good deal was lost. This second crop was somewhat disappointing, but in one or two cases the flower-bud maggot was the chief cause of the loss experienced.

The planters of the island having realized the necessity of clearing off their old cotton before planting the young crop, in order to combat the leaf-blister mite, are generally favourable to the establishment of a definite 'closed season,' when no cotton, old or young, would be found on estates.

Mr. Robson in his report draws attention to a point which again emphasizes the importance of seed selection in cotton planting. A shipment of cotton from a field on Dagenham estate, planted with selected seed from Grove Station, was very favourably reported on from England, and commanded a price higher by a penny per pound than any other cotton shipped from this estate.

Spray Mixture for Thrips.

Owing to complaints of the occurrence of thrips on young cacao trees at St. Lucia, the Agricultural Superintendent of that island was in September last, advised to try the effects of four spraying washes on these insect pests. The washing mixtures in question were—(1) rosin wash, (2) kerosene emulsion, (3) kerosene emulsion with whale oil soap, and (4) rosin and whale oil soap compound. Directions for the preparation of all these washes are given in the *West Indian Bulletin*, Vol. IX, p. 191, and are also included in Mr. Ballou's pamphlet, 'Insect Pests of Cacao,' just issued by the Department, a review of which will be found on page 126 of this issue.

Mr. Moore lately reported on the trials made by him, and states that while all the mixtures were more or less effective in destroying the thrips, the rosin wash appeared to do the best work. On account of its sticky nature, this mixture adhered well to the cacao leaves, and on trees so treated dead thrips were observed in greater number than when other washes were used.

Owing to the caustic properties of the rosin wash (it contains caustic soda) it should be handled carefully.

Cotton Experiments in the Hawaiian Islands.

The energy and intelligence that are being displayed in connexion with agriculture in the Hawaiian Islands are indicated by the rapid progress that has of late been made. Old-established industries are being developed, and a number of new cultivations started or at least tried.

A report from the islands now states that experiments are being made in cotton cultivation, the varieties under trial being the Sea Island, Caravonica, and Egyptian cottons. Breeding work has been started over an area of 5 acres, and 10 acres have been laid out for manurial trials with cotton. It is stated that planters are showing marked interest in cotton planting, and it is probable that the crop will be grown over an extensive area next season, since large numbers of applications for selected Sea Island and Caravonica cotton seed have been received at the Experiment Station.

Preserved Ginger from China.

Although West Indian ginger is justly famous for its quality, the finest kinds of the spice are probably grown in China, from which country preserved ginger is chiefly obtained. The United States Consul at Canton, in a recent report describes the method adopted by the Chinese in preserving the ginger. The roots are first thoroughly cleaned in water, and then boiled in earthenware pans for two or three hours. Afterwards they are transferred to copper pans, sufficient water being added to cover the roots, and also a quantity of white sugar, at a rate of 5 lb. of sugar to 10 lb. of ginger. This mixture is then boiled for two hours. At the end of that time the ginger is put into large jars, and allowed to stand for seven days, when it is again boiled in sugar and water in the same quantities. After it has become cold it is packed in jars or tins for export. The Chinese season for preserving ginger is from July to October.

Poultry Keeping in Porto Rico.

Increasing attention is being given by small landholders in Porto Rico to the possibilities of poultry keeping in the island, and since the local breeds of fowl are small in size, a number of imported breeds have been tried.

On the whole, it would seem that the Leghorn varieties, especially the white and buff kinds, appear to be most suitable to the prevailing conditions, which are, of course, not dissimilar to those of the British West Indian islands. The Black Minorca fowl also does very well in Porto Rico. This variety lays large, white eggs, is a non-sitter, and being somewhat heavier than the Leghorn, is more valuable for table purposes. The several varieties of Plymouth Rocks, Wyandottes, Rhode Island Reds, etc., are reported to be too heavily feathered, and too addicted to sitting, to be profitable under the circumstances.

No reference is made to the Indian Game and Buff Orpington breeds, which are deservedly popular in Jamaica.

Demerara Seedlings in Louisiana.

A writer in the *Louisiana Planter* lately discussed at considerable length the merits of the Demerara seedling canes D. 74 and D. 95, as compared with the varieties that have been exclusively cultivated in Louisiana for sixty or seventy years past. An important point in favour of cane D. 95 is its storm-resisting power. It remained erect and undamaged after severe wind storms, when the 'home' or native canes were laid flat, and D. 74 was considerably injured by breakage of tops, etc. D. 95 suffers more from drought than from excess of rainfall, and gives good results on reclaimed marsh and swamp lands.

D. 74 has proved satisfactory in giving a good return of sucrose, and further, is a cane which requires a shorter period than either the Louisiana cane or D. 95 before coming to maturity. A disadvantage connected with D. 74, however, is that it is particularly susceptible to attack by cane borers. On the other hand, D. 95 appears to be very resistant to attacks of this pest, although possessing a somewhat soft fibre.

It is mentioned that D. 95 usually gives a return of cane about 20 per cent. greater, on the average, than that obtained from D. 74; but the superior richness of the juice of seedling D. 74 is generally almost sufficient to make up for this discrepancy.

It is evident that canes D. 74 and D. 95 are proving valuable additions to the varieties at the disposal of Louisiana planters.

Tuberculosis in Cows and in Human Beings.

The relationship between tuberculosis of cattle and that of human beings has been the subject of much discussion in the past, and the Royal Commission appointed by the British Government to report upon the disease has given a good deal of attention to this phase of the matter. The second interim report of the Commission was reviewed in the *Agricultural News*, Vol. VI, p. 217, and in this the Commissioners expressed strongly the opinion, that in numbers of cases, tuberculosis of the human subject, especially of children, was the direct result of the introduction of the bacillus of bovine tuberculosis into the system, milk from diseased cows being the chief medium of infection.

A third report lately issued by the Commission deals further with experiments and observations as to the infectious nature of milk, and also of the excreta of cows affected with tuberculosis. In the great bulk of cases, the location of the disease was in the lungs, and no affection of the udder could be observed, yet the milk of the cows contained bacilli of the disease. The bacilli were also present in more or less quantity in the fæces of the animals. Since dirt of various kinds from the cow-house is almost always present in milk, as it reaches the consumer, the conclusions arrived at by the Commissioners, after exhaustive enquiry, are further evidence in support of the necessity for a pure milk supply. Cows in the West Indies seldom suffer from tuberculosis, but in any case, the precaution of sterilizing the milk, by boiling it just previous to use, is a very wise one.

INSECT NOTES.

Natural Enemies of Scale Insects.

Insects may be beneficial in several different ways: as producing valuable products; as natural enemies of other insects which are pests attacking crops, domestic animals, household materials, or even man himself: or they may merely be scavengers and be beneficial on account of their habit of feeding on decaying organic matter.

In these notes, however, it is intended to discuss only one of these groups of beneficial insects, viz., natural enemies of other insects, especially of scales.

Readers of the *Agricultural News* may have noted in the 'Department News' that the Entomologist on the staff of this Department had been on a visit to Montserrat in connexion with an extended study of scale insects and their natural enemies.

The natural enemies of scale insects are of two kinds: parasitic and predaceous; both of these are to be found in the West Indies. Among the predaceous insects which attack scales are the lady-birds, and the lace-wing fly. There are many kinds of lady-birds in the West Indies. Two or three which are large enough to be easily seen are well known, but these are not, perhaps, more useful than certain others which are very small in size, and very plain and inconspicuous in their colouring. They are not generally known, and the planter does not often realize how much good is continually being done by these small creatures.

The parasitic insects are even more important than those which are predaceous in nature, and while it is very likely that there are many species which live at the expense of the scale insects, very little is actually known of the parasites which attack scale insects in the West Indies.

It is probable that all, or nearly all, of the 120 species of scale insects known to occur in the Lesser Antilles are attacked by parasites to a greater or less extent, and thus somewhat kept in check.

There are recorded from the island of St. Vincent alone as many as eighty-six species of parasitic Hymenoptera, of which many are probably parasites on scale insects, and many others also are probably parasites on other parasites. The latter kind are known as 'secondary parasites,' and it will readily be seen that, although parasitic in habit, they cannot be counted as beneficial insects.

Scale insects which are abundantly attacked by parasites can easily be distinguished, for many of them will be seen to have a little round hole in the back. This hole is the aperture through which the adult parasite has escaped, having spent the larval portion of its existence and the pupal stage under the protective scale of the host insect. The feeding of the parasite larva causes the death of the insect on which it feeds, and so well is the relationship adjusted between the parasite and its host, that the food material lasts the parasite larva until it is full-grown. If the food material were exhausted before the larval growth of the parasite was completed, the parasite would naturally die.

There can be no doubt that in all the islands of the Lesser Antilles, the natural enemies of scale insects are always abundantly and actively engaged in doing their part toward maintaining the equilibrium, otherwise the scale insects would multiply in perhaps one year, or at the most in two years, to a point where their numbers would be so great that none of the plants on which they feed would be able to live.

Scale insects become unusually abundant when for one reason or another they increase greatly beyond the numbers of their parasites and other natural enemies. On the other hand, when for any reason the natural enemies become unusually abundant, scale insects are less numerous and the effect of their attacks on plants are not so easily to be seen. One of the first indications of the presence of certain species of scale insects is the appearance on the leaves of the unsightly soot fungus commonly known throughout the West Indies as 'Black Blight.'

It is rather remarkable that the habits of parasitic insects are generally associated with certain definite structures, and that closely related insects have similar habits. For instance, certain groups of parasitic Hymenoptera are known to be egg parasites. The specialist, on examining an insect of one of these groups for the first time, would be able to say that it probably was an egg parasite, because of its relationship as evidenced by its structure. An exception to this, however, was recently found in the parasite of the Black Scale which attacks cotton. This parasite was sent from this Department to the Bureau of Entomology at Washington for identification, where it was named *Zalophothrix mirum*. Dr. Howard, Chief of the Bureau, wrote to the Commissioner of Agriculture to enquire whether there might be any mistake in the records, because, as he said, it ought from its affinities to be an egg parasite, and not a parasite of scale insects. Specimens of the scale insect containing parasites were sent on to Washington, however, which proved that this insect was an exception to the general rule, and was really a parasite of the scale.

In the editorial of the present number of the *Agricultural News*, mention is made of the work that is being done by the United States Department of Agriculture, in importing from Europe and establishing in Eastern Massachusetts certain beneficial insects. Much has been done in other States and in other parts of the world in this line. Insect pests transported from the countries in which they are native, are often transported at the same time away from their natural enemies, so that it frequently happens that many pests are much more troublesome in new localities than they were in their native land.

The Imperial Department of Agriculture hopes to get a considerable amount of knowledge of the natural enemies of the scale insects of the Lesser Antilles, with the object finally of endeavouring to utilize these parasites in the control of scale insects. It may be added that in addition to parasitic insects, there are certain fungi which are parasitic on scale insects. In Florida, and perhaps in other places, much has already been accomplished in the control of scale insects and white flies (*Aleyrodes*) by means of parasitic fungi. It is hoped that all readers of the *Agricultural News* in the West Indies will take an interest in this work, and will forward specimens whenever they notice anything of interest, which seems to them likely to be in any way connected with this study of natural enemies. Any such specimens may be sent to the local Agricultural Officer, who will forward them to the Head Office of the Department.

AGRICULTURE AND TRADE IN THE LEEWARD ISLANDS.

In his address to the general Legislative Council of the Leeward Islands on February 22 last, his Excellency Sir Bickham Sweet-Escott, K.C.M.G., referred to the marked improvement which had taken place in the trade of each Presidency in the colony during the past five years. This improvement is in large measure due to the development and extension of the agricultural industries of the several islands.

Referring in the first place to Antigua, the Governor pointed out the beneficial influence which the two central sugar factories at Gunthorpe's and Bendal's had exercised upon the trade of the island since they were started. Another important factor, of course, was the cultivation and export of cotton. The value of the cotton shipped from Antigua increased from £1,508 in 1904 to £17,479 in 1907. In 1908, notwithstanding a short crop and reduced prices, the cotton exported was valued at £12,983.

The financial conditions of St. Kitt's-Nevis were also in a satisfactory state, and this must be in large measure attributed to the increased output of sugar from St. Kitt's, and the development of the cotton industry in the islands of St. Kitt's-Nevis and Anguilla. The revenue of Anguilla in 1905-6 was £575 12*s.* 7*d.*, but in 1907-8 it had increased to £1,001.

Sir Bickham Sweet-Escott then alluded to the great development of the lime and cacao industries at Dominica which have been the principal cause of increased revenue in that island. The total value of the Dominica trade had increased by no less than £111,023 in the past five years.

Montserrat had also experienced increased prosperity of recent years, although it had not the resources of some other islands in the Leeward group. The value of the cotton exports from Montserrat had advanced from £2,072 in 1904 to £28,370 in 1908.

Cotton, too, had been an important source of prosperity to the Virgin Islands, and the shipments of lint from that Presidency in 1908 were valued at £1,992. A hope was expressed that the development of the lime industry might prove to be equally profitable to those islands in the future.

Sir Bickham Sweet-Escott then referred to the unfortunate experience of cotton growers in the past two seasons owing to low yields and reduced prices. In those islands of the Presidency where a heavy yield per acre could be expected with confidence, there was no doubt that this crop would give a remunerative return ; but since the results of the past two seasons had not been so profitable as those obtained when the industry was first started, he expressed a hope that planters would not lose sight of the possibilities of other crops, which, if included in their cultivations, might give lucrative returns.

At the conclusion of that part of his address which related to agricultural industries, the Governor referred again to the central factory question. He alluded to the profitable results that had been obtained at Antigua, and suggested that if a central factory were established at St. Kitt's and were managed with the same efficiency as the factory at Antigua, even better results might be obtained than in the latter island. He should be very glad to see the inhabitants of St. Kitt's participating in the advantages which Antigua now derived from the existence of the two central factories in that island.

EDUCATIONAL EXHIBITS AT AGRICULTURAL SHOWS.

The stimulating influence and educational value of properly conducted Agricultural Shows are too obvious to need much comment. At these functions every competitor and visitor has a chance of comparing the results obtained by the prize-winners with those achieved on their own holdings, and of ascertaining the methods by which these results were brought about. In this way the influence of intelligent care and attention and superior methods of cultivation upon the nature of the return is amply demonstrated for the benefit of all.

Apart from the competitive side of these meetings, it is interesting to note that increasing attention has of late been given at many of the prominent Agricultural Shows in Great Britain and other countries, to the display of certain classes of exhibits which have for their aim a purely educational function. Such exhibits include specimens of agricultural plants showing signs of various diseases, or of attack by insects, mounted specimens of insects responsible for damage to crops, collections of fungicides, insecticides, spraying and dusting apparatus, samples of various kinds of artificial manures, prepared feeding stuffs, specimens of plants which it is proposed to introduce into local cultivations, or improved varieties of crops already generally cultivated. Such collections are, of course, usually prepared and arranged under the direction of Agricultural Departments, Colleges, or Experiment Stations. Diagrams illustrating in a graphic way points to which it is desired to draw special attention are frequently found very useful in connexion with these educational sections, and an officer from the Department or Station is generally in attendance to explain points that give rise to enquiry.

At the Agricultural Show held at Port-of-Spain, Trinidad, in January last, a very interesting collection of exhibits, such as those to which reference has been made, was on view. The total number of separate exhibits reached about 140. Among these were included twenty-eight samples of different fungicides and insecticides—both liquid and solid, with four kinds of spraying machines; there were also twenty-eight specimens of various plant diseases affecting the principal crops of the colony—cacao, sugar, fruit trees, etc.; parasites, such as the 'love vine,' were also represented. In addition, visitors to the Show had opportunities of examining the various life stages of the chief insect pests affecting cacao, cocoa-nuts, sugar-cane, oranges, etc., in Trinidad. The final class in the section consisted of twenty-six exhibits illustrating various natural and artificial sources of plant food, and comprised a number of leguminous plants, such as 'Immortel' (Erythrina), velvet bean, pigeon peas, 'sensitive plant' (*Mimosa pudica*), etc., carefully removed from the soil, and showing the nodules formed on the roots by the nitrogen-fixing bacteria which are associated with plants of this order, together with many specimens of artificial manures.

The exhibit thus organized by the Department created a fair amount of interest, which should be an encouragement for maintaining the 'educational section' at subsequent Shows.

GLEANINGS.

Sugar planters in British Guiana have arranged for the importation of 2,525 indentured labourers during the coming year. (*Demerara Argosy.*)

Onion growing would appear to be regarded with increasing favour at Montserrat, since 130 lb. of seed have been ordered from Teneriffe for this season's planting, as compared with 110 lb. ordered last year.

Rats are reported to be giving trouble from time to time in cotton fields at Montserrat. These pests are apt to damage the return by dragging the cotton from the bolls for the sake of the seed.

Mr. A. D. Hall, M.A., Director of the Rothamsted Experiment Station, England, has been elected a Fellow of the Royal Society, in recognition of his valuable investigations in Agricultural Science.

It has recently been enacted at Grenada, by an Order in Council, that substances or preparations intended for use in agriculture as insecticides or fungicides, and for no other purpose, shall be imported into the island duty free.

The Agricultural Instructor at Nevis reports that onions are doing remarkably well in that island, and that a large crop will be reaped this season. With a more extended market, it seems that onion growing would be the most profitable of the minor industries of Nevis.

A note in the St. Lucia *Official Gazette* draws attention to the fact that the price of grafted mango plants at the Botanic Station has been reduced to 2*s.* each, on condition that they are purchased for planting only in the island. A few plants are now ready for distribution.

The Cohune palm (*Attalea Cohune*), which occurs in British Honduras in enormous numbers, bears heavy crops of nuts which yield a useful oil. The Belize *Colonial Guardian* refers to the profitable industry that might be created, if proper machinery for extracting this oil were established in the colony.

It was stated at a meeting of the St. Lucia Agricultural Society that, apart from the cotton grown by Messrs. Macfarlane, Junior & Co., at Balembouche, only some 2,000 lb. of seed-cotton had been offered for purchase at the ginnery in the past season. The peasantry of the island were shy of a new industry. The Agricultural Society decided to import 100 lb. of cotton seed from St. Vincent for distribution.

Owing to the small crop that has resulted from the drought of last year, many of the smaller mills at Barbados will not be worked this season, but the canes will be ground at some larger neighbouring mill. Peasant-grown canes are being purchased at 10*s.* 6*d.* per ton by one or two of the larger factories in the island.

The Ceylon Gamboge tree (*Garcinia Morella*), the resin of which forms gamboge, flowered and fruited in the Dominica Botanic Gardens during the year 1907-8. It is hoped to raise seedling plants of this strong-growing Garcinia, with the object of utilizing them as stocks on which to graft the delicate mangosteen.

The Curator of the Montserrat Botanic Station reports that about 100 sweet potato plants have lately been raised from seed, and are now growing in the nursery at the station. In this connexion it may be mentioned that the well-known and heavy-cropping 'Hen-and-Chickens,' and 'Spooner' sweet potatos are seedling varieties.

A recent number of the *Indian Trade Journal* mentions that ground nut cultivation has, of late, increased rapidly in Burma. For the year ending June 30, 1908, the total area planted with this crop reached 142,051 acres, compared with 78,743 acres in the previous season. In order to foster the industry, the Government are distributing seed nuts, which are repaid at harvest time.

According to the London *Times*, the well known English firms of Messrs. Cadbury, Messrs. Fry, and Messrs. Rowntree, have decided, after careful investigation of the matter, not to make any more purchases of cacao from the Portuguese islands of St. Thomé and Principe, on account of the slave-like labour conditions in those islands. West Indian cacao should therefore find a more extensive market in Great Britain.

Tobacco is grown fairly extensively in Italy, and in 1906-7 the value of the home-grown product shipped from the country was £107,924. This was exported chiefly for the use of Italian communities in other lands, Buenos Ayres taking by far the largest quantity, viz., tobacco to the value of £95,004. In 1906, a sum of £7,720 was expended on the Experiment Station for the growth and manufacture of tobacco at Salerno. (*British Consular Report.*)

Divi-divi pods (the produce of *Caesalpinia Coriaria*), forwarded to the Imperial Institute, from trees planted by the Botanical Department, Gold Coast, West Africa, were found to contain 33·10 per cent. of tannin, as compared with 45 per cent. in the ordinary divi-divi of commerce. The sample was not well prepared, and was valued at £5 per ton, as against a current value of £9 to £11 for West Indian and South American divi-divi.

A note in *Nature* draws attention to the fact that the Research Defence Society, of 70, Harley St., London, which has for its object the dissemination of trustworthy information on the aims and achievements of research in medicine and physiology, has lately prepared material for a series of illustrated lectures on such diseases as malaria, yellow fever, Malta fever, sleeping sickness, etc. The materials, together with lantern slides, etc., can be obtained on loan from the Society by accredited persons.

STUDENTS' CORNER.

Seasonal Notes.

APRIL.

2nd FORTNIGHT.

Students should note the effect of the moth borer (*Diatraea saccharalis*) on the growth of the sugar-cane, and observe the habits of this pest. Read article on moth borer in *West Indian Bulletin* (Vol. I, pp. 327-51). Eggs of this insect may be found on the young leaves of the canes at this time of the year. Collect some of these egg clusters, which may be kept in a wide-mouthed bottle, the opening of which is closed with muslin. Observe the young caterpillars as they emerge. Note also the eggs which have been parasitized, and observe the minute Hymenopterous insect which emerges from the latter. Shut up some freshly laid eggs of moth borer with parasites and observe the result.

On estates where cotton is grown, students should note the difference, if any, in the quality of the cotton, the quantity of the nep, etc., from the first picking and that from the second picking. Note also the relative quantity and quality of the lint obtained from ratooned cotton, i.e., cotton plants that are allowed to remain on into the second year from planting. Students should further make a point of observing the difference, if any, between the yields from plants that have been pruned, and those which have not been so treated.

The gathering of the 'Easter' cacao crop will be in progress. Compare the different varieties: Criollo, Forastero, and Calabacillo, in regard to their vigour of growth, yield of pods, and number of beans in the individual pods. Discuss the relative advantages and disadvantages of the three varieties. Search for and poison the nests of wood ants in cacao plantations: also regularly lay poison to keep down the plague of rats.

Lime seedlings in nursery beds need attention. Keep surface soil loose in these beds, or seedlings will 'quail.' Green dressings are most useful for improving the texture of soil in lime plantations, but should not be planted after the end of April. Why is this?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Describe how budding is done, and name the principal West Indian plants that are propagated by budding.

(2) What is meant by the 'germinating power' of seed? How would you test the vitality of a sample of cotton seed?

(3) What advantages are derived from the use of leguminous green dressings? State what non-leguminous plants are sometimes used for green dressings in the West Indies, and explain why crops of the former class are more useful than those of the latter for this purpose.

INTERMEDIATE QUESTIONS.

(1) Explain clearly the difference between *available* plant food, and *total* plant food constituents in the soil.

(2) What causes a 'plough pan,' and how can this be rectified? Does this interfere with soil capillarity?

(3) How does adequate drainage benefit soil and plants?

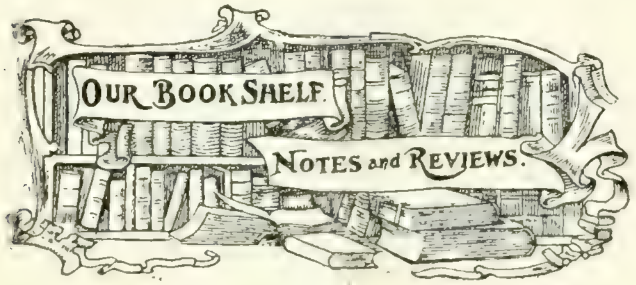
IMPERIAL DEPARTMENT OF TROPICAL AGRICULTURE.

At the annual meeting of the Associated Chambers of Commerce of the United Kingdom, held early in March, a resolution proposed by Mr. J. C. Atkins, of Oldham, was carried unanimously, which strongly urged upon the Government the importance of establishing an Imperial Department of Tropical Agriculture. The following forms a summary of Mr. Atkins' speech on the subject:—

A large part of the British Empire lay within the tropics and contained extensive tracts of the most fertile land in the world, which was largely undeveloped. These lands were capable of producing immense quantities of food stuffs and raw materials, which would bring prosperity to the inhabitants, and thus by increasing their purchasing power, also benefit the mother country. The natives could be helped to grow more of the products they now cultivated, and also new ones suitable to the various climates could be introduced. But, in order that this might be done properly, and to avoid useless expenditure, a thorough knowledge of the climatic conditions, the rainfall, the quality of the soil, labour supply, and transport facilities, etc., were necessary. That could only be done satisfactorily by a Government Department. In India and Ceylon, and in parts of South Africa, much good was being done by the Agricultural Departments, but there was no relationship between those different bodies, and there must be some central authority if the best results were to be obtained, so that the information and experience gathered might be available for the whole Empire. To ensure unity of purpose in the carrying on of such a Department, it must be on an Imperial basis. From his connexion with the British Cotton-growing Association, he knew the great difficulties which had to be contended with in the initial stages from want of information as to the climate, soil, and also of technical knowledge, and many mistakes were made and money lost. The same remark applied to many other products. The history of the British Cotton-growing Association and its results, proved what could be done in developing the colonies, if proper methods were employed. It was only about seven years since the idea of growing cotton within the Empire was started. Now it had been proved that cotton of every variety can be grown under the British flag, and the industry had been firmly established.

What had been done in cotton could surely be done in other commodities. Rubber, for instance, was being grown in many parts of the Empire, but much of it was of inferior quality owing to lack of knowledge. The natural resources of our Empire were enormous, and, if only properly developed, would bring prosperity to all. In order that this might be brought about it would be necessary to have agricultural departments in all the colonies, and a central department in London, where all the information and experience that have been collected will be gathered together, and experts will be able to advise, assist, and direct on all matters in connexion with tropical agriculture.

The work should be concentrated in one department whose sole object would be to develop the agricultural resources of our tropical possessions, acting in conjunction with departments in the colonies, formed on lines similar to that in the West Indies. The cost of the central department would be borne by the Imperial Government, and that of the branches principally by the colonies themselves.



AGRICULTURE FOR SOUTHERN SCHOOLS. By J. F. Duggar, Director of the Alabama Agricultural Experiment Station. *New York: The Macmillan Company. pp. 355.*

Numbers of elementary text-books have been published in England and the United States which deal with the principles and practices of agriculture as it exists in countries of temperate climate. The present volume is particularly noticeable, however, in that, while treating of the general principles of the subject, the crops whose methods of cultivation are discussed for purposes of study and illustration are chiefly those grown exclusively in the Southern (and therefore sub-tropical) States of America.

The subject-matter is arranged on the plan which experience has shown to be best in developing the teaching of agriculture in elementary and secondary schools. Beginning with a consideration of the parts of a flower, process of pollination, the growth of plants, and the manner in which they obtain food and moisture, this is followed by chapters on the properties, methods of tillage and improvement of soils; manures, their uses, and adaptation to particular soils and crops; farm crops, and the principle of rotations; and the cultivation of flowers and fruit trees, etc. In the section dealing with farm crops, the sugar-cane, cotton, maize, ground nuts, cowpeas, etc., all receive attention, so that teachers in West Indian schools where elementary instruction in agriculture is given will find much matter of interest in the book.

Considerable space is devoted to diseases in plants, and their causes, insect life, the insect enemies of the crop grower, and methods of preventing their ravages. The closing chapters deal with the various kinds of farm live stock, their rearing, feeding, and management, dairy work, and farm implements and machinery.

An attractive feature of the book is the abundance and interest of the illustrations. Altogether, there are no less than 220 figures, which illustrate every phase of the matter discussed.

At the close of every chapter a few practical exercises bearing on the subject of the preceding lessons are suggested for the pupils. This is followed by hints for the teacher, indicating special points that may be emphasized, sources of further information, etc.

The spirit of enquiry by both teacher and scholar, which is inculcated by Mr. Duggar's book is especially striking. The teacher is recommended to step down from the desk, and to become a comrade with the pupils. The following is quoted from the preface, in which the author addresses the teacher: 'Be a leader in raising questions which you need not be ashamed to own that you cannot answer. If you arouse the interest that will make your pupils desire an answer, you arouse in them for the years to come the spirit of enquiry by means of which, as men and women, they will educate themselves. In teaching agriculture, humility is the teacher's proper attitude, and to show it will not forfeit the respect of either pupils or patrons.'

Not only will this book prove useful in connexion with school work, but from its sound practical character, it may be cordially recommended to those who are about to enter, or who have already entered upon practical agricultural life. It may be studied to advantage by those, for example, who are preparing for the Preliminary or Intermediate Examinations of this Department of Agriculture. In brief, the book may be described as interesting, sound, and useful.

INSECT PESTS OF CACAO. By H. A. Ballou, M.Sc. *Issued by the Imperial Department of Agriculture.* Price 4*d.*

The above booklet, written by the Entomologist on the staff of the Imperial Department of Agriculture, and which forms one of the latest additions (No. 58) to the Pamphlet Series of the Department, contains within the limits of twenty-six pages, a considerable amount of useful information on the subject of the principal insect pests which attack cacao trees in the West Indies, and the measures which experience has shown to be most useful in keeping these pests in check.

Regular readers of the publications issued by this Department will note that much of the material of the pamphlet in qestion has already appeared at different times, in the form of articles or notes contributed by Mr. Ballou to the *West Indian Bulletin* or the *Agricultural News.* At the same time it will be recognized that a distinct purpose is served, by bringing together, and including with other matter, within the compass of a small booklet, the information formerly scattered through a number of periodicals.

Cacao thrips and the cacao beetle are the pests chiefly found in West Indian cacao orchards. In addition, there are several kinds of insects, mealy bugs, etc., which occasionally give trouble. These are all described, and the remedies recommended are in every case clearly stated. Stress is laid throughout the pamphlet on the need for careful cultural methods to be adopted in cacao cultivation. Experience has shown at Grenada that this is a most important factor in dealing with attacks of insect pests.

The pamphlet is suitably illustrated, and an appendix gives an interesting account of the measures recommended in combating attacks of the cacao beetle.

RICE IN BRITISH GUIANA.

In their fortnightly report dated April 2 last, Messrs. Sandbach, Parker & Co., of Georgetown, give the following particulars respecting the condition of the rice industry of British Guiana: —

The weather during the past fortnight has been much brighter, and most of the small mills have taken advantage of it to clean some of the paddy they had on hand, with the result that deliveries to town of cleaned rice have been considerably larger than during the past two months. A short crop is also now being reaped in some districts, and small quantities of new paddy have changed hands. Preparations for the October-December crop are going on, and planting will soon be commenced in real earnest.

Shipments to the West India islands during the fortnight amount to about 2,800 bags, the greater part being for Trinidad.

We quote to-day, f.o.b. Demerara, for good export quality, per bag of 180 lb. gross, 19*s.* 1½*d.* to 20*s.* 1½*d.*; and per bag of 164 lb., 17*s.* 7½*d.* to 18*s.* 7½*d.*

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A. L. S., has forwarded the following report on the London drug and spice market during the month of February :—

No change in the condition of trade in spices and drugs in Mincing Lane since our last communication can be recorded. The month of February, indeed, has been one of almost remarkable dulness. It was not until the middle of the month that the supplies of new and old drugs assumed even a normal position, and at the last spice and drug auctions on the 24th and 25th respectively, very small supplies were brought forward, with a corresponding limited demand. With regard to West Indian products, the following are the details :—

GINGER.

At the first spice sale on February 3, 82 barrels of Jamaica were offered and disposed of at 60*s.* to 63*s.* for fair to good bright, and 55*s.* to 60*s.* for good middling. Cochin was represented by 125 bags, all of which were bought in at 40*s.* per cwt. for fair to washed rough. It was reported that several hundred bags of washed Cochin had been sold privately at 35*s.* per cwt. At the succeeding sale, no Jamaica was offered, and only a small supply of Calicut, which was bought in. On the 17th, the offerings consisted of 27 bags Jamaica ratoon, which were bought in at 45*s.* ; 107 bags of washed rough Cochin, and 20 cases of good small native cut Calicut, all of which were bought in, the first at 38*s.* per cwt., and the second at 55*s.* No further quotations were made in this article during the remainder of the month.

NUTMEGS, MACE, AND PIMENTO.

Very little attention has been given to nutmegs during the month. At the spice sale on the 10th, large nuts were quoted at an advance of ½*d.* to 1*d.* per ℔. over previous prices. At the same sale West Indian mace was in good demand, 35 packages being offered and sold at the following rates : fine, 1*s.* 11*d.* to 2*s.* 1*d.* ; good pale, 1*s.* 8*d.* to 1*s.* 9*d.* ; fair, 1*s.* 6*d.* to 1*s.* 7*d.* ; and ordinary, 1*s.* 4*d.* to 1*s.* 5*d.*

Of pimento, the market opened on the 3rd with a few bags of fair, which realized 2*d.* per ℔. out of a total offering of 75 bags. On the 10th, some 250 bags were bought in at 2⅛*d.* per ℔. On the 17th, 164 bags were offered, of which 10 were sold at 2*d.* per ℔. for fair. At the last sale on the 24th, all the offerings, amounting to 136 bags, were bought in at 2*d.* to 2⅛*d.* per ℔.

ARROWROOT.

Of this article, there is very little to report. Thirty bales of St. Vincent were offered on the 17th, all of which were bought in. On the 24th, some 20 barrels of good Natal were offered and bought in at 4½*d.* per ℔.

SARSAPARILLA.

In the early part of the month, grey Jamaica was scarce, but at the last drug auction on the 25th, 9 bales of genuine grey Jamaica realized from 1*s.* to 1*s.* 5*d.* per ℔. The details of the last drug auctions of the month are as follows : On the 11th, there was no grey Jamaica or Lima-Jamaica offered. Five bales of dull red native Jamaica were brought forward and bought in at 1*s.* per ℔. Some 40 bales of Honduras and Guatemala mixed, were also offered and retained at 1*s.* 3*d.*, 11*d.* being the highest bid.

On the 25th, the offerings and sales were as follows : Grey Jamaica, 30 bales ; Lima-Jamaica, 36 bales ; native, 7 bales. All these were disposed of at the following rates : Grey, fair to good, 1*s.* 4*d.* to 1*s.* 5*d.*; roughish, 1*s.* to 1*s.* 1*d.*; fair to good Lima-Jamaica, from 1*s.* 1*d.* to 1*s.* 2*d.*, and common dark chumpy, 1*s.* For good, red, native Jamaica, 1*s.* to 1*s.* 1*d.* was paid ; for fair red, 11*d.* to 11½. ; and for ordinary yellow, 11*d.* At the same auction, 22 bales of Honduras were also offered, and 11 sold without reserve at 1*s.* 3*d.* to 1*s.* 4*d.* per ℔.

KOLA, LIME JUICE, OIL OF LIME, TAMARINDS, ETC.

In the middle of the month, 6 bags of dark, slightly mouldy, West Indian kola found buyers at 1½*d.* per ℔. ; 4 hogsheads of palish raw Jamaica lime juice were also sold at 1*s.* 1*d.* per gallon. At the end of the month, 6 cases of fair West Indian distilled oil of lime were offered and bought in at 2*s.* 3*d.* At the same auction a case of West Indian oil of bitter orange was sold at 5*s.* per ℔ ; 10 other cases, about the quality of which there was some doubt, were withdrawn. Tamarinds were represented by 13 barrels of rather dark Barbados, which were held at 11*s.* in bond, an offer of 10*s.* 6*d.* being refused. Twenty casks of fair black Calcutta were also offered and bought in at 14*s.*

PIGEON PEAS.

The pigeon pea (*Cajanus indicus*), which is grown on a fairly extensive scale in the West Indies for food and green-dressing purposes, is known in the East Indies as 'dhall,' and the methods of cultivation and uses of the crop form the subject of a leaflet lately issued by the Ceylon Agricultural Society.

The pigeon pea plant—as is generally known—grows to a height of 6 feet or more, the mature pods being from 3 to 5 inches long, and containing from three to five seeds. Pigeon peas resist drought to a remarkable degree, and form a very useful crop for restorative purposes on worn-out soils. In India it is estimated that there are no less than 700,000 acres under this cultivation ; the pulse, either split or ground into flour, forms, in combination with rice, the staple diet of millions in that country.

Pigeon peas do best on alluvial soils, or medium clay loams, containing a fair proportion of lime. In India it is frequently grown as a mixed crop with sorghum, or even rice. Generally, however, the best returns are obtained, and the soil is most benefited, when the crop is grown alone.

Pigeon pea plants do not usually yield their produce until about six months after sowing ; if the land is not immediately required, successive crops of pods may be obtained from the plants.

When pigeon peas are grown alone, and on fairly good soil, the yield of pulse may be as high as 2,000 ℔. per acre, and 500 ℔. per acre is a very ordinary return. When the peas are used for human food, it is found best to free them from the husks or outer skin before cooking. These husks may, of course, be given to cattle or goats ; the foliage of the plants is suitable for fodder, or, with the stalks, may be buried in the soil as a green manure, thus forming a useful supply of humus.

The pigeon pea is hardy, and does not suffer much from insect or fungoid attack. At St. Kitt's, however, some plantings are reported to have been damaged by the net-wing bug. As green dressing, although it supplies a large weight of vegetable matter, it does not cover the ground so well as cowpeas, woolly pyrol, velvet beans, Bengal beans, etc.

MARKET REPORTS.

London,—March 30, 1909, THE WEST INDIA COMMITTEE CIRCULAR; Messrs. KEARTON PIPER & Co., March 16, 1909; Messrs. E. A. de Pass & Co., March 19, 1909.

ARROWROOT—Quiet; $1\frac{7}{8}d.$ to $2\frac{1}{16}d.$ according to quality.
BALATA—Sheet, 2/2 to 2/4; block, no quotations.
BEES'-WAX—£7 12s. 6d. for dark to pale.
CACAO—Trinidad, 56/6 to 70/- per cwt.; Grenada, 51/6 to 59/- per cwt.
COFFEE—Santos, 33/- per cwt.; Jamaica, no quotations.
COPRA—West Indian, £18 to £19 per ton.
COTTON—Nevis and St. Kitt's, 13d. to 14d., Barbados, 13½d. to 14d.; St. Vincent, 15d. to 16d.
FRUIT—
BANANAS—Jamaica, 4/6 to 9/- per bunch.
LIMES—Not wanted.
PINE-APPLES—St. Michael, 1/6 to 4/.
GRAPE FRUIT—5/6 to 9/- per box.
ORANGES—Jamaica, 6/- to 9/- per box.
FUSTIC—£3 to £4 per ton.
GINGER—55s. to 63s. Quiet.
HONEY—25s. 6d to 29s. per cwt.
ISINGLASS—West India lump, 2/2 to 2/6 per lb.
LIME JUICE—Raw, 1/- to 1/3 per gallon; concentrated, £18 to £18 15s. per cask of 108 gallons; distilled oil, 2/- to 2/3 per lb.; hand-pressed, 5/6 per lb.
LOGWOOD—£3 to £4 5s. per ton; roots, no quotations.
MACE—Dearer.
NUTMEGS—Steady.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5s. $1\frac{3}{4}d.$ per lb.
RUM—Jamaica, 3/1 to 3/4; Demerara, 1/6½ to 1/7, proof.
SUGAR—Crystals, 14/3 to 16/9; Muscovado, scarce: about 15s. to 15s. 6d.; Syrup, 15s. to 15s. 6d.; Molasses, no quotations.

New York,— April 2, 19, 1909.—Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 13c. to 13½c.; Grenada, 13¼c. to 13¾c.; Trinidad, 13½c. to 14c.; Jamaica, 12c. to 13½c. per lb.
COCOA-NUTS—Jamaica, select, $23·00 to $24·00; culls, $14·00 to $15·00; Trinidad, select, $23·00 to $24·00; culls, $14·00 to $15·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8¼c.; good ordinary, 9¼c.; washed, up to 12c. per lb.
GINGER—9c. to 13c. per lb.
GOAT SKINS—Jamaica, 55c.; Antigua and Barbados, from 49c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
GRAPE FRUIT—Jamaica, $3·00 to $3·75 per barrel.
LIMES—No quotations.
MACE—30c. to 35c. per lb.
NUTMEGS—110's, 11¼c. per lb.
ORANGES—Jamaica, $1·50 to $2·00 per box.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 3·98½c.; Muscovados, 89°, 3·48½c.; Molasses, 89°, 3·23½c. per lb., duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., April 10, 1909; Messrs. T. S. GARRAWAY & Co., April 12, 1909.

ARROWROOT—St. Vincent, $3·90 to $4·00 per 100 lb.
CACAO—Dominica and St. Lucia, $10·00 per 100 lb.
COCOA-NUTS—$13·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb.
HAY—$1·50 per 100 lb.
MANURES—Nitrate of soda, $62·00 to $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $72·00 to $75·00; Sulphate of potash, $67·00 per ton.
MOLASSES—Fancy, 16c.; Grocery, 16c. per gallon.
ONIONS—Strings, $2·25 to $3·00 per 100 lb.; loose, no quotations.
POTATOS—Nova Scotia, $2·60 to $2·75 per 160 lb.
PEAS—Split, $6·00 per bag of 210 lb.; Canada, $3·50 per bag of 120 lb.
RICE—Ballam, $5·60 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—Dark Crystals, 96° $2·30; Muscovado, 89° $1·80.

British Guiana,—Messrs. WIETING & RICHTER, April 3, 1909; Messrs. SANDBACH, PARKER & Co., April 2, 1909.

ARROWROOT—St. Vincent, $9·00 to $9·50 per 200 lb.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. per lb.
CACAO—Native, 14c. per lb.
CASSAVA—60c. to 84c.
CASSAVA STARCH—$6·00 per barrel of 196 lb.
COCOA-NUTS—$12·00 to $16·00 per M.
COFFEE—Creole, 12c. to 13c.; Jamaica, 13c. to 13½c. per lb., slow.
DHAL—$4·75 to $4·80 per bag of 168 lb.
EDDOS—$1·68 per barrel.
MOLASSES—No quotations
ONIONS—Lisbon, 5c. to 6c. per lb.
PLANTAINS—24c. to 48c. per bunch.
POTATOS—Nova Scotia, $2·40 to $2·50 per 100 lb.
POTATOS—Sweet, Barbados, 84c. per bag.
RICE—Ballam, $5·50; Creole, $4·50 to $4·60.
SPLIT PEAS—$5·60 to $5·80 per bag (210 lb.); Marseilles, $4·00
TANNIAS—$1·44 per bag.
YAMS—White, $2·00 per bag; Buck, $1·80.
SUGAR—Dark crystals, $2·35 to $2·40; Yellow, $3·10 to $3·25; White, $3·60 to $3·80; Molasses, $2·30 to $2·40 per 100 lb. (retail).
Timber—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—$3·75 to $5·75 per M.
——CORDWOOD—$2·40 to $2·64 per ton.

Trinidad,—April 3, 1909.—Messrs. GORDON, GRANT & Co.

CACAO—Venezuelan, $12·80 to $13·50 per fanega; Trinidad, $13·25.
COCOA-NUTS—$22·00 per M. f.o.b. for selected pealed in bags of 100 lb.
COCOA-NUT OIL—70c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 8½c. per lb.
COPRA—$3·20 per 100 lb.
DHAL—$4·65 to $4·75 per 2-bushel bag.
ONIONS—$5·00 to $6·00 per 100 lb. (retail).
POTATOS—English, $1·25 to $1·30 per 100 lb.
RICE—Yellow, $5·00 to $5·25; White, $4·50 to $4·90 per bag.
SPLIT PEAS—$5·25 to $5·50 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

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CONTENTS.

Food Supply of the West Indies.

IN considering the annual trade returns of the West Indies it must strike the observer that the quantities of food stuffs imported each year are very large for countries whose industries are almost purely agricultural.

To take the Leeward Islands as an instance. In 1906-7, the total value of all the imports into the colony was £407,251, which included articles of food to the value of £151,260. Among the chief items in this latter class are wheat flour, £46,751 ; corn meal, £13,593 ; salt pork, hams and bacon, £12,657 ; bread-stuffs, £9,127 ; rice, £8,537 ; and peas and beans, £991.

To a certain extent it may be truly urged that it is economically sound and more generally profitable for these islands to grow for export such staple products as sugar, cacao, cotton, limes, bananas, etc., and to import foreign-grown foods. But, under existing conditions, there are numbers of men in many of the West Indian islands who find little or no employment, and in most of the colonies there are more or less considerable tracts of uncultivated land. It would be highly beneficial, therefore, if these now unused resources could be employed in the production of food stuffs for local consumption. In such a case, large sums of money at present paid out for imported foods would be spent at home, and the value would remain in the colony to be again employed in raising other useful products.

The matter of the more extended cultivation of food crops in the West Indies is especially worthy of consideration just now in connexion with the question of cotton planting.

It has been demonstrated that, under ordinary estate circumstances, it is not advisable to attempt to grow cotton continuously year after year on the same land, even in districts where this crop has been most successful, and it would seem that in the majority of cases, the most suitable rotation to adopt is that in which some provision or grain crop alternates with cotton. This method will afford the opportunity of giving the land the change of cultivation that is necessary, and the produce from the crops mentioned will generally find a satisfactory and comparatively steady market.

Wheat flour, which is the chief article of food imported into the Leeward Islands, and probably into the other colonies as well, possesses advantages peculiar to itself, and it is hardly likely that it will ever be displaced, although the more extensive production of home-grown feeding stuffs might lead to a considerable substitution. Corn meal is a food which offers a good field for home production, although it would be difficult to do without the imported article altogether. It is apparent, too, that with the development of more extensive sources of home-grown food stuffs, there would come into existence a more or less regular supply of offal—surplus and damaged material—which would render it possible to raise much larger numbers of pigs than is now the case, so that part of the large amount which is now spent on imported pork might be applied to home production.

Part, if not all, of the rice purchased from abroad, might with advantage be substituted by locally produced grains and meals, and there should certainly be no need in any of the West Indian islands to import beans and peas, as all the supply required could be grown locally.

Peas and beans are seldom grown in the West Indies on any extensive scale as field crops, except in cases where a green-dressing crop is required. This is unfortunate in view of the fact that all pulse or leguminous products are rich in albuminous matter, a constituent in which most food stuffs grown in the West Indies are deficient. It would be well if peas and beans formed a more prominent article in the dietary of the labouring classes of these colonies, and this is a matter which deserves special attention in any effort to extend the local production of articles of food.

Although the conditions as regards the relative proportions of imported and home-grown foods have not undergone much alteration in the West Indian islands during the past ten years, yet a notable instance of the rapid development of a local food-producing industry, which has been attended with much increased prosperity to the labouring classes, exists in the neighbouring colony of British Guiana. While in 1899-1900 the quantity of rice imported into British Guiana was 11,313 tons, the imports have gradually fallen off with increasing home production, and in 1906-7, when the local-grown rice crop reached 40,472 tons, the rice brought into the colony was no more than just over 2,751 tons.

The chief crops suitable for human food, which are cultivated in the West Indies, are sweet potatos, yams, tannias, eddos, cassava, maize, guinea corn, bananas, and small quantities of rice. Of these crops, sweet potatos are probably more extensively cultivated than any other, and during the months of the year when these are most plentiful, they form a large part of the diet of the labouring classes. Yams are grown on a smaller scale, but possess the advantage that they will keep for a longer period than sweet potatos. There is no doubt that cassava might with advantage be produced and utilized in the manufacture of bread to a much greater degree than is at present the case.

Surveying the whole situation, it would seem that the main reasons which account for the relatively large proportion of imported food stuffs consumed in these islands, as compared with locally raised produce, are that, under present conditions, the supply of home-grown food stuffs is not regular and uniform—which, in its turn, is due to the fact that the crops previously enumerated possess but poor keeping qualities—and that the means of distribution are very poor. The food crops produced in a given district are directly consumed by the inhabitants of that district, and deficiencies are made up by imported food stuffs, the supply of which is regular and reliable. It is evident that any attempt to promote the more extensive cultivation of West Indian food products for local consumption, if it is to be successful, must be accompanied by an effort to establish a general system of distribution, by means of which a deficiency in the supply of local produce in one district may be made up by importation from neighbouring districts where there may exist an excessive supply.

Another important matter that demands consideration in this connexion is the possibility of initiating and developing some method of treatment by means of which the keeping qualities of West Indian food stuffs could be increased. It would seem that this could best be accomplished by converting such raw products as sweet potatos, yams, cassava, bananas, etc., into a powdered and desiccated form, so that an excessive supply at one time of the year might be utilized to meet a deficiency at some other period.

Wood of Silk Cotton Tree. The wood of the silk-cotton or ceiba tree, so well known in the West Indies, is soft and subject to attack by insects, which make it unsuitable for most industrial uses. In his paper 'Timbers of Jamaica,' appearing in the *West Indian Bulletin*, Vol. IX, No. 4, Mr. W. Harris, F.L.S., states that, if steeped in strong lime water, the wood of this tree will last for several years, when made into boards and shingles.

THE POSSIBLE DEVELOPMENT OF A WEST INDIAN HAY INDUSTRY.

Mr. H. A. Tempany, B.Sc., F.I.C., Acting Superintendent of Agriculture and Government Chemist for the Leeward Islands, has sent in the following interesting notes on the possibilities of developing a hay industry in parts of the West Indian islands:—

In certain West Indian islands, notably Dominica and Barbados, there is at the present time a not inconsiderable importation of hay during the dry months of the year, when green fodder is scarce. This demand is at present met by supplies from America.

In Antigua there are considerable areas of flat pasture covered by the grass known locally as 'hay grass' (*Andropogon caricosus*), which, when cut at the right time, makes excellent hay.

The Victoria Park on the eastern side of St. John's is taken up by this grass, and the purchase by the St. John's City Commissioners of a mowing machine suitable for the cutting of long grass, offered a favourable opportunity for an experiment to decide whether it would be possible to supply some of the existing demand for hay in other islands with grass reaped from Antigua pastures.

Accordingly, in November 1908, a trial bale of hay was made from this pasture and shipped to Dominica by Dr. Watts, acting in conjunction with Mr. W. J. Abbott, Clerk to the City Commissioners.

The bale was exhibited at the Botanic Station, Dominica, and attracted favourable comment from persons interested locally. As a result, a trial order for a commercial shipment of 5 bales was sent to Antigua. This order was executed in due course and the 5 bales were sold at rates which left a considerable margin of profit for the shipper, and at the same time enabled them to be disposed of more cheaply than American hay.

This preliminary experiment indicates that there is a field for the development of a profitable trade in hay between islands possessing flat pastures occupied by hay grass, and other islands, where, at certain seasons, fodder is scarce.

The initial cost of a suitable mowing machine is comparatively small. That used in the above experiments cost £11, landed in Antigua. The cost of reaping and baling the grass is trifling, and, under average conditions, two or even three cuttings of grass should be obtained each year.

Further, it must be remembered that in addition to forming a possible valuable export, the hay should have considerable use locally as a fodder. By systematic reaping much fodder would be saved which at present is wasted by the dying-back of the shoots after seeding. Also, if the pasture is kept clear of grazing stock, the growth of grass would be more vigorous, since its development would not be hindered by the trampling of the animals, and the premature feeding down of succulent growing shoots.

Hay grass (*Andropogon caricosus*) is an East Indian grass, and in the West Indies at present is only found in Antigua. The history of its introduction is obscure. It is readily established, and, once this is done, takes possession of the land to the exclusion of other grasses. This is a valuable feature when deciding the correct time for cutting, since in fields containing mixtures of grasses it is not always easy to select the best time for taking off the crop, as different species ripen at different times. After cutting, hay grass pastures are greatly improved by a light scratching with a cultivator.

The proper time at which to cut the grass is important. This is when the pollen has fallen from the flower, but before the seeds have swollen. If seeding has taken place the grass is valueless as fodder, since the constituents possessing food value have been, by then, transferred to the seed.

Too little attention is paid at the present time to the care of pastures in the West Indies, and to the possible development of a dry fodder industry locally. It is suggested that serious consideration should be given to the above facts, that efforts should be made to establish an industry on these lines from existing pastures, and that suitable areas elsewhere should be established in this grass for the purpose. If this were done, it is believed that considerable benefits would result in the future.

In addition to the preparation of hay for export, it is believed that much advantage would be derived, were the owners of estates to give attention to their pastures, to put them into fair order, and to cut the grass at regular intervals. This grass might be made into hay and stored to meet the requirements of a dry season, or it might be fed to the animals of the estate in stables or pens. The amount of fodder obtained from a given pasture would probably be greatly increased if this method of cutting were adopted, instead of the over-grazing of which one sees so much at present. A limited amount of grazing might be found permissible, but the chief attention should be given to cutting.

With a light mowing machine and a small baling press (such as is commonly used for cotton), the work of making and storing hay becomes a very simple matter, and one which should engage the attention of estate owners, particularly in Antigua, where the conditions for this kind of work are very favourable.

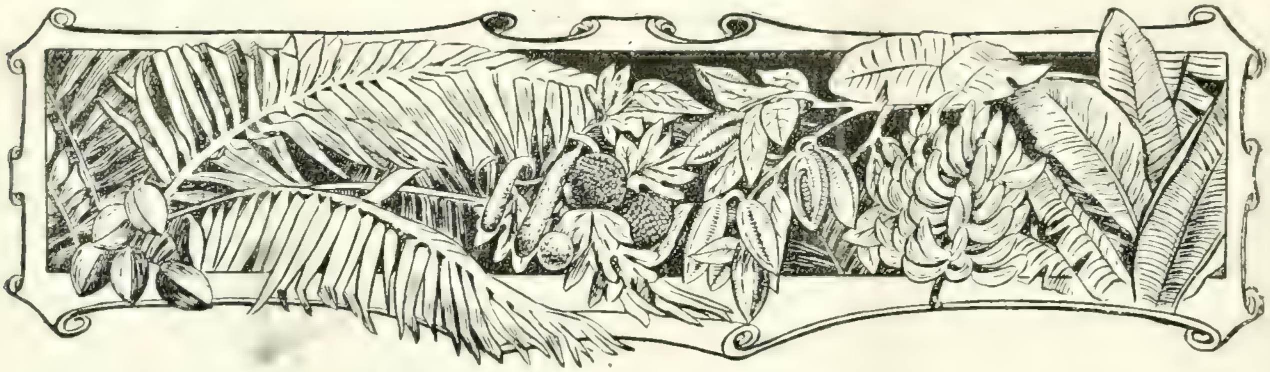
HEAVY RAINFALL AT DOMINICA.

Mr. Joseph Jones, Curator of the Dominica Botanic Station, reports as follows on the unusual weather conditions that were experienced in the island in the early part of April. Mr. Jones writes:—

Very heavy rains fell in Dominica on April 7 and 8, no less than 5·42 inches of rain being registered at the Botanic Station during a period of thirty hours. Very high winds were also experienced, which caused some damage to the lime crop of the island.

It is very unusual for heavy rains to fall in Dominica during April. The records at the Botanic Station which go back for sixteen years show nothing during April approaching the rainfall of the 7th and 8th inst. April is the driest month of the year, and the mean rainfall for this month at the Gardens over a period of sixteen years, 1883 to 1908, is 1·96 inches. Probably the heavy rainfall will considerably advance the lime crop. The weather still continues showery.

Papaw trees are usually diœcious (having male and female flowers on separate trees). A paper in *Science*, by an officer connected with the Porto Rico Experiment Station, reports a change of sex observed in some papaw trees in Porto Rico, brought about apparently by removing the terminal bud. A tree which had previously borne staminate (male) flowers only, had its terminal bud injured, and shortly afterwards was noticed to bear pistillate (female) flowers also. These flowers set and yielded fruit, and this was repeated in the second year. Further data are being collected on the subject.



WEST INDIAN FRUIT.

THE AVOCADO PEAR.

The very wholesome character and peculiarly attractive flavour of the avocado pear have caused it to be regarded with increasing favour in all countries where it is known, and the cultivation of this plant has now extended to practically all the tropical and many sub-tropical parts of the world.

In the West Indies avocado pears are produced in sufficient quantity to supply the local demand, but it is unfortunate that the great susceptibility of the fruit to damage by bruising should be a great obstacle in the way of building up an export trade, otherwise a remunerative industry might already have been established in this direction. The avocado is undoubtedly one of the most delicate of West Indian fruits, and it is necessary to use the greatest care in gathering and handling it. The slightest bruise is sufficient to cause the pear to rot in a very short time; indeed, it is often much bruised by its own seed if carelessly shaken.

Notwithstanding this, however, it has been amply demonstrated that it is possible successfully to ship avocados for very considerable distances, if due care is exercised in gathering, packing, etc. West Indian pears have been exported in small quantity to New York and to England, and experimental shipments from the Hawaiian Islands to the Pacific coast of the United States (reported on in the *Agricultural News*, Vol. VI, p. 404) gave very satisfactory results. Under the system of packing which seemed most suitable, the pears arrived at their destination (Portland, Oregon) with a loss of only 2·9 per cent. It is generally recommended that the cases in which avocados are packed for transport should be small in size and contain but few fruits. The crate found most satisfactory in the Hawaiian experiments (with medium-sized fruits) was of the following dimensions, inside measurement: 13 x 14 x 3¾ inches. This crate contained about one dozen fruits, necessarily in a single layer, the fruits being merely wrapped in a single paper cover.

There is a good market for avocados in the United States, and the crop is being increasingly cultivated in Florida, where efforts are being made, by selection and breeding, to produce improved varieties. It is stated in the *Yearbook* of the U.S. Department of Agriculture (1905) that West Indian avocados were exported to New York so long ago as 1887, when one firm handled from 300 to 500 fruits per week from these colonies during the months from June to November. It would seem that the West Indian avocado trade did not survive competition with the Florida product.

Avocado trees are usually produced from seed, but as with most other fruits, the vegetative method of propagation is to be recommended in preference. Budding has proved very successful with this tree, the simplest form of the operation—that known as shield budding—being the best to employ with the avocado.

LIME GROWING AT TORTOLA.

Efforts are being made to encourage lime planting at Tortola, since one or two preliminary attempts in this direction have given promise of success. The first three hogsheads of concentrated lime juice prepared in the island, were shipped to London in March last, and were valued at £45. The juice was prepared at the Experiment Station. With the object of bringing the question of the possible establishment of a lime industry before the general population, a meeting was held at Tortola on March 25 last, under the presidency of his Honour the Commissioner, when Mr. W. C. Fishlock, Agricultural Instructor of the Virgin Islands, gave an address on the matter. About seventy peasant proprietors were in attendance.

Mr. Fishlock drew attention to the importance of making every effort to develop the agricultural resources of the Virgin Islands, and referred to the increased prosperity of the Presidency since the establishment of the cotton industry.

Tortola was not adapted for sugar production on a commercial scale, and, therefore, attention must be given to other industries, among which lime growing appeared well suited to the local conditions. It had already been demonstrated that limes would grow well on the rich slopes of the north side of the island, and in the sheltered valleys of the south side.

An advantage in favour of this crop was that it was permanent in character, and when once established, required little attention, compared with such crops as sugar-cane, cotton, etc.

It was pointed out that no large outlay on machinery would be necessary to start an industry in the preparation of concentrated lime juice. The limes could be crushed in existing sugar mills, and the juice boiled in the batteries. Small holders might note that the skins of the fruits, after crushing, make a useful addition to cattle food.

One small holder present at the meeting stated that he had already several hundred lime trees in bearing on his holding.

FRUIT EXPORT TO ENGLAND.

With the development of the agricultural possibilities of Queensland, efforts are being made by that colony to find regular and satisfactory markets for its produce in foreign countries. In view of this object, a fruit expert to the Department of Agriculture and Stock was last year commissioned to visit Great Britain to report on the state of the fruit market as it concerned Queensland fruits. Some of his remarks, contained in an official report lately published, are of general interest to producers of oranges and bananas, and are summarized here.

Thorough enquiries were made in England as to the qualities of fruit required, the price likely to be obtained, and the best methods of packing. For the guidance of Queensland orange growers it was stated, that the best months to export citrus fruits to England were in August and September, although there is a good market for high-class Navel oranges and mandarins during June and July as well. Great stress was laid on the fact that only first-class fruit was wanted. It was stated that the oranges sent should be clean and bright with fine, thin skins. Jamaica oranges were referred to as the best fruit of the kind then on the market (in September). These were described as being about 2 inches in diameter, of light yellow colour, and with thin skins. The writer of the report pointed out that fruit similar in appearance and quality to the Jamaica oranges were grown in several districts in Queensland. It was added that navel oranges, such as were grown in a certain district in Queensland could be relied upon to fetch excellent prices on the English market. The Jamaica fruit was then commanding a price of 14*s.* per case, containing about 112 oranges.

The section of the report relating to the orange trade concludes with this passage: 'The trade is very emphatic as to our sending nothing but the very best fruit, and from what I can see of the market I quite agree with them. No fruit must be exported to England from Queensland unless up to standard quality. If inferior goods are sent it will simply ruin the market. The whole world is catering for the market of Great Britain, and buyers want the best that the world can produce.'

In reference to packing fruit for export, it was pointed out that the fruits should in all cases be wrapped separately in glazed or thin wax paper. Oranges should be thoroughly sweated before being put up, and packed so firmly that they will not roll about in the case. The size or shape of the case is immaterial, so that the grower can adopt whatever seems to him most convenient.

Trial shipments of mandarins and other kinds of oranges from South Africa have lately been placed on the English market, and these are referred to in the report in question. They are described as being of the scarlet type, of medium size, good colour, and with fairly tight skins. Exporters have adopted the plan of packing these in fancy trays which hold only one layer of fruit, and then binding five of the trays together in one package. This method of packing appears to be a new one but is giving satisfactory results.

It was mentioned that the British market was well stocked with bananas from the West Indies and Canary Islands. In sending bananas from the Canary Islands every bunch of fruit is packed in a separate crate, and great care is taken in putting up the fruit. The bunch has first a thin layer of cotton wool round it. It is then wrapped in paper, and outside the paper is placed a thick layer of straw or dry banana leaves. This method is illustrated in fig. 16.

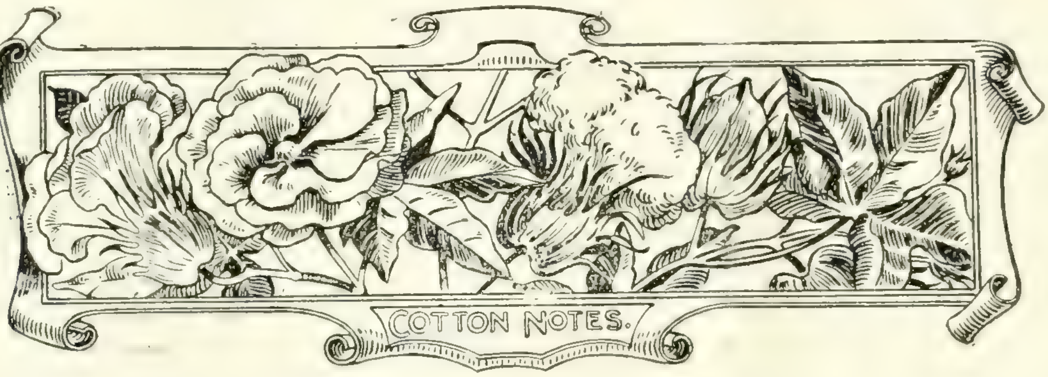
Fig. 16. Method of Packing Canary Bananas.

The fruit arrives in England in the green state, and is ripened by artificial heat. These bananas usually sell in the English market at 1*s.* a dozen. The Jamaica bananas, which are of larger size and more showy, are not equal to the Canary Islands banana in flavour, and fetch only about half the price on the English market.

Referring to the prospects of Queensland bananas in England, it is stated that the fruit from the Canary Islands is larger and better filled than the North Queensland product, although in the Buderim mountains (Queensland), bananas are produced which are certainly superior in appearance and quality to those grown in the Canary Islands.

These particulars indicate that producers in other countries possessing great possibilities of development are anxious to secure their share of the English market, and therefore emphasize the need on the part of growers to produce only the best, and to use every care in packing so that fruit exported may appear as attractive as possible in the market of destination.

The Dhak tree of India (*Butea frondosa*) is now well established at the Dominica Botanic Station. The Dhak belongs to the Leguminosae, and its bright orange-red blossoms make it one of the most handsome of trees when in flower. In India the flowers are sometimes utilized in the preparation of a dye.



WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, writing on April 7 last, report as follows on the market conditions and prospects for West Indian Sea Island cotton :—

Since our last report a good business has been done in West Indian Sea Island cotton, and about 400 bales have been sold, including Barbados at 12½*d.* to 14¼*d.*, Nevis and Montserrat, 12½*d.* to 13½*d.*; St. Kitt's, 12¾*d.* to 13¾*d.*; Antigua, 13½*d.*; St. Croix, 12*d.*; and Anguilla, 12¾*d.* to 13*d.*; also some miscellaneous stains at 6¼*d.*

Prices are steady, but there is no prospect of any immediate improvement, as when prices are advanced, spinners withdraw from the market. The Charleston and Savannah markets are rather quieter, and 'fully fine' Islands cotton is offering on this market at 13½*d.* to 14*d.* This competes with the West Indian product.

In view of the fact that planters are finding present prices unprofitable, we should not recommend any increased cultivation, until the accumulated crops of the last two years have been consumed. This remark only applies if the Florida and Georgia crops progress satisfactorily. Any damage to these would alter the whole situation for all descriptions of Sea Island cotton.

COTTON CULTIVATION.

At a meeting of the Antigua Agricultural and Commercial Society held on April 8 last, the Imperial Commissioner of Agriculture gave a brief address on the subject of cotton cultivation, with especial reference to the condition of affairs at Antigua.

Dr. Watts reviewed the situation and went over the chief points in the history of the Sea Island cotton industry in the Leeward Islands. This was illustrated by means of a diagram prepared for the occasion, which showed in a graphic way the rapid rise in the cotton exports each season for some years after the start of the industry, and the sudden drop that of late had taken place at Antigua consequent on reduced prices and bad seasons.

The Commissioner's address was of an encouraging nature, although he fully recognized the difficulties with which cotton planters recently had to contend. In the first place the market was depressed by artificial causes originating in America, and also in England, which resulted in a diminished demand for cotton as well as for many other products. Further there had been an unusually large output from the Sea Islands, Florida, and Georgia last season, so that an increased supply occurred when the demand was low, which again depressed prices.

There was no doubt, too, that the seasons 1907 and 1908 had been especially unfavourable for cotton throughout the West Indies, although it would seem that Antigua had suffered more than other islands. As a result of the long drought, it had not been possible to plant cotton at the right time, and the dry weather had also prevented the plants from making good growth, and insect and fungoid pests had been very prevalent. With such a conjunction of unfavourable conditions, the results were bound to be unsatisfactory, but there was no reason to believe that all the depressing causes would continue to be in operation at the same time.

Dr. Watts urged the planters to stick to the cotton crop, and to exercise every care in its cultivation. Despite the difficulties of the past two seasons, an industry which had reached an export value of £17,000 in a few years—which had been the case with cotton in the Leeward Islands—was obviously one which was worth a strong effort to keep alive. On estates where cotton was not regarded as a main crop, it was very valuable as a rotation crop with sugar-cane, since it afforded an opportunity of giving the land a change in cultivation. The periodical growing of a crop of cotton was one of the best measures to adopt on land where sugar-cane suffered from root disease, since cotton plants were not attacked by the *Marasmius* fungus, and the cultivation of the crop necessarily entailed a good cleaning of the land.

COTTON GROWING IN SOUTH AFRICA.

With the assistance of the British Cotton Growing Association, efforts are being made to establish a cotton industry in suitable districts of British South Africa. So far the most satisfactory results appear to have been obtained in the Transvaal, where native labour is plentiful and cheap. Sea Island cotton does not do well in the Transvaal, and American Upland varieties are more promising than Egyptian cotton. The seasonal conditions are said to be satisfactory for cotton growing, and the crop can be planted so as to be ready for gathering in the dry season. From Upland cottons, yields of lint from 200 lb. to 400 lb. per acre have been obtained. Picking is done by native women at a wage of 6*d.* per day. The picking capacity of a native woman is placed at 40 lb. per day.

Owing to the fact that there is at present only one ginnery in the colony, little advances have so far been made. With the extension of railways, the erection of additional ginneries at various centres, and the establishment of a mill for extracting oil from the cotton-seed, it is thought the industry might spread. A few sample shipments of cotton have already been made to the Liverpool market.

COPRA.

There appears to be great variation in the quality of copra placed on the market, despite the fact that a good quality product is always in satisfactory demand. The copra produced in Ceylon and in the islands of the Pacific, where large European soap-making and other firms have extensive interests, is always of high quality, and commands the best price. Copra from the Malay States, however, sells at a secondary price, and is reported to have frequently been prepared in an unsatisfactory manner. While the best copra at Singapore sells for about \$7·50 per picul (133⅓ lb.), the market price of lower qualities is often \$1·00 per picul below this. These lower grades are usually prepared on estates owned and managed by Malays and Chinese. Although West Indian copra does not fetch the high returns of two years ago, it is satisfactory to note that prices have lately shown signs of advance, and the latest quotation is about £19 per ton.

THE ORIGIN AND DEVELOPMENT OF THE FLORAL CUSHION IN CACAO.

In a pamphlet on the 'Witch broom' disease of Cacao, Dr. C. J. J. van Hall and A. W. Drost have given a full account of the origin of the cushion in cacao. For this purpose they studied the development of the lateral buds in *Theobroma bicolor*, a tree nearly allied to the cacao.

The buds are borne on fairly young branches (*A* in the accompanying diagram) in the angle between the leaf and the

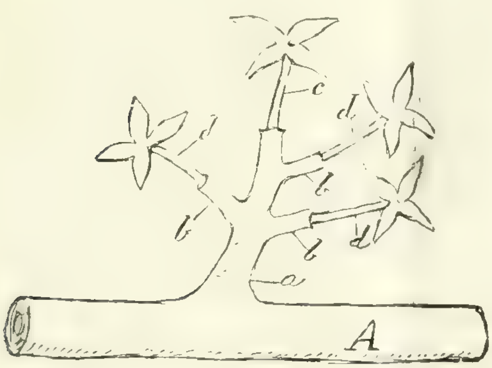


Fig. 17. Cacao Branch with Flowers.

branch. In the flowering season the bud grows out in a central shoot *a*, and is terminated by a flower borne on a short flower-stalk *c*; from the sides of the central shoot secondary branches *b* arise, each of which is terminated by a flower also borne on a short stalk, *d*.

In this way ten or twelve flowers may be borne on a floral branch. The flowers eventually give rise to fruit.

In *Theobroma cacao*, the cacao proper, practically the same thing occurs, with this difference: that in this case the flowers and fruit arise only on those parts of the tree that have lost their leaves and become woody, such as the main trunk and older branches.

The bud from which the flowers arise was originally borne, as in *Theobroma bicolor*, in the axil of a leaf, but it remained dormant until the leaves had all fallen and the bark had grown up round it.

After the flowers have fallen, the central axis of the original bud thickens up and becomes the cushion. Only a few of the flowers form fruit, so that usually each cushion bears only three or four fruits. The fruit when ripe falls off, leaving the central axis or cushion to again bear flowers and fruit in the following years.

To summarize, the cushion is the remains of the central axis of a bud, originally borne in the angle between a leaf and a young branch, but which does not develop until the branch on which it is borne has lost its leaves and becomes hard and woody.

SUPERPHOSPHATE.

Superphosphate, as is generally known, is made by the action of sulphuric acid on mineral phosphates, steamed bone, or bone ash. Raw bone is seldom used for the purpose, since the organic matter interferes with the action of the acid and the after-usefulness of the manure.

Mineral phosphates, as coprolites, are by far the chief source of superphosphate. In these minerals the phosphoric acid is present in the form of tribasic phosphate of lime, being combined with the maximum quantity of lime required for its complete neutralization (three proportions of lime to one of phosphoric acid). In this state it is insoluble in water. The sulphuric acid is added in quantity sufficient to combine with two proportions of the lime contained in the mineral, gypsum or calcium sulphate being formed as a result. Monocalcic phosphate is also formed, and, in this, one proportion of phosphoric acid is combined with one proportion of lime, the compound being soluble in water. It will be seen, therefore, that superphosphate consists chiefly of a mixture of calcium sulphate and soluble monocalcic phosphate. In addition, there is always some tribasic phosphate present which has not been rendered soluble: this is usually from 4 to 6 per cent. in amount.

The price of superphosphate is naturally based on the proportion of soluble phosphate it contains. This is usually expressed in the guarantee accompanying the manure as the amount of tribasic phosphate made soluble. When a superphosphate is described as a 30-per cent. super., it means that a contained weight of tribasic phosphate, equal to 30 per cent. of the whole mixture, has been rendered soluble. As a matter of fact, however, the actual quantity of monocalcic phosphate, or superphosphate of lime, is considerably less—22·6 per cent.

In fixing the price of the manure, the insoluble phosphate and gypsum are not taken into consideration. They have, however, a slight manurial value. It should be pointed out, too, that the phosphoric acid in the 35-per cent. superphosphate is not worth any more per unit than that in the 26-per cent. manure, but in making the former, more expensive material of higher quality is required. When carriage has to be paid on the manure over a long distance, the higher grade superphosphate will often prove the more economical, since a greater quantity of phosphate is obtained for each ton of carriage paid.

It may be added that in addition to the monocalcic phosphate, insoluble phosphate, and gypsum, a superphosphate also contains proportions of sandy matter, water, and small quantities of oxide of iron and alumina. Those mineral phosphates which contain the smallest quantities of iron and alumina are the most desirable for making superphosphate. The monocalcic phosphate has an affinity for these compounds, and will recombine with them, thus giving rise to what is known as reverted phosphate, which is insoluble.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial article of this issue deals with the relative proportions of imported and locally produced food stuffs consumed in the West Indies, and discusses the possibility of increasing the latter at the expense of the former.

Trials that have been made at Antigua indicate that something might be done to establish a hay-producing industry in parts of the West Indies (page 131).

Efforts are being made to encourage lime planting at Tortola (page 132). An article on page 133 deals with the requirements of the British banana and orange market.

A good deal of West Indian cotton has lately been sold in England. On April 8 last, Dr. Watts gave an address at Antigua on cotton cultivation (page 134).

Some notes on superphosphate will be found on page 135.

An informative article on the subject of eel worms, or nematodes, appears on page 138. These pests have been found on various crops in many of the West Indian Islands.

The committee of the Trinidad Agricultural Society appointed last year to consider the question of stock-breeding in that colony has lately issued its report (page 139).

A considerable amount of data in relation to the yield of Para rubber trees will be found on page 143.

Hint to Poultry Keepers.

Although poultry keeping in the West Indies, as in other parts of the world, possesses potentialities of profit, yet the average householder who has a number of hens running around his holding would probably be dissatisfied with the returns obtained, if regular records were kept. This is probably due to the fact that the flock is formed of hens of constitutionally poor laying capacity, or that the birds are kept until long past the period when they are at their best as layers. The profit from an individual hen is, of course, small at the best, and this tends to prevent poultry keepers from being over critical as to the achievements of their birds. It is only the owner who considers the capacity of the individual birds separately, however, who is likely to get the very best returns. These are obtained (*a*) by careful selection of good laying strains, and (*b*) by weeding out unprofitable birds.

West Indian Bulletin.

The ninth volume of the *West Indian Bulletin* has lately been completed by the issue of Part 4. This contains two lengthy and useful articles on the Timbers of Jamaica, and the Timbers of Dominica, respectively, the former by Mr. W. Harris, F.L.S., while the latter is based on the list compiled by the late Dr. Imray, which has been revised with the assistance of several writers. Mr. Harris gives details of the various uses for which the timber of over 100 Jamaica trees are suited, while in the case of Dominica, the information extends to 176 trees. The third article, which is illustrated, is by Mr. C. C. Gowdey, B.Sc., and deals with the Aleyrodidae (white flies) of Barbados. The various fungus diseases of cocoa-nuts in the West Indies are discussed by Mr. F. A. Stockdale, B.A., F.L.S., and the final article has for its subject 'Millions and Malaria'; this is by Mr. H. A. Ballou, M.Sc., and is also illustrated. Part 4 contains the title-page, contents, and index of Vol. IX.

Exportation of Fruit.

Two or three years ago legislation came into force throughout the Commonwealth of Australia, which laid down the conditions under which certain agricultural commodities were to be exported from the country. The *West India Committee Circular* recently drew attention to these Australian regulations, and urged that something should be done to create a similar system of control in the West Indian islands from which oranges, bananas, limes, and other fruits are exported. As the result of legislation such as that to which reference has been made, inspectors are appointed, whose duty it is to examine the nature and quality of the fruit, and the method of packing, and to see that a proper description of the contents is affixed to the outside of each case. Such regulations undoubtedly strengthen a produce-exporting industry; they form a strong incentive to the producer to do his best, and also tend to give confidence to the buyer in the foreign market.

Destruction of Insects in Stored Grain.

Stored corn, guinea corn, pigeon peas, and provision crops are liable to be attcked by weevils and other insect pests which do considerable damage in a short time. It may be pointed out that the best means of destroying these pests is by fumigation with carbon bisulphide, and this should be undertaken on the first signs of attack. The compartment or bin in which the grain is stored should first be rendered air-tight by effectually closing all openings, and the contents then exposed for twenty-four hours to the fumes of the bisulphide. At the end of that time most, if not all the insects will be killed. The quantity of bisulphide required will be at the rate of 1 drachm per cubic foot. In the West Indies, the price of carbon bisulphide is about 2*s.* 6*d.* per lb.

West African Sheep at Barbados.

It has previously been mentioned that numbers of young sheep, the offspring of a cross between the West African rams imported by the Commissioner of Agriculture, and the local woolless sheep, are now to be observed at Barbados, and that the results of the crossing have been very satisfactory. In view of the enquiries on the subject that not infrequently come to hand, it may further be added that two of the African rams were in 1908 loaned to Chancery Lane plantation by the Department. As a result of the crosses that have been made, Mr. Graham Yearwood, the proprietor, now has a considerable number of promising young sheep and lambs, which in their marking and size show distinctly the characteristics of the male parent. Although the season has been very dry, the progress made by the young animals has been very satisfactory. Persons interested in the matter have a good opportunity of seeing several of these improved sheep at Chancery Lane plantation.

Ground Nuts and Ground Nut Oil in France.

Marseilles is notable as being the port to which the greater part of the ground nuts shipped to Europe are consigned, and the town is regarded as the headquarters of the ground nut oil trade. During 1908, over 190,000 tons of ground nuts were imported into Marseilles. In recent reports from the south of France, Bombay ground nuts are quoted at \$5·93 per 220 lb., Coromandel nuts at \$6·22, and Mozambique nuts at \$7·33. All these are imported without their shells. For 'Cayor' and 'Gambia' nuts from West Africa, imported with their shells, present prices are about \$4·57 per 220 lb. The ground nuts yield from 38 to 50 per cent. of their weight in oil. About 16 to 18 per cent. of the oil is used for culinary purposes, and the remainder is put to industrial uses. The edible ground nut oil is worth from \$13·50 to \$15·50 per 220 lb., while the lower grades of oil, used for soap-making are valued at about \$12 per 220 lb. The cake left after expressing the oil is sold at about \$3·30 per 220 lb. for cattle feeding.

Cohune Palm in British Honduras.

The Cohune palm (*Attalea Cohune*) of which specimens are to be seen at the Botanic Stations of the different West Indian islands, and which is cultivated at Jamaica, is native to British Honduras, where it exists in enormous quantity. This tree somewhat resembles the cocoa-nut palm, but does not grow to so great a height, and has much larger leaves and a thicker trunk. The Cohune palm is of economic interest, inasmuch as it may later become the basis of a profitable industry, on account of the oil contained in the kernels of the nuts which form the fruit of the tree. The nuts are about as large as a hen's egg, and are enclosed in a hard shell. There are at present two machines in British Honduras for cracking the nuts and extracting the kernels, which are then exported. It is mentioned, however, that at least 50 per cent. of the kernels are injured in the process of cracking, and, as a result, the contained oil becomes rancid while under export.

Although the oil is stated to be more valuable than cocoa-nut oil, yet under present conditions, millions of bunches of nuts are wasted annually in British Honduras. What is wanted is the establishment of machinery in the colony, so that the oil could be expressed locally. This would undoubtedly be more remunerative than the present system.

Treatment of Parasitic Diseases in Plants.

It is well known in connexion with the life-history of bacteria, that the products of their activity, if allowed to accumulate, have an injurious, and finally a fatal effect upon these organisms themselves. Thus, to take a case in point, the souring and coagulation of milk are due to the conversion of milk sugar into lactic acid by bacteria. The maximum percentage of lactic acid in sour milk, however, is no more than from 0·8 to 1·0 per cent., since this degree of concentration of the acid is sufficient to paralyse the activities of the bacteria responsible for its production.

An interesting paper by Professor Potter, of Newcastle-on-Tyne, which appears in the *Journal of Agricultural Science* (Vol. III, part 1), suggests a method of treating certain parasitic diseases of plants based on the above principle. A bacterial parasite, *Pseudomonas destructans*, responsible for a disease in turnips, was grown in a culture medium, and when the organism had exhausted the nutrient content of this preparation, the residue, containing the waste products of the activity of the bacteria, were collected and the solutions concentrated. When this solution was injected into turnips suffering from the disease caused by *P. destructans*, microscopic investigation showed that it had a paralysing effect upon the bacteria, and it was observed that further progress of the disease was prevented.

Further experiments showed that the principle was also applicable in the case of the fungous disease of oranges caused by *Penecillium italicum*. This method is interesting, and may possibly prove of some practical value in dealing with plant diseases.

INSECT NOTES.

Eel Worms or Nematodes.

At the present time a considerable interest is being shown in the nodules that may frequently be observed on the roots of plants. Much work has been done in connexion with the assimilation of nitrogen by means of certain bacterial organisms, which cause the development of characteristic root nodules, in which these bacteria live.

The bacteria inhabit the roots of the Leguminosae—that group of plants in which the fruit is a pod. Among the leguminous plants are the peas, beans, acacias, cassias, and many other similar plants. Recently, however, a theory has been advanced that plants of other groups may also be able to assimilate free nitrogen by means of bacteria and root nodules, and many plants other than legumes have been examined with the object of determining whether or not root nodules are present.

As a result of this interest, root swellings have been found on many plants and several enquiries have been received at the Head Office of this Department with regard to them. It may safely be stated that in the West Indies, nitrogen bacteria have up to the present been found only in the characteristic root nodules of leguminous plants.

Eel worms are the cause of many deformities and swellings in the roots of a great variety of plants. These swellings are usually quite distinct from the leguminous root nodules.

The eel worms belong to that group of animals known as nematode worms, many of which are harmless, living in

FIG. 18. ROOTS OF COLEUS PLANT, SHOWING SWELLINGS CAUSED BY EEL WORMS.

FIG. 19. ROOT OF COWPEA WITH NITROGEN-GATHERING NODULES.

damp situations, often in decaying organic matter. At least one species, however, is parasitic in man, and is known as the filarial worm (*Filaria bancrofti*) which produces the disease that is known as filariasis, Barbados leg, or elephantiasis.

The species (*Heterodera radicola*) which attacks the roots of plants is the one which is commonly known as the eel worm or nematode worm. It is so small as to be almost invisible to the unaided eye, but the adult female can be distinguished by the use of a hand lens. It is known to occur in the United States, Mexico, and most of the islands of the West Indies, and in fact is widely distributed in many parts of the world. It seems likely that when more is known about the prevalence of eel worms in these islands, it will be found that they are responsible for greater injuries to growing plants than is suspected by planters at the present time.

In previous numbers of the *Agricultural News* (see Vol. III, p. 283, and Vol. IV, p. 123) mention has been made of eel worms. This pest has been found at Antigua on ochros, at St. Lucia on lettuce, at St. Vincent on yams, and at Barbados on coleus and other garden plants. In Mexico, eel worms attack coffee, and are also known to damage cotton, tobacco, and many other plants.

The attack of eel worms on the tender tissues results in the production of a gall or distortion of the root, due to the irritating effect of the presence of the pest. These galls are not merely swellings due to the development of extra cells. This development occurs in many instances, but it also happens in addition that the ducts which convey plant food and moisture to the leaves are eaten into, and become disorganized and unable to perform their normal functions. Plants that are badly attacked wilt and die.

As already mentioned, it is probable that a great deal of damage to growing crops in the West Indies is caused by eel worms, although this damage is at present ascribed to other causes. Examination of the roots of plants which are plainly seen to be suffering from some unknown cause will serve to fix the blame for the injury when conspicuous galls are found. But sometimes the swellings are small, and not greatly different from the root nodules of the leguminous plants, and it has been suggested that in the roots of sugar-cane, maize, and other gramineous plants, the nematodes might be present without forming galls, but at the same time cause a considerable amount of injury.

It will easily be seen that injuries to the roots of plants, such as those resulting from attacks of eel worms, would afford a ready entrance for fungoid and bacterial plant diseases. It seems very probable that many diseases of plants are greatly assisted in their attacks by the injuries caused by eel worms.

This suggestion indicates a line of observation which planters would do well to bear in mind. The Imperial Department of Agriculture would be glad to be informed of any cases of serious injury caused by eel worms. In cases of attack by these minute pests, material supposed to be infested may be sent for examination to the local officers of the Department or to the Head Office.

Eel worms are likely to become more numerous in the tropics than in temperate regions, where they have to undergo the effects of a cold winter.

The remedial measures to be employed would be of two kinds: The use of chemicals or insecticides, and the adoption of suitable cultural methods. The use of insecticides presents many difficulties and chances for failure. The eel worms and their eggs are inside the plant tissues, and consequently very difficult to reach with poisons or chemicals.

In Mexico, where the coffee trees are seriously attacked by eel worms, gasoline, benzene, sulphate of iron, carbon bisulphide, and calcium carbide have been used with good effect (see *Agricultural News*, Vol. VI, p. 123). If eel worms become a pest in field cultivations in the West Indies, it will be necessary to carry out experiments to ascertain the best remedial measures. The use of lime in heavy applications, rotation of crops, and the cultivation—as catch crops—of plants that are especially attractive to the pest, and which should be destroyed as soon as they are thoroughly infested by the worms, should be tried. Vaporite may perhaps prove of value in this connexion.

CATTLE BREEDING IN TRINIDAD.

A select Committee of the Agricultural Society of Trinidad and Tobago was appointed in July last to consider and report upon the question of cattle breeding in the colony, with special reference to securing the full benefit of stock at the Government Farm for breeding for beef, milk, and draft. The report of this Committee was published in the *Proceedings* of the Society for February last.

The average annual value of the cattle imported into Trinidad during the past five years has been £43,000, and the number 7,000. It will be seen, therefore, that there is abundant reason for making every possible effort to encourage cattle breeding in the colony, and provided the most suitable breeds are selected, the industry should be made to prove remunerative.

The Committee discuss in separate sections the raising of cattle for beef, for milking purposes, and for draft respectively. In breeding for beef, it is stated that the most suitable crosses hitherto obtained in Trinidad appear to have been those of the Hereford and half-bred Zebu, and the Red Polled and half-bred Zebu. The Red Polled has shown itself to be a satisfactory butcher's beast; it requires less fattening than many other breeds, and has the further advantage of being a good milker. There does not appear to have been much experience in Trinidad with the Hereford, which is the primary beef breed of cattle in England. A number of Hereford bulls have been imported, but these have all died shortly after importation—a fact which leads to the suggestion that all bulls should be imported as calves, and not as full-grown beasts. This breed has a great reputation in Jamaica, and has done well in Tobago. The animals fatten readily, and give beef of very good quality.

Opinion in Trinidad is divided as to the breeds of cows which are likely to be most successful for dairy purposes in the colony. The Committee, in their report, draw attention to the well-known and excellent milk-yielding qualities of the Jersey and Guernsey breeds. Cows of these breeds have proved very satisfactory in the West Indies and fully kept up their high reputation. No mention is made of the Ayrshire, which is recognized all over Great Britain as a most economical and satisfactory cow for the dairyman. The Holstein or Dutch breed is another variety which in England as well as in many continental countries has earned a well-established reputation for yielding a large and profitable return of milk. The butter-fat content of this milk, however, is usually slightly below the average. Dutch cows have done well in Trinidad, and one practical cattle breeder recommended a cross between this breed and the Zebu, the result of which, in the opinion of the gentleman referred to, 'should make an invaluable dairy cow, combining the temper and milk-giving qualities of the Holstein with the hardy and healthy constitution of the Zebu.' The Red Polled and the Shorthorn breeds have also given satisfactory results as dairy cattle in Trinidad.

For draft purposes, it is evident that the Zebu breed of cattle is pre-eminently suitable. The further fact that they are so useful for crossing with other breeds renders this variety the most valuable yet introduced into the colony. Apart from the pure-bred Zebu, the animals resulting of a cross between this breed and the Hereford are also especially useful as draft cattle.

The Committee recommend that bulls of the breeds referred to, together with pure-bred cows, be imported, and that an effort be made to establish and maintain three separate classes of cattle especially suitable for beef, milk production, and draft respectively.

INSURANCE OF LIVE STOCK.

A system of mutual live stock insurance, similar in principle to those described in late numbers of the *Agricultural News* (Vol. VII, pp. 302, 383), but on a much smaller scale, has recently been adopted by a section of the live stock owners of Cyprus. As a result of this co-operative action, any loss suffered by an individual member of the association, through death or disablement of working stock, is wholly or partially compensated out of the common fund.

It appears from the particulars given in the *Cyprus Journal* that at present the society deals with cattle only, and the maximum sum for which an animal can be insured has been fixed at £15. The premiums payable are at the rate of 3 per cent. per annum of this value, and in case of accident, the society pays up to 60 per cent. of the sum insured. Certain precautions are, of course, laid down, such that in case of epidemics, stock owners must have their animals vaccinated or inoculated, and that no compensation will be paid in the case of animals running loose in the field. At the start of this useful Society, sixty-four animals were insured.

RICE IN BRITISH GUIANA.

The fortnightly report of Messrs. Sandbach, Parker & Co., dated April 16 last, contains the following information on the rice crop in British Guiana:—

With the exception of two very wet days, the weather during the fortnight has been bright, and all mills have taken the opportunity to clean paddy, and deliveries to town have been large. The short crop is being reaped, and the price of paddy is somewhat easier than during the last six months. The crop to be reaped from October to December next is now being planted, and there seems every prospect that the rice area of this year will be larger than that of 1908.

Prices have declined slightly, owing to the extremely low prices which continue to be quoted for East Indian rice in the West Indies.

Shipments to the West Indian islands during the past fortnight amount to about 1,600 bags, mostly for Trinidad.

Present prices for good export quality rice, f.o.b. Demerara, are: 19*s.* to 20*s.* per bag of 180 lb. gross, and 17*s.* 3*d.* to 18*s.* 3*d.* per bag of 164 lb.

DEPARTMENT NEWS.

The Commissioner of Agriculture returned to Barbados from Antigua on Tuesday, April 20, by the R.M.S. 'Esk.'

While calling at St. Lucia on the return journey from Antigua, Dr. Watts paid a visit to the Agricultural School on Monday, April 19, in order to meet the teachers from the Elementary Schools who are receiving a course of instruction from the Superintendent of Agriculture, Mr. J. C. Moore. The Commissioner briefly addressed the teachers on the subject of the educational value of Nature Teaching in Elementary Schools.

GLEANINGS.

In the season 1907-8, the exports of citrate of lime from Sicily and Calabria were 22,500 pipes of 108 gallons each. The production for the present season will probably be about the same figure.

The syndicate of planters which lately imported a donkey sire of superior breed into Barbados has now decided to import nine large jennie donkeys, from 13 to 14 hands high, for different members of the syndicate.

Very welcome showers of rain have been experienced at Barbados during the past fortnight. These should be especially useful in promoting the growth of grass and other fodder crops, of which there has lately been a scarcity.

A sample of papain prepared in Ceylon from papaws grown in that island was some time ago examined at the Imperial Institute, London. It was stated to be of fair quality, and valued at 5*s.* per ℔.

Mr. J. R. Johnston, of the Bureau of Plant Industry, U. S. Department of Agriculture, lately paid a visit of several months' duration to the district of Baracoa, Cuba, in order to study the bud-rot disease of cocoa-nut trees in that island.

A correspondent of the *Demerara Chronicle* points out that rice, especially the lower grades, is of late being used in increasing quantity for stock food. He states that in parts of British Guiana, paddy has to a large extent taken the place of maize as a food for poultry.

The exports of camphor from Japan have of late shown a remarkable decline in value. This is stated to be due to competition caused by the introduction of German chemically manufactured camphor, and by an increasing output from China.

A small red Spanish onion is grown on an extensive scale in Egypt, both for local consumption (which is large) and for export. In the first nine months of 1908, these onions were shipped abroad to the value of $975,680. They are chiefly exported to England and Austria, and used in the preparation of pickles. (*U. S. Consular Reports.*)

Mention was made in the *Agricultural News* about a year ago (Vol. VII, p. 156) of the scheme for starting sisal hemp cultivation in British Guiana. An area of 7,000 acres was granted by the Government of the colony, and it is stated in a recent issue of the *Demerara Chronicle* that about 500 acres have now been cleared, and 40,000 sisal plants set out.

A creeping plant, *Alsomitra sarcophylla*, is referred to by the Agricultural Superintendent, Grenada, in a recent report, as being eminently suitable for covering a fence or wall. This creeper possesses fleshy leaves, and bears numerous long, hanging panicles of creamy, white flowers.

In the report for 1908 of the Entomologist (Dr. L. O. Howard) of the U. S. Department of Agriculture, it is mentioned that the parasitic enemies of the cotton-boll weevil are year by year becoming more effective in controlling the ravages of the pest in the United States. During 1908, the average parasitism is shown to have doubled in Texas and trebled in Louisiana.

According to the fourth annual report of the British Cotton Growing Association, there would seem to be an unlimited market for cassava starch in Lancashire for sizing and finishing purposes. It is feared, however, that the probable market price—about £9 per ton—would not be high enough to bring about the establishment of a West Indian industry in this product on a commercial scale.

At a meeting of the St. Lucia Agricultural Society, held during the recent visit of the Imperial Commissioner of Agriculture to that island, it was mentioned, as evidence of the fertility of the land, that in the valleys of Cul-de-Sac and Roseau, it was the general practice to grow ratoon crops of sugar-canes for five or six years before replanting. In one or two fields of remarkable fertility, ratooning had been practised for so long as twenty years before replanting.

In the year 1907, copra was exported from Ceylon to Europe to the quantity of 336,907 cwt., while in the following year the shipments reached 690,250 cwt. It is not expected, however, that the output from Ceylon will be maintained in the present year, and hence prices for copra are considerably higher than they were six and nine months ago.

'Collecting Fungi in Jamaica' is the title of an interesting and illustrated article contributed to the *Journal* of the New York Botanic Gardens by Dr. W. A. Murrill. Dr. Murrill spent about six weeks in Jamaica collecting fungus specimens during the past winter. Among the edible fungi mentioned as being found in the island are *Boletus granulatus* and *Pluteus cervinus.*

In the list of plants imported from foreign countries into the United States by the Department of Agriculture is mentioned a mango which, judging by the description given, must be a remarkably good acquisition. The variety is known as the 'White Alphonso;' it was obtained from Calcutta, and it is stated that an individual fruit weighed very nearly 2¼ ℔., although the contained stone was but small in size.

A delicious sweetmeat is prepared from bananas in San Domingo in the following way: Large, thoroughly ripe bananas are skinned, and the fruit is cut into thin slices about ¼-inch in thickness. These pieces are sprinkled with fine or powdered sugar, and placed in the sun on boards or trays. As the fruit dries, it is turned over several times, and each time dusted with sugar. In a few days it is sufficiently dry, and forms a crystallized conserve of delightful taste. (*U. S. Consular Report.*)

STUDENTS' CORNER.

Seasonal Notes.

MAY.

1st FORTNIGHT.

The effects of mulching young canes with trash is a subject that deserves careful attention. Students should observe these effects, and note the difference between young canes that have been trashed, and those which have not been so treated. The effect of mulching the more advanced canes, should any trashing be done later in the season, is also a matter for observation. The question of the amount of tillage that may with advantage be given to ratoon canes is an important one. Students should discuss this matter, and wherever possible, make a point of comparing the relative effects of surface tillage, carried out to produce a dust mulch 1 or 2 inches deep, and deep cultivation of the soil, undertaken after the young canes have started to grow.

Students on cotton estates should take the opportunity, when ginning is in progress, to get to understand clearly the structure and working of the gin. Observe how it is set, and the chief points that must receive attention if the machine is to be kept in good working order. At the end of the season, the quantity of lint that has been gathered per acre from the different fields shohld be noted, and an effort made to ascertain the causes which have resulted in differences of yield.

Now that the Easter cacao crop has been nearly all gathered, many points in connexion with the sanitation of the plantations need attention. Dead branches will have to be cut out, pruning done where required, and suckers removed. All wounds must be treated with the tar and resin oil mixture. Note under what conditions it is advisable to prune lightly, and when more heavy pruning is advantageous to the trees.

Keep a sharp look-out for scale insects and other pests on lime trees. In this connexion look up Pamphlet No. 5 in the series issued by this Department.

Fields planted in corn in November or December last will now have been reaped. A look-out should be kept for weevils in stored corn. Ascertain the yield of grain reaped, and see how this compares with the return obtained in other countries.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is meant by 'assimilation' of plant food?

(2) Enumerate the principal characteristics of a fertile soil.

(3) What is grafting, and why is it possible to graft dicotyledonous, and not monocotyledonous plants? Indicate briefly the chief differences between these two groups of plants.

INTERMEDIATE QUESTIONS.

(1) How can root disease (*Marasmius*) be detected in ratoon canes, and what are the remedies suggested?

(2) Which variety of cane do you consider best suited to your district, and why? Describe briefly its characters.

(3) Discuss the various shade trees for cacao, and state for what localities you recommend them.

TOBACCO CULTIVATION IN CUBA.

The methods of raising tobacco, and the prices paid for labour on tobacco estates in Cuba, have been investigated by the United States Consul at Havana, and are reported upon in detail in the *Consular and Trade Reports* for February last, issued from Washington.

The chief tobacco-growing districts of Cuba are in the provinces of Havana and Pinar del Rio, and it is here that the best quality leaf is grown. Of late years the cost of production has largely increased, owing to the greater demand for labour in connexion with other industries.

The Consul takes as the basis of his estimate an area equal to an English acre, and gives the details of expenditure necessary to produce the tobacco from the young plant to the leaf in bale, both when sun-grown, and when raised under shade provided by cheese cloth. By far the greater part of the Cuban tobacco is raised in the open without shade of any kind. Generally speaking, the shade-grown tobacco is for wrappers of cigars, and that raised in the open (the less expensive process) serves for filler purposes.

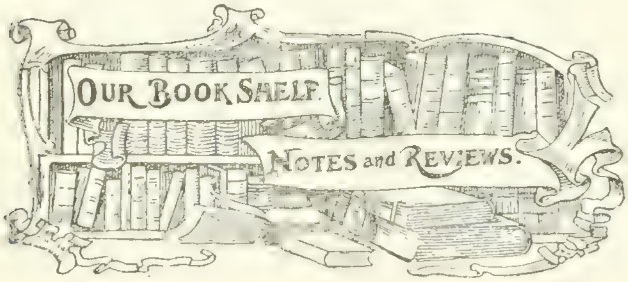
The following statement of expense is given for producing an acre of tobacco in the open:—

Sun-grown (open) Tobacco.

Ploughing, 20 days' wages at $1·20	$24·00
Planting, 10 ,, ,, ,, ,, ...	12·00
Supplying, 3 ,, ,, ,, ,, ...	3·60
Hoeing (3 times) 21 days' ,, ,, ...	25·20
Other cultivation expenses (estimated), such as topping, pulling off suckers, etc.	15·00
Gathering crop, 15 days' wages at $1·20 ...	18·00
Labour in curing house (perhaps 2 days' wages)	3·00
Packing labour (unskilled) 8 bales at $6·00 ...	48·00
Total, Spanish currency	$148·80
Total, American currency ...	$129·40

In order to reduce the Spanish figures to their equivalent in American currency, it is necessary to make a deduction of about 13 per cent. It will be seen, therefore, that the average price given for labour on the Cuban tobacco plantations amounts to about $1·05 per day. This labour must be regarded as more or less skilled. The sum of $24·00 (Spanish) for ploughing an acre of land may seem an expensive item, but it should be pointed out that under this heading are really included all the operations of cultivation, and it may really involve several ploughings of the land, which is thoroughly prepared before planting.

The expenses of growing the crop under shade are far greater, and are placed at an average of $328·20 per acre. When shade is provided, a somewhat higher yield is usually obtained—about 10 bales per acre, and the value of the product is, of course, considerably greater. The figures which have been quoted do not represent the total cost of production. In addition to the items enumerated, the cost of supervision, depreciation of plant and implements, etc., must be taken into account. It is mentioned that the total time occupied in the production of tobacco from seed to bale is about six months. The average price realized per bale (150 lb.) of Cuban tobacco is not far from $60, and the best qualities command prices of from $70 to nearly $100 per bale. On the whole, therefore, the industry would appear to be highly profitable.



LES BALAIS DE SORCIERE DU CACAOYER PROVOQUES PAR COLLETOTRICHUM LUXIFICUM. Par le Dr. C. J. J. van Hall and A. W. Drost. *Reprinted from the Recueil des Travaux botaniques, Neerlandais.*

Although the 'Witch Broom' disease of the cacao has till recently been confined to the mainland of South America, yet of late, reports have been circulated that it has reached the islands of Cuba and San Domingo. This makes it of considerable importance that all cacao planters should have a sound knowledge of the principal symptoms of the disease and the methods of treatment, so that they may be in a position to take the necessary steps, should their own plantations be attacked.

A valuable and complete account of 'witch broom' disease has recently been published by Dr. van Hall and A. W. Drost, of the Department of Agriculture of Dutch Guiana, under the above title. According to these authors, the losses that the cacao industry of Surinam has suffered from this trouble have been most serious. As a result, the exports of cacao from the colony declined gradually from 38,600 bags (each of 100 kilograms) in 1899 to 8,540 bags in 1904. In 1905 and 1906 the shipments were 16,818 and 14,806 bags respectively.

As will be seen, 1904 was the worst year for the disease, which has become less severe of late, though the authors of the paper in question cannot hold out any hopes of its complete disappearance. They suggest rather, that a condition will be reached in which the damage caused by the disease will become approximately constant for each year.

The symptoms of the disease are threefold: First, there is the appearance of the so-called 'witch brooms.' These are young branches which become swollen and remain green, producing many lateral branches of erect habit, and bearing a few small leaves whose stipules do not fall off. These 'witch brooms' quickly dry up and fall off, leaving scars which do not heal well, and so afford a good means of entry for other parasitic fungi, which may ultimately kill the trees.

Secondly, there is the 'hardening' of the fruit somewhat similar to 'Black Pod,' but distinguished from it by the fact that the whole of the fruit hardens, and further the stalk often becomes swollen.

The third symptom is the 'radiating inflorescence' consisting of very numerous flowers on the same cushion standing erect and sometimes interspersed with vegetative branches. These flowers rarely if ever bear fruit.

The fungus causing the disease is a new species of Colletotrichum, to which the name *Colletotrichum luxificum* has been given. It attacks the young buds as soon as they begin to grow. Its mycelium and spores may sometimes be found, more especially at the end of the wet season, at the base of the 'witch brooms' and on the hardened fruits. It is stated that it does not attack any of the species of trees commonly used in cacao plantations for shade purposes.

The authors found, as the result of numerous experiments, that conditions of soil, such as its chemical nature and water content, were entirely without effect on the disease; and also that the presence or absence of shade was almost or entirely unimportant in combating the disease. As this is so, it was found impossible to assist the trees to recover by improved drainage or artificial manures. Spraying was also found to be of very little value since the density of the foliage prevented the solution from reaching the whole of the leaves and buds. Consequently the only course left was to remove all the diseased parts.

The measures recommended appear extremely drastic, but they have met with complete success in the experimental work that has so far been done. All the vegetative parts of the trees affected were removed, leaving only the trunk and main branches standing. This was done while the tree was passing through a resting period, which, in Surinam, was in the month of September, about the end of the dry season. Care was taken to leave the trees as symmetrical as possible, and all the wounds were tarred over. All the diseased parts were collected and burnt. After this, the trunks were thoroughly sprayed with Bordeaux mixture, followed a week or so later by a further spraying with copper sulphate solution. Six months later the trees had reformed new, healthy crowns, and at the end of eighteen months were bearing again. It was expected that at the end of two seasons the trees would once more give an average crop, and would have completely recovered from the effects of the disease.

When reappearance of the trouble took place, the diseased part was cut out, a small portion of the mother branch being removed at the same time, and the wound carefully tarred. By these means the authors have been able to keep the disease well in check, especially as infection spreads very slowly, and does not appear to be affected by the direction of the prevailing winds.

NOTES ON DOMINICA AND HINTS TO INTENDING SETTLERS. Price 6*d.*

With the object of attracting attention to the undeveloped agricultural resources of Dominica, and giving reliable information to intending settlers, a pamphlet under the above title was prepared in 1903 by Mr. (now Sir) H. Hesketh Bell, then Administrator of the island. As this has been for some time out of print, it was decided to issue a new and up-to-date edition. The task of revision and enlargement was undertaken by the Hon. Douglas Young, C.M.G., the present Administrator of Dominica, who, as the title-page states has received the assistance of the Agricultural and Commercial Society, and the Planters' Association, of Dominica, and of the Officers of the Imperial Department of Agriculture. The result of this collaboration is an attractively got up and well illustrated pamphlet, comprising in all rather more than fifty pages.

This contains full particulars as to present conditions in Dominica—climatic, industrial, agricultural and social—and gives adequate information on all points of interest to persons who may be thinking of settling in the island. The various agricultural crops, such as cacao, limes, oranges, and spices, that are grown in the island are discussed, and a detailed estimate is given as to the cost of taking up an estate of Crown lands, clearing, planting, building a house and necessary outbuildings, and the expense of living before a return can be expected. British settlers who propose to take up and develop land in Dominica should possess a capital of about £3,000.

The final twenty pages of the pamphlet give valuable details in regard to the various timbers of Dominica and the uses for which they are suitable.

YIELD OF PARA RUBBER TREES.

The yields that may be expected from rubber trees at given ages or sizes have been the subject of much discussion, and figures that have been placed on record from numbers of sources show wide difference. Wild rubber trees (*Hevea brasiliensis*) in the Brazilian forests are reported to show returns varying from 1 lb. to a maximum of as much as 10 lb. per annum. The average return obtained under those conditions, however, is believed to lie between 2·2 lb. and 3·3 lb. per tree yearly. This question is discussed in a recent number of the *India-Rubber World*, and a large mass of figures are given showing the quantities of rubber yielded on numbers of planted estates in the East Indies.

It is pointed out that the yields of produce obtained are influenced by a number of factors, i.e., the character of the soil, altitude, or climatic conditions, the closeness or width of planting, the frequency of tapping, the method of tapping, and the care with which the latex is handled. It is added that the age at which tapping may be commenced is determined more by the size than by the age of the tree; trees with short trunks of large girth may be more productive than taller ones of less girth.

A large amount of additional data is still required before reliable statements can be made as to yields that may definitely be expected from rubber trees under certain conditions. Towards this end, records are needed from numbers of well-managed plantations, showing the returns obtained from a definite number of rubber trees, of uniform size and age, tapped the same number of times, by the same system, and with the same method of treating the latex.

The latest edition of Mr. Herbert Wright's book '*Hevea Brasiliensis*' contains a quantity of data relating to yields on rubber estates, although no effort is made to connect average yield with age. One table in the book shows the returns from twenty-three estates, on which, in one year, 166,740 Para trees gave 215,933 lb. of rubber, or an average of 1·235 lb. per tree. The estate with the lowest average showed a mean return of 0·32 lb. per tree; the highest average on any estate was 5·5 lb. per tree. Six estates showed average yields of 2, 2·2, 3·2, 3·25, 3·5, and 5·5 lb. per tree respectively. Figures relating to another list of estates described by Mr. Wright indicate a mean return of 2·52 lb. of rubber per tree.

The report of the Anglo-Malay Rubber Company, Ltd., for 1907, contains some interesting items. On one estate, a plantation of Para trees, aged 7 to 8 years, yielded a mean return of 3·76 lb. of rubber per tree; on a second estate, however, trees from 9 to 10 years old gave an average yield of only 2·95 lb. Again, on a third estate, where the greater number of trees were from 6 to 7 years old—but a few were aged 9 to 10 years—an average of 3·32 lb. of rubber was given.

The following data—given in the *India-Rubber World*—relate to the number and age of trees tapped, and to the returns obtained, on the Malay estates of the Bukit Rajah Rubber Co., Ltd., and have been compiled from the reports of the company:—

Year ending March 31, 1906.—Trees tapped, 34,457; yield, 33,203 lb.; average age of trees at end of period, 6·23 years; average yield of tree, 0·97 lb.

Year ending March 31, 1907.—Trees tapped, 88,341; yield, 118,982 lb.; average age of trees, 5·94 years; average yield, 1·345 lb.

Year ended March 31, 1908.—Trees tapped, 89,295; yield, 163,521 lb.; average age of trees, 7·27 years; average yield, 1·83 lb. of rubber.

Some definite information is given in the report of the Highlands and Lowlands Para Rubber Company, Ltd., for 1906. It is stated that on one block of 16 acres, 807 Hevea trees, planted 30 by 25 feet, were tapped, during three periods of the year mentioned, with the results: 2,500 lb. of rubber at the first, 1,469 lb. at the second, and 1,773 lb. at the third tapping, or a total of 5,742 lb.—an average of 7·01 lb. per tree for the year.

During the business year 1906-7, the Federated Malay States Rubber Company, Ltd., collected 32,175 lb. of rubber from 12,335 trees, or an average return of 2·60 lb. of rubber per tree. These trees were planted at fairly wide distances.

From all the data given in the article it would appear safe to estimate a return of not less than 2 lb. per tree annually, from trees about 8 years old, with reason to expect a larger yield with increased age.

PLANTING CASTILLOA RUBBER.

Castilloa rubber has received some attention in a number of the West Indian islands, and, on the whole, the trees have made good growth, although it would seem that this variety is not likely to give so satisfactory a yield as the Hevea or Para rubber. The following note, referring to the distance apart at which Castilloa trees may best be planted, and the culture of catch crops between the rows, is extracted from an article on the subject contributed to *Tropical Life* of September last by Mr. William Fawcett, B.Sc., late Director of Public Gardens and Plantations, Jamaica:—

The distance at which Castilloa trees should be planted at first depends upon whether they are to be grown with bananas or other catch crop, or alone. If the soil is suitable for bananas, and the locality one where it will pay to grow them, no other catch crop is anything like as good. The bananas should be planted in March at distances of 15 feet apart, and the Castilloa seedlings may be put out about September, each seedling in the centre of four banana plants, or, if the cultivator or plough is used to keep down weeds, the Castilloa must be planted in the banana rows between the bananas. The bananas may be grown for three or four years, and then they should be gradually thinned out as the Castilloa trees spread their branches. If bananas are not suitable, corn (maize) and pigeon peas (*Cajanus indicus*) may be used as catch crops and temporary shade. The fields should be lined out in March, and stakes put in to mark where the Castilloa plants are to be put out. Then the pigeon peas should be sown so as to leave a clear space of 4 feet round the stakes, and the corn not nearer than 7 feet The pigeon peas will not last more than two or three years, but by that time the young Castilloa plants will not require any more nursing. The corn will not interfere with the Castilloa if kept at a safe distance, and if there is a market for it, the returns will help to pay expenses. Even if there is not a market for the pigeon peas, they will increase the nitrogen content of the soil, besides forming a slight shade for the rubber. The cultivation of the soil will be of the greatest benefit to the growing rubber plants. If no catch crops are to be grown, the distance for the rubber plants may be 6 feet at first, to be thinned out eventually to 18 feet apart.

MARKET REPORTS.

London,—April 13, 1909. THE WEST INDIA COMMITTEE CIRCULAR; Messrs. KEARTON PIPER & Co., March 16, 1909.

ARROWROOT—St. Vincent, $1\frac{7}{8}d.$ to $2\frac{1}{2}d.$ according to quality.
BALATA—Sheet, 2/2 to 2/4 ; block, no quotations.
BEES'-WAX—£7 12*s.* 6*d.* for dark to pale.
CACAO—Trinidad, 58/- to 70/- per cwt. ; Grenada, 51/- to 59/6 per cwt.
COFFEE—Santos, 33/9 per cwt.; Jamaica, no quotations.
COPRA—West Indian, £18 10*s.* to £19 10*s.* per ton.
COTTON—Nevis and St. Kitt's, $12\frac{3}{4}d.$ to $13\frac{3}{4}d.$; Barbados, $12\frac{1}{2}d.$ to $14\frac{1}{4}d.$; Anguilla, 15*d.* to 16*d.*
FRUIT—
BANANAS—Jamaica, 4/6 to 9/- per bunch.
LIMES—Not wanted.
PINE-APPLES—St. Michael, 1/6 to 4/-.
GRAPE FRUIT—5/6 to 9/- per box.
ORANGES—Jamaica, 6/- to 9/- per box.
FUSTIC—£3 to £4 per ton.
GINGER—62*s.* to 65*s.* for medium washed.
HONEY—25*s.* 6*d* to 29*s.* per cwt.
ISINGLASS—West India lump, 2/2 to 2/6 per lb.
LIME JUICE—Raw, 1/- to 1/3 per gallon ; concentrated, £18 per cask of 108 gallons; distilled oil, 2/- to 2/3 per lb.; hand-pressed, 5/6 per lb.
LOGWOOD—£3 to £4 5*s.* per ton ; roots, no quotations.
MACE—Firm.
NUTMEGS—Steady.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5*s.* 13*d.* per lb.
RUM—Jamaica, 3/1 to 3/4 ; Demerara, 1/6, proof.
SUGAR—Crystals, 15/3 to 15/6 ; Muscovado, scarce : about 15*s.* 9*d.* ; Syrup, steady ; Molasses, no quotations.

New York,— April 2, 19, 1909.—Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 13c. to $13\frac{1}{2}$c. ; Grenada, $13\frac{1}{4}$c. to $13\frac{3}{4}$c. ; Trinidad, $13\frac{1}{2}$c. to 14c. ; Jamaica, 12c. to $13\frac{1}{2}$c. per lb.
COCOA-NUTS—Jamaica, select, $23·00 to $24·00 ; culls, $14·00 to $15·00 ; Trinidad, select, $23·00 to $24·00 ; culls, $14·00 to $15·00 per M.
COFFEE—Jamaica, ordinary, $7\frac{3}{4}$c. to $8\frac{1}{4}$c.; good ordinary, $9\frac{1}{4}$c.; washed, up to 12c. per lb.
GINGER—9c. to 13c. per lb.
GOAT SKINS—Jamaica, 55c.; Antigua and Barbados, from 49c. to 50c. ; St. Thomas, St. Croix, St. Kitt's, 46c. to 48c. per lb., dry flint.
GRAPE FRUIT—Jamaica, $3·00 to $3·75 per barrel.
LIMES—No quotations.
MACE—30c. to 35c. per lb.
NUTMEGS—110's, $11\frac{3}{4}$c. per lb.
ORANGES—Jamaica, $1·50 to $2·00 per box.
PIMENTO—$4\frac{1}{2}$c. per lb.
SUGAR—Centrifugals, 96°, $3·98\frac{1}{2}$c. ; Muscovados, 89°, $3·48\frac{1}{2}$c. ; Molasses, 89°, $3·23\frac{1}{2}$c. per lb., duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., April 26, 1909 ; Messrs. T. S. GARRAWAY & Co., April 26, 1909.

ARROWROOT—St. Vincent, $3·90 to $4·00 per 100 lb.
CACAO—Dominica and St. Lucia, $10·00 per 100 lb.
COCOA-NUTS—$13·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb.
HAY—$1·15 per 100 lb.
MANURES—Nitrate of soda, $62·00 to $65·00 ; Ohlendorff's dissolved guano, $55·00 ; Cotton manure, $42·00 ; Cacao manure, $42·00 to $48·00 ; Sulphate of ammonia, $72·00 to $75·00 ; Sulphate of potash, $67·00 per ton.
MOLASSES—Fancy, 17c. ; Grocery, 20c. per gallon.
ONIONS—Strings, $3·50 to $4·00 per 100 lb. ; loose, no quotations.
POTATOS—Nova Scotia, $1·60 to $1·75 per 160 lb.
PEAS—Split, $6·00 per bag of 210 lb. ; Canada, $3·40 per bag of 120 lb.
RICE—Ballam, $5·40 (180 lb.) ; Patna, $3·80 ; Rangoon, $3·00 per 100 lb.
SUGAR—Dark Crystals, 96° $2·30 ; Muscovado, 89° $1·80.

British Guiana,—Messrs. WIETING & RICHTER, April 17, 1909 ; Messrs. SANDBACH, PARKER & Co., April 16, 1909.

ARROWROOT—St. Vincent, $9·00 to $9·50 per 200 lb.
BALATA—Venezuela block, 32c. ; Demerara sheet, 48c. per lb.
CACAO—Native, 14c. per lb.
CASSAVA—60c. to 84c.
CASSAVA STARCH—$6·00 per barrel of 196 lb.
COCOA-NUTS—$12·00 to $16·00 per M.
COFFEE—Creole, 12c. to 13c. ; Jamaica, $13\frac{1}{2}$c. per lb., slow.
DHAL—$4·80 to $4·90 per bag of 168 lb.
EDDOS—$1·20 to $1·68 per barrel.
MOLASSES—No quotations.
ONIONS—Lisbon, 5c. to 6c. per lb.
PLANTAINS—24c. to 48c. per bunch.
POTATOS—Nova Scotia, $2·50 to $2·75 per 100 lb.
POTATOS—Sweet, Barbados, $1·00 per bag.
RICE—Ballam, $5·50 ; Creole, $4·50 to $4·60.
SPLIT PEAS—$6·00 per bag (210 lb.) ; Marseilles, $4·00
TANNIAS—$3·00 per bag.
YAMS—White, $2·16 per bag ; Buck, $1·92.
SUGAR—Dark crystals, $2·35 to $2·50 ; Yellow, $3·10 to $3·25 ; White, $3·60 to $3·80 ; Molasses, $2·30 to $2·40 per 100 lb. (retail).
Timber—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—$3·75 to $5·75 per M.
——CORDWOOD—$2·00 to $2·40 per ton.

Trinidad,—April 17, 1909.—Messrs. GORDON, GRANT & Co.

CACAO—Venezuelan, $12·00 to $12·25 per fanega ; Trinidad, $11·80 to $12·50.
COCOA-NUTS—$22·00 per M. f.o.b. for selected peeled in bags of 100 lb.
COCOA-NUT OIL—70c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to $8\frac{1}{2}$c. per lb.
COPRA—$3·20 per 100 lb.
DHAL—$4·65 to $4·75 per 2-bushel bag.
ONIONS—$3·00 to $5·00 per 100 lb. (retail).
POTATOS—English, $1·25 to $1·30 per 100 lb.
RICE—Yellow, $5·00 to $5·25 ; White, $4·50 to $4·90 per bag.
SPLIT PEAS—$5·25 to $5·50 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

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CONTENTS.

Soil Inoculation.

AGRICULTURAL literature has of late years included numbers of papers and reports on the subject of 'soil inoculation.' This term is applied to the various attempts that have been made to increase the crop-yielding power of soils by the introduction of bacteria which are known to be the cause of the nodules frequently observed on the roots of leguminous plants, and which are capable of assimilating free nitrogen from the atmosphere, that can be utilized as food by the plants in whose roots the bacteria live.

Practical agriculturists have for generations past been well aware of the fact that the growth of a leguminous crop such as peas, beans, alfalfa, etc., results in an increase in the crop-yielding capacity of the land cultivated, although it is only within comparatively recent years that a satisfactory explanation of the matter was brought forward. One of the early observers in respect to this subject was a Frenchman, Boussingault, who, as the result of weighing and analysing the crops grown on his own farm throughout six separate courses of rotation, was able to state definitely that from one-third to one-half more nitrogen was removed in the produce than was supplied in the manure. He observed, too, that the gain of nitrogen was particularly large when clover or other crops of the same family were grown.

Investigation work in relation to the manner in which leguminous plants obtained the supply of nitrogen was undertaken by a number of experimentors, but the credit of carrying out the researches which ultimately cleared up the whole matter belongs to two German scientists, Messrs. Hellriegel and Wilfarth, who published their results in 1886. These results demonstrated conclusively, that leguminous plants were capable, under certain conditions, of obtaining and utilizing nitrogen from the atmosphere. It was further shown that this nitrogen assimilation was dependent upon the production of nodules on the roots of the plants. In later research work it was found that the root nodules were full of bacteria, which were the evident agents by which the free nitrogen was appropriated, and to these the name *Pseudomonas radicicola* was given. Other observers have since confirmed the results obtained by Messrs. Hellriegel and Wilfarth. Although these have been fully established, it may be added that the exact details of the whole process by which the nitrogen of the atmosphere is first assimilated by the bacteria and afterwards taken over and utilized by the plant are not yet clearly understood.

The importance of the whole question is indicated by the large quantities of nitrogen which a leguminous crop is frequently enabled to withdraw from the air, even in the course of a single season, through the agency of the bacteria obtained in the nodules on its roots. As examples, it may be mentioned that in experiments carried out at the New Jersey Experiment Station, a crop of crimson clover was found to have added over 200 ℔. of nitrogen per acre to the land in one year, while trials with velvet beans have shown nitrogen gains amounting to 213 ℔. per acre in Alabama, 172 ℔. in Louisiana, and 141 ℔. in Florida.

In the light of the knowledge thus accumulated on the subject, the question naturally suggested itself to investigators as to whether the co-operation of leguminous crops and nitrogen-gathering bacteria might not be more extensively utilized in enriching the soil and increasing its crop-yielding capacity. With this object, therefore, a number of preparations for inoculating the soil, all containing the bacteria *Pseudomonas radicicola*, have, at different times been placed on the market, and a good deal of experimental work has been carried out in the United States, Germany, Canada, and in England. The value of inoculation under certain circumstances has undoubtedly been indicated, but, speaking generally, the results have so far—for different reasons—been distinctly less promising than was at one time anticipated.

So long ago as 1887, some inoculation trials were undertaken in Germany. In this case, the land under experiment—reclaimed moor-land—was dressed with soil from a field which had previously borne flourishing legume crops. The results were successful, and eminently encouraging, and the example thus set was speedily followed in many districts. In view of the expense of carting soil over long distances, and of the danger of introducing weeds or plant diseases, this method was, however, soon substituted by the introduction of pure cultures of the nitrogen-gathering bacteria, put up in a convenient form for inoculating either a quantity of soil, or of the seed about to be sown.

The first preparation of the kind introduced on a commercial scale was placed on the market about 1895 by a German experimentor, Nobbe. It was known as 'Nitragin,' and consisted of pure cultivations of the *Pseudomonas* organism on a gelatine medium. 'Nitragin' was extensively tested both in Europe and America, but the results, on the whole, were not at all satisfactory. This failure was generally believed to be due to the unsuitable nature of the medium (gelatine) on which the bacteria were grown, and when this was changed a greater degree of success was attained. Another scientist (Hiltner) brought forward a method of cultivating the bacteria on agar jelly, while Moore introduced the still greater change of sending out the bacteria contained in cotton wool, which had been soaked in liquid cultures and afterwards dried. This preparation is added to a large bulk of water, with which the seed to be inoculated is treated before sowing. Moore's preparation was used in a very extensive series of experiments carried out by the United States Department of Agriculture in 1904. The results were very conflicting, but, on the whole, were unfavourable, although slight increases of crop were noticeable in many cases as the result of inoculation. Probably many of the failures noticed were due to lack of skill in preparing, handling, and employing the cultures. Culture preparations are still sent out by the United States Department of Agriculture, but they are now put up in liquid form, enclosed in hermetically sealed bottles.

In 1907, Professor Bottomley, of London, brought forward a new preparation of nitrogen-fixing bacteria for inoculation purposes, to which the name of 'Nitro-bacterine' was given. This was tried in numbers of experiments, but its introduction into the soil appeared to have little influence on the yields of the various leguminous crops treated. Sample cultures were obtained by this Department and by one or two estate owners for trials with various crops in the West Indies (including sugar-cane, since Professor Bottomley devised special preparations, which he hoped would be useful not only with legumes, but with plants of other orders as well). The experiments made are reported upon on page 151 of this issue. It will be seen that while inoculation had no influence on the returns obtained with cowpeas at Antigua, the crop yields of woolly pyrol showed, in the case of one estate at least, considerable increase as the result of treatment. The results at Grenada also show one or two points of interest. Inoculation of sugar-cane at Antigua and Barbados had no effect whatever.

There are undoubtedly certain conditions under which inoculation of the soil with nitrogen-fixing bacteria may prove to be of very considerable value, but on the majority of cultivated lands, which have already borne leguminous crops, inoculation is likely to prove beneficial only if the bacteria introduced belong to a more vigorous race of nitrogen-gatherers than those normally present in the soil, or are specifically adapted to the peculiar crop to be grown. In this connexion it may be mentioned that it has not yet been fully decided whether nitrogen-fixation is carried on by more than one species of soil bacteria, or whether the bacteria which are associated with the various leguminous crops all belong to the species *Pseudomonas radicicola*. Points of similarity and slight points of difference are observed in organisms from different plants, and it would appear that if all are of the same species, there are a number of varieties of this species in existence. Evidence has been brought forward in support of the belief, held by many investigators, that the bacteria, when grown continuously in association with one kind of leguminous crop only, become in time so modified as to be capable of giving the best results with that crop alone. At any rate, a greater degree of success has in many cases been obtained when each species of legume is directly infected with bacteria from nodules taken from other plants of the same species.

The most notable instances of success in soil inoculation that have so far been recorded have naturally been obtained on lands which have not previously borne a leguminous crop, more especially on virgin soil newly broken up, or on heath or bog land lately reclaimed. The presence of suitable quantities of lime and mineral manures are necessary for success, and must be provided, if normally deficient in the soil. In East Prussia very large areas of barren sandy heath land have been reclaimed and made valuable for agricultural purposes by working on this principle. Dressings of basic slag and kainit were applied to the soil, and after preliminary inoculation, crops of lupins have been repeatedly grown, and ploughed in. As a result, the nitrogen content of the first 8 inches of land has been raised from 0·027 to 0·177 per cent. in the course of twenty-five years, while it has also become proportionately richer in the mineral constituents of fertility.

Book on Plant Names. A handy little book entitled 'Pronunciation of Plant Names' has lately been issued from the office of the *Gardeners' Chronicle*. The book contains a list of over 4,000 generic plant names, accented to indicate the proper method of pronunciation. It was prepared by the Rev. C. Butler, M.A., and should prove useful to workers in horticulture, as Curators and assistants at Botanic Stations.

HOME-GROWN AND IMPORTED SEED.

In raising crops from seed, a review of all the evidence available on the subject strengthens the opinion that the seed likely to give the best results in any locality is that which has been wisely selected and carefully bred under the conditions peculiar to that locality. The seed should be good, selected, home-grown seed, in fact, and this is likely to be more reliable than high-priced, high-bred seed brought from a distance.

This subject is discussed in a *Bulletin* issued sometime ago from the Nebraska Experiment Station, which reports a series of experiments with corn carried on at the Station. The following is quoted from the report :—

When corn grown in one section of the country for a number of years is moved to another section where soil and climate are different, the plant always undergoes more or less change during the first two or three years before it becomes 'adapted' to its new conditions.

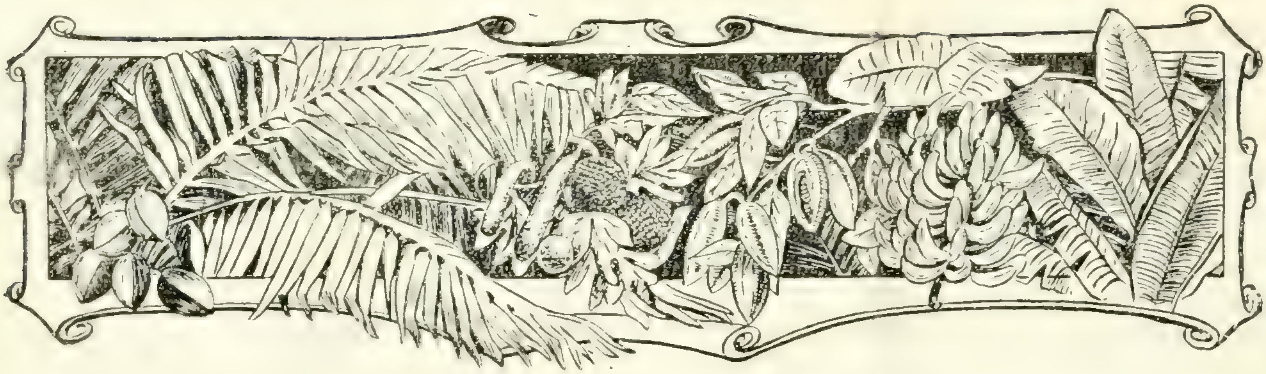
Several trials made at the Nebraska Experiment Station show the effect of climate in modifying the characteristics of the corn plant. Seed of two varieties of corn, 'Snowflake White', and 'Iowa Gold Mine', obtained from Iowa, were grown for two years in Nebraska. In the third year seed was taken from this and a further supply obtained from the same original source in Iowa. These were all grown on adjacent plots at the Experiment Station, but marked differences were observable throughout between the plants resulting from the Iowa and Nebraska seed. With the 'Snowflake White' corn, the stalk from the seed that had grown in central Nebraska for two years had decreased almost 1 foot in height, the ear was 8·8 inches lower down, and the ear shank 2 inches shorter, while the leaves on these plants were, on an average, 1·2 per plant less than on those from Iowa seed.

The weight of both stalk and ear was found to be heavier in the corn grown from the freshly-imported Iowa seed, but the proportion of ear to stalk was higher in the acclimatized corn. The diminished leaf area of the corn from the Nebraska seed was what might be expected from plants grown in a dry climate. The yield of grain was in favour of the home-grown seed.

Experiments were also organized by the Nebraska Experiment Station, in which twenty-two different varieties of corn were tried by farmers in different parts of the State. Of these varieties, thirteen had long been adapted to Nebraska conditions, and nine were native to other States. It is significant that not one of the nine kinds of corn, of which the seed was imported, have, in any season, ever taken first or even second place in the average results for the State. This is attributed to the fact that these varieties have not yet become acclimatized in Nebraska.

The lesson to be learned from the above trials is that to get the best results in corn growing, the seed must be home-grown, and grown not only in the same country, but the same locality. The results of the variety tests referred to, indicate that seed grown in eastern Nebraska will not do as well in western Nebraska as local varieties, and *vice versa*. Seed growing and seed selection should be carefully done in every district.

These results form another notable addition to the large mass of evidence which has of late years been accumulated by Experiment Station work that locally grown seed is the most reliable, and that planters and farmers should give increased attention to the work of raising and selecting their own seed



WEST INDIAN FRUIT.

CITRUS FRUIT CULTIVATION.

A paper which contains a large amount of useful information on the methods of citrus fruit cultivation which have been shown to be most suited to Dominica —and incidentally for other parts of the West Indies—was prepared by Mr. A. J. Brooks, Officer-in-charge of the Dominica Agricultural School, to be read at the Colonial Fruit Show held in London at the end of November last, under the auspices of the Royal Horticultural Society. This paper is reprinted in the *Journal* of the Society for March last (Vol. XXXIV, Part 3).

The figures showing the citrus fruits exports from the West Indian islands would appear to indicate that Jamaica practically monopolizes the industry. Thus, the total value of the citrus fruit shipped abroad in 1907-8 was £98,410 17*s.* 6*d.*, of which Jamaica contributed no less than £96,697 4*s.* Trinidad and Tobago, £1,047 ; and Dominica, £666*. Increasing attention is being given to the industry, however, in several of the smaller West Indian islands, and in Dominica alone, over 16,000 citrus trees, occupying an area of about 150 acres, have been planted out during the past seven or eight years.

The most suitable altitudes for orange groves is from 800 to 1,200 feet above sea-level. The fruit will thrive, however, up to 2,500 feet. It is important that the grove be sheltered, either naturally or by artificial wind-breaks. Orange trees prefer an open, well-drained soil, which is rich in plant food, and which retains a good supply of moisture without producing stagnation. Very dry soils are especially undesirable. A high rainfall is necessary for the trees to do their best. A fall of 100 to 200 inches per annum is required.

With the exception of the lime, all citrus fruit trees (oranges, grape-fruit, shaddock, lemon, etc.) are best propagated by budding, in preference to raising from seed or from cuttings. Budded trees bear earlier, yield superior fruit, and also bear more true to the original variety than seedling trees.

The sour orange, the Seville orange, and the rough lemon are best suited for stocks on which oranges, etc., are to be budded. The first two kinds are stated to be immune to root rot, while the third suffers but slightly. The sour orange is an especially hardy stock, and thrives well on good retentive soils, such as are found in the interior lands of Dominica. Both the Washington navel orange and the grape-fruit are said to do better on this stock than on any other, and it is therefore used very extensively in the West Indies. The Seville orange stock does best at low altitudes, while the rough lemon flourishes on high, dry soils, but is not suited for moist ground at lower levels. The growth of trees on the rough lemon stock is much more rapid than on the sour or Seville orange. The grape-fruit does exceedingly well on this stock. Shaddock seedlings may also be used as stocks for budding purposes. Root rot can be kept in perfect check if care be taken to see that there is effective drainage, and that sunlight is allowed free entrance to the base of the stems.

In order to raise seedling stocks, seeds are sown in nursery beds about the month of October. The soil in the nursery will, of course, have to be well prepared, and tilled to a depth of 2 feet. It is important that the seed beds be sheltered from the direct rays of the sun. Small drills about 1 inch deep and 6 inches apart will be made in the beds in which the seed will be sown, at distances of 2 inches from seed to seed. These beds will need weeding from time to time.

About five or six months after sowing, the young seedlings will probably be ready for transplanting. It is advisable to soak the soil thoroughly with water, previous to pulling up the seedlings. Before replanting is done, the young roots should be pruned, the main or tap-root being cut back, and the longer side roots slightly lopped. This stimulates the production of a surface-feeding root system, and prevents the breaking of the roots when being transplanted. At the same time the heads of the young seedlings may also be cut back about half their length, the leaves being clipped. The young seedlings will then be re-planted in the beds at distances of from 12 to 18 inches in the rows, which are themselves about 3 feet apart. An important point to remember at this stage is that the seedlings are not planted deeper than they stood before transplanting.

In the following October, i.e., a year after sowing, the seedling stocks should be cut back to about 3 inches above the soil. Shoots are thrown out, the strongest of which is ultimately selected for budding. The shoot is ready for this purpose when from 12 to 18 inches in height, and of the thickness of a lead pencil.

Mr. Brooks gives a detailed description of the process of budding, and of the points which need attention in carrying out the operation, and afterwards. The budwood used should be of the last season's growth, and preferably not too angular nor too round. The stock should be budded at a height of not less than 10 or 12 inches above the soil.

*The term 'citrus fruits,' as used in Mr. Brooks' paper, does not appear to include *limes*, although this is not expressly stated by the author.

Before carrying out budding operations on an extended scale, the planter will, of course, be advised to study the characteristics of the different varieties of oranges and other citrus fruits, and also ascertain the requirements of the market for which he proposes to cater.

In regard to oranges, the 'Washington navel' is recommended as an excellent variety to cultivate, and if the grower desires to confine himself to the cultivation of one good all-round variety, this is undoubtedly the kind for him to grow. What is known as the 'common sweet orange' is also a very marketable kind of fruit. Good early fruiting varieties are 'Parson Brown' and 'Boone's Early.' 'Valencia Late' is an excellent late-ripening kind. The 'Satsuma' mandarin oranges, and the 'King' tangerine are also referred to in high terms. Varieties of grape-fruit which, it is remarked, are difficult to surpass for general health and prolificness, are the 'Triumph' and 'Jamaica.'

At the end of six to nine months after budding, when two strong shoots have been made, the young citrus trees should be ready to transplant to the grove. The heads must first be cut back, and it is not well to move the trees when the ground is hard and dry. The best time for transplanting is at the first sign of growth, as one is then sure that the sap is active. Before re-planting is done, all bruised and broken roots should be pruned back. Since it is advisable to allow plenty of space for development, a distance of 25 feet each way from tree to tree should be allowed in citrus fruit plantations. The soil should be thoroughly forked to a depth of 1½ feet, and cleared of stumps, etc. Great care must be taken to see that the young trees are not planted too deeply, a fault which in orange and other citrus fruit groves is often attended with fatal results. The highest crown root should not be lower than an inch below the surface of the soil.

Each young citrus tree is usually set out in a circular bed. These beds will have to be carefully hand-weeded, and the weeds, with other vegetation, may, with advantage, be utilized to form a mulch around the roots of the young trees. The circles should be widened from time to time by forking, in order to enable the root system to develop with the head of the plant. It is well to keep a sharp look-out for suckers, which may spring from the stock below the point of budding. These, of course, should be immediately removed. In the first few years pruning will consist in removing dead wood, and branches too near the ground. The object to be kept in view in pruning a citrus fruit tree is the removal of all interior branches which would prevent the free circulation of air and light.

The chief points to be observed in gathering, 'quailing,' grading, and packing oranges, grape-fruit, shaddocks, etc., are discussed by Mr. Brooks. The process of 'quailing,' which consists of the evaporation of the surplus moisture from the rind, is accomplished by laying out the fruit in single layers in drying trays in a cool, airy shed, for two or three days. After quailing has been completed, each orange is wrapped in a separate piece of tissue paper before packing. In despatching the fruit, it is important that each grade be kept separate, and the work of grading may be facilitated by the use of a simple machine, of which many examples are on the market.

The most suitable box in which to ship oranges, grape-fruit, and lemons is described as being 27 by 12½ by 12½ inches, with a centre partition 1 inch in thickness. Such a box will accommodate 96 to 252 oranges, according to grade: 48 to 80 grape-fruit, and from 252 to 300 lemons. It is mentioned that the most desirable sizes for oranges are from 152 to 176 per box.

WOODLANDS AND WATER SUPPLY.

The popular idea that extensive woodlands have a beneficial effect upon the water supply of a locality has its basis in established fact, though the actual reason for this influence does not appear to be generally understood. A note on the conclusions arrived at in this connexion at Forest Experiment Stations of Germany, Austria, and France may therefore be interesting.

Briefly, it may be stated that the real effect of woodlands in this direction, as opposed to deforested areas, does not so much consist in bringing about an increase in the actual amount of rainfall experienced, as in economising the normal supply, and in modifying the agencies which tend to allow the rainfall to waste by evaporation or percolation. It is true that if very extensive areas were planted up, some small increase in precipitation might, after a time, be noticed, which would be due to the reduction of temperature associated with forests, and to the greater absolute and relative humidity of the air within the wooded area. Tree-planting on the most favourable scale that might be adopted in the West Indian islands, however, could hardly be expected to have any appreciable influence in this direction.

It appears more reasonable to conclude that, in the majority of cases, the amount of rain that reaches the ground is—generally slightly, but sometimes more appreciably—diminished over thickly wooded areas as compared with the open country. This is due to the thick canopy of leaves which intercepts a proportion of the rainfall, that is afterwards rapidly evaporated. In this connexion, however, much depends on the nature of the rainfall. In a district enjoying a high annual precipitation, the proportion thus intercepted is smaller than in localities where the rainfall is light. The same is true of heavy and long-continued rain as contrasted with gentle showers. In the latter case, indeed, little of the moisture reaches the ground at all.

Observations have clearly shown, that although less rain reaches the surface of the soil in woodlands than in open country, yet this small quantity is better conserved. Forest soils are generally found to contain a large amount of moisture (in comparison with field soils in the neighbourhood). There are several reasons which account for this, the chief of which are the reduction of evaporation—owing to the exclusion of the sun's rays by the foliage, partly to the air in a forest being more humid—as a result of which evaporation is again checked, and partly to the absorbent and retentive character of the decaying vegetable matter that covers the ground of a dense and well-managed wood. It may be pointed out too, that the rapid surface-flow of water which occurs on sloping land in the open after heavy rain is checked in woodlands by the frequently occurring tree roots.

Another agency which assists in increasing the moisture-retaining properties of forest lands is the lightening and opening influence exercised by tree roots on the soil. These penetrate to a considerable depth, and when they die they leave large holes through which water readily percolates from the surface. This percolation of moisture into the ground is facilitated by the loose and friable condition of the surface soil beneath the trees, as compared with the denser and more compact character of land in the open. The consequence is that streams in a wooded country are not so subject to rapid rises and falls, the flow being maintained more equably throughout the year.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows, under date of April 26 last, with reference to the sales of West Indian Sea Island cotton:—

A moderate business has been done in West Indian Sea Island cotton since our last report.

The sales, which amount to 350 bales, include Anguilla at $12\frac{3}{4}d.$, Barbados at $13d.$ to $14d.$, St. Croix at $12\frac{1}{2}d.$ to $13d.$, St. Kitt's at $12\frac{1}{2}d.$ to $13\frac{1}{4}d.$, Virgin Islands at $13d.$, and a few bags of St. Vincent at $17d.$ to $18\frac{1}{2}d.$

Prices remain quite steady, and there is a prospect of a little improvement in values if patience is exercised.

BATH SPRINGS AT NEVIS.

The therapeutic value of the 'Bath Springs' water at Nevis has long been recognized. These springs occur on an estate which is the property of Messrs. Gillespie Bros., and are at a distance of about ¼-mile from Charlestown. The water is of a high temperature as it issues from the earth. Samples have been analysed on several occasions, and pronounced to be free from impurities or deleterious substances. In its physical and chemical properties, the water is stated by a well-known London chemist to be similar to that from the Wilsbad Thermal Springs at Wurtemburg, Germany, which are extensively used for rheumatism and gout. There is no reason why the water should not be employed for cooking purposes. If used in steam boilers it would be necessary to add a little caustic soda, to prevent the deposition of scale or 'fur' within the boiler. Messrs. Gillespie are now having the Bath House (a hotel near the springs) repaired, and made habitable for the use of visitors.

AGRICULTURE IN SIERRA LEONE.

The total exports from Sierra Leone increased from £716,623 in 1906-7 to £831,259 in 1907-8. Agricultural products naturally form the chief articles of shipment, most prominent among these being kernels of the oil palm (£447,801), palm oil (£51,154), kola nuts (£113,674), rubber (£22,480), ginger (£11,578), and rice (£5,635). With the exception of rubber, all of the above articles were exported in greater quantity in 1907-8 than in the previous year. The rubber shipped in 1906-7 was worth £30,170.

Palm kernels realized a very satisfactory price in 1907-8 in consequence of a short supply of animal fats, and the greater demand for vegetable oils. For the past five years, the shipments of palm kernels and oil from Sierra Leone have shown a steady increase. The bulk of the palm kernels shipped—26,693 tons out of a total of 34,912 tons—were exported to Germany.

It is interesting to note that although no less than 1,374 tons of kola nuts were exported from Sierra Leone in 1907-8, none of this went to Europe, but the whole found a market in other parts of Africa, as Gambia and Senegal. Kola nuts are largely consumed by the natives as a tonic stimulant. It is affirmed that one kola nut, well masticated, will sustain a man for a whole day. European traders in Sierra Leone have lately begun to take an interest in this product, and in view of the valuable medicinal effects and sustaining qualities of the nuts, the market should soon be considerably extended.

Ginger was produced in the colony in 1907-8 to the extent of 618 tons, worth £11,571 as already mentioned. This is an advance on previous years, and a good deal of attention has been paid by some of the small planters to the better cultivation and preparation of the product for the market.

It is believed that the decline in the export of rubber is due to the steps that have lately been taken to check the reckless and wasteful system of tapping the trees that was formerly prevalent.

IRRIGATION ON JAMAICA SUGAR ESTATES.

A note on an interesting irrigation enterprise that is being carried through by the proprietors of some valuable sugar estates in the Vere district of southern Jamaica appears in the current number of the *West India Committee Circular.*

The soil of the district around Vere is of great natural fertility in seasons when an average rainfall is experienced. Of late years, however, crop returns have largely fallen off, owing to the long spells of dry weather that have occurred. Notwithstanding the tendency of the land in question to suffer from drought it was known that there existed within a few feet of the surface an excellent and practically inexhaustible supply of water, and efforts, the results of which have so far been very successful, have been made to tap and utilize for crop producing purposes this underground reservoir.

It may be mentioned that a few years ago a system of irrigation was started on the Vere Estates at a cost of £50,000.

In this case, however, the irrigation water was brought to the sugar estates from the Milk River by a number of canals, and in the great drought of 1907 the system broke down in consequence of the river itself running dry.

The irrigation operations that have lately been initiated are due to the enterprise of the Amity Hall Factory Co., Ltd., and the Vere Estates Co., Ltd. When the first well was sunk on Perrins Estate, a fine flow of water was struck at a depth of about 15 feet. Thereupon the Vere Estates Company proceeded to excavate on Moreland estate, and from a well which was carried down to a depth of 40 feet they are now obtaining a continuous flow of 100,000 gallons per hour, this flow being maintained without reducing the surface of the water below 3 feet of the bottom of the well. Gas engines are being imported which will work pumps capable of raising 168,000 gallons per hour. It is thought that further excavation will lead to an increased supply of water. Further wells will probably be sunk in other sections of the estates, and, if the success so far obtained continues, the danger from drought in the Vere district will be largely obviated in the future.

INOCULATION OF LEGUMINOUS CROPS IN THE WEST INDIES.

During the year 1908, the effect of inoculating the soil, or in some cases the seed, to be sown, with prepared cultures of nitrogen-gathering bacteria was tried at Antigua and Grenada, with the object of ascertaining whether such a procedure would stimulate the growth, and increase the crop returns of various leguminous crops. At Antigua, where cowpeas, woolly pyrol, and alfalfa were the crops under experiment at the instance of Messrs. Henckell, Du Buisson & Co., Professor W. B. Bottomley's 'Nitro-bacterine' was the inoculating material used, but at Grenada, a culture preparation sent out from the United States Department of Agriculture was employed. It may be added that experiments in which a small number of sugar-cane plants were inoculated with a special culture prepared by Professor Bottomley, in the hope that it might be beneficial in increasing the yield, were also carried out at Antigua and Barbados.

At Antigua inoculation experiments were conducted at the Experiment Station, and also at Fitches' Creek, Gambles, and Cassada Garden.

Seed of the different crops sown was inoculated at the Laboratory, and part of the culture solution was used in inoculating the soil, and later on the growing crops. Where crop and soil inoculation was carried on, two applications of the solution were made, at an interval of a fortnight.

No effect of inoculation could be traced in the case of the cowpeas grown. Practically no differences were observable between the treated and the untreated plots. It is therefore to be presumed that the soils in the experiment plots were well stocked with the bacteria responsible for nodule formation on this crop, or that they were well supplied with available nitrogen.

With woolly pyrol the results of inoculation were, in the case of one estate, more definite and satisfactory. The experiment plots were each $\frac{1}{8}$-acre in area, and from the plot sown with seed that had not been inoculated 330 lb. of green bush was gathered. A second plot also sown with uninoculated seed, but which was 'watered' with the culture fluid, yielded 700 lb. of green bush; a third plot that had been sown with inoculated seed gave 970 lb. of bush, while from the fourth plot, sown with inoculated seed, 1,015 lb. of bush was reaped. It will be seen that in the cases indicated, inoculation seems to have been distinctly beneficial for woolly pyrol. At two of the stations, however, all the plants on the experiment plots were destroyed by caterpillars. No report has yet been received on the trials with alfalfa.

The Grenada experiments were designed to ascertain (1) whether any benefit is to be derived from inoculation of leguminous crops on Grenada soils, and (2) whether, by inoculation, leguminous green dressings, such as cowpeas, can be grown under the shade produced by full-grown cacao. The trials were made at the Experiment Station, and on six different estates in the island, where the crop under treatment was cowpeas, which were inoculated with a material prepared especially for this plant.

At the Botanic Station and two of the estates, the results obtained showed no difference whatever in favour of inoculation. At two other estates, the returns from the inoculated plots were slightly superior to those which had not been treated. Finally, on the two remaining estates—Dougaldston and Diamond—it is reported that the inoculated plots gave yields very considerably higher than the untreated plots, although no actual figures are stated.

Inoculation, however, had no effect in influencing the growth of cowpeas planted beneath the shade of cacao trees, and these failed completely in all cases. The results of the experiments, therefore, give a negative reply to the second question suggested above.

It may be added that the inoculation of sugar-cane plants with Professor Bottomley's culture preparation could not be observed to have any effect whatever, either at Antigua or Barbados.

CULTIVATION AND FERTILITY.

Thorough and judicious cultivation is essential for a soil to give its best results as a crop-producing medium. Providing a soil is well-drained, the more deeply it is cultivated, the more extensive is the area through which the plants can forage in search of food, and thus it is that improvement in tillage methods which result in deepening the soil and promoting nitrification, tend to have the same effect as applications of manure.

The advantages of a deep soil, as compared with a shallow soil, are obvious, and—expressed concisely—these may be said to consist in the fact that when land is ploughed to a depth of no more than 3 inches, the plants growing thereon have 3 inches of food, while when the land is ploughed 6 inches deep the land has access to 6 inches of food, and so on. The lower portions of the soil are not so rich in available plant food as the upper portions, but this may be remedied to a large extent by suitable cultivation, which results in admitting air, moisture, and heat, the necessary conditions under which fertility is developed.

It need hardly be pointed out, however, that any deliberate attempt to lower the line of division between the soil and subsoil by deeper ploughing should be carried out gradually and with caution, and the most judicious plan is to extend the operation over several years, i.e., to plough just a little deeper each season than was done in the previous year. Many instances are on record in which the fertility of land remarkable for its crop-producing capacity has suffered enormously as the result of lowering the depth of ploughing 2 or 3 inches below the normal level in one season. This is because the surface soil containing the organisms which are responsible for the breaking down of plant food, has been buried, and a heavy, raw, infertile subsoil brought to the top.

Another important point in connexion with the capacity of a soil to return large crops is its ability to retain moisture. This power is greatest when the land contains a good proportion of humus, is well tilled, thoroughly pulverised, the subsoil firm, and the soil kept in the form of a loose mulch at the surface.

As the result of all these conditions, absorption of rain water takes place readily, and this is retained instead of rapidly draining away. Water in a cultivated soil is held in the form of thin surface films enclosing each separate particle. It is obvious, therefore, that the more thoroughly the land is pulverised by cultivation, the greater will be the number of soil particles, and the greater the capacity of the land to retain moisture. The presence of humus increases this storage capacity, and reduces evaporation. It has been estimated by agricultural physicists that a ton of humus will store over seven times as much moisture as a ton of sand, and further, that sand loses its water by evaporation from three to four times as rapidly as the humus. Clay soils store only about one-fourth as much moisture as humus, and lose it by evaporation about twice as rapidly.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The work that has been done on the subject of soil inoculation, with the object of increasing the assimilation of atmospheric nitrogen by leguminous crops, is reviewed in the editorial. Some further notes on inoculation experiments, carried out last year in some of the West Indian islands, will be found on page 151.

Experimental work has shown that it is more advisable to raise crops from home-grown than from imported seed (page 147). The relations between woodlands and water supply are briefly discussed on page 149.

Useful and interesting information on citrus fruit cultivation in the West Indies, with especial reference to Dominica, is given in the article appearing on pp. 148-9.

It has been observed that when Bengal bean plants were allowed to climb over lime trees at Montserrat, the attacks of scale insects on the lime trees diminished (page 154).

An interesting article dealing with Toggenburg goats, more especially in the West Indies, appears on page 155.

Attention is drawn to the article 'Hedges and Hedge Plants at Antigua,' that will be found on page 158. This deals with the characteristics of various plants useful for establishing hedges (for ornament or otherwise) in the West Indies.

Experiments with Varieties of Cassava.

The importance of cassava as a source of food supply in the West Indies is indicated by the fact that experiments involving the trial of a large number of varieties of this crop, both native and foreign, were carried out in 1907-8 at the Experiment Stations at Antigua, Montserrat, St. Kitt's-Nevis, and the Virgin Islands. The varieties 'White Greenaway' and 'Red Greenaway,' did especially well at Antigua and St. Kitt's, giving yields at the rate of from 13,000 to 14,000 lb. per acre. At St. Kitt's, however, the 'Small Leaf' variety did best of all, returning 14,262 lb. per acre. 'French No. 3' and 'Blue Top' appear also to be promising varieties of cassava. These gave crops at the rate of from 10,000 to 13,000 lb per acre. At Montserrat the 'Bloody Mind' cassava gave the highest return (15,456 lb. per acre). Jamaica cassavas tried at Antigua that did especially well are 'Blue Bud Black,' and 'Shuana Sweet.'

Several varieties imported from Colombia were tried in the different islands. These grew less vigorously and gave much smaller returns than the native kinds. The Colombian cassavas are sweet, however, and well adapted for culinary purposes.

Butter Making.

Butter of high quality is not often met with in the West Indies, although there is no doubt that with due attention to the feeding rations given to cows, cleanliness in milking, skill in ripening the cream, and churning and washing the butter, etc., a better article might often be turned out. In the tropics there is no doubt that it is better to use a small separator than to wait for the cream to rise to the top and then to skim it off. Two good separating machines are the 'Alpha-Laval' and the 'Melotte,' both of which are manufactured in a number of sizes or capacities, the smaller grades of which can be worked by one boy. A larger quantity of butter of superior flavour is obtained from 'ripe' or acid cream than from the same volume when fresh, and therefore the cream should always be allowed to stand until acid. 'Starters,' i.e., skim milk or whey, containing lactic acid bacteria are frequently used to accelerate the ripening of the cream, and these form a valuable means of influencing the flavour of the resulting butter, which appears to be largely determined by the particular strain of lactic bacteria responsible for maturing the cream. For this reason it is always advisable that the 'starter,' at the outset, be obtained from a farm or estate where butter of good quality is known to be regularly manufactured. A quantity of starter sufficient to bring about the required acidity by the time churning is to take place, is added to the cream after separating. This is then covered with a muslin cloth and placed aside. When the butter has been churned a portion of the buttermilk is drawn off and used as 'starter' for the next occasion. It is important to wash the butter thoroughly with several lots of water on completion of churning, as in this way particles of curd are eliminated, which have a bad influence on the keeping qualities of the butter.

Trade of Trinidad.

The report for 1907-8 on the Blue Book of Trinidad and Tobago has just been issued, from which it is seen that the year under review was a very prosperous one for the colony. The total trade shows an advance from £5,993,042 in 1906-7, to 7,282,327 in 1907-8, while, in the same period, the exports advanced from £2,872,325 to £3,907,503. Of this increase, £1,056,757 was in respect of the produce of the colony. The particular items responsible for the chief increase were: Trinidad cacao, £984,300: Venezuelan cacao, £157,800: sugar, £90,900; and asphalt, £25,500. During the year the total quantity of Trinidad cacao exported was 49,730,576 lb., valued at £1,786,386, while the corresponding figures for 1906-7 were 27,570,928 lb. of cacao, of value £802,073. The sugar exported in 1907-8 was 46,270 tons, as against 45,004 tons in 1906-7.

Rainfall Returns at Antigua.

Mr. H. A. Tempany, B.Sc., has forwarded a table showing the rainfall returns from seventy-two stations at Antigua during 1908. The mean rainfall for the year from all the stations was 43·79 inches. As in 1907, the station at which the highest fall (65·67 inches) is recorded, is Wallings (Dam). Yorks station comes second with 61·69 inches, and Wallings (Hill) third with 60·86 inches. The least rainfall experienced at any station was 25·58 inches, recorded at Mannings. Two other stations at which very small rainfalls occurred were Cocoa-nut Hall (which last year came at the bottom of the list with 26·20 inches) 29·26 inches, and Collins, 29·89 inches. December was the month in which the greatest amount of rain fell at Antigua, 10·64 inches being recorded as the mean of all the stations in that month. November came second, although a long way below, with 4·85 inches of rain. The driest month was February, when the mean precipitation was 0·84 inches. The average rainfall for the past thirty-five years is 45·41 inches, so that the rainfall for 1908 was 1·62 inches below the average.

Agriculture and Trade in Ceylon.

The report of the Planters' Association of Ceylon, for the year ended December 31, 1908, has been issued, and contains particulars of the condition of the chief agricultural industries of the island.

Tea continues a profitable cultivation, and the area planted with this crop is still on the increase. The 1909 crop is estimated at 182,000,000 lb.

Cacao in Ceylon has lately suffered from a very severe drought, as the result of which the yield fell from 92,511 cwt. in 1907 to 62,186 cwt. in 1908. Rains that fell some months ago have improved matters however, and the crop of this year is expected to reach 75,000 cwt.

Consequent on the fall in prices, a much smaller acreage was planted with rubber in 1908 than in the four previous years. The areas already planted, however, are receiving every care and attention, and promise to be distinctly profitable, even at present prices.

Cardamoms were not a success in 1908, the yield being irregular, and the fruits small. The crop of 1909 is estimated at 750,000 lb. Camphor has fallen in price from 400s. to 135s. per cwt., which has discouraged further planting of the trees yielding this product.

Cocoa-nuts to the number of 20,609,864 were exported from Ceylon in 1908, this being by far the greatest quantity shipped since 1898. Copra exports also advanced from 347,970 cwt. in 1907 to 729,140 cwt. in 1908, and the shipments of cocoa-nut oil from 460,683 cwt. in 1907, to 629,122 cwt. in 1908.

West Indian Orchids.

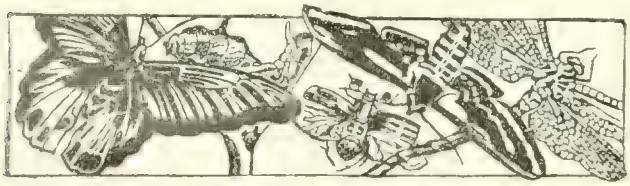
Mr. William Fawcett, B.Sc., late Director of the Botanical Department, Jamaica, and Dr. A. B. Rendle, Keeper of the Botanical Department, British Museum, have in preparation a book describing the orchids of Jamaica, which will be published by the Trustees of the British Museum. This work will be written somewhat in the style of the Colonial Floras prepared at Kew. It will include thirty-two pictorial plates, showing the mode of growth of most of the genera, with enlarged drawings of flowers to illustrate their structure. The plates are prepared from drawings made in Jamaica from living plants, under the direction of Mr. Fawcett.

Notes will be given of the occurrence of these orchids in the other West Indian islands and British Guiana, and it is hoped that the work will prove useful throughout this region to all who take an interest in the subject.

Specimens of orchids from any district in the West Indies will be gratefully received by Messrs. Fawcett and Rendle at the British Museum (Natural History), Cromwell Road, South Kensington, London, S.W.

Hen Breeding and Egg Production.

The influence of selection and breeding with the object of developing or eliminating any given characteristic is soon evident among hens. An illustration in point, showing the relationship of breeding to egg production is seen in a report lately issued from Reading University College, England. Three lots of Leghorn fowls, one lot being Danish, the second American, and the third English, were kept under comparable conditions for twelve months, and the numbers of eggs laid were carefully recorded. Denmark is famous for its dairy and small stock industries, and Danish poultry are selected and bred with the object of developing their egg-laying capacity. The English birds competing had, however, been bred for exhibition purposes. From the table of results it is seen that the Danish birds proved most profitable, laying an average of 153·7 eggs per hen (of an average weight of 2·12 oz.) in the twelve months. The American birds came second with 142 eggs (average weight 2·34 oz.), and the English Leghorns last, with only 76 eggs (average weight 2·05 oz).



INSECT NOTES.

The Use of the Bengal Bean in Lime Cultivations.

The Bengal bean (*Mucuna pruriens*, var.) which has often been referred to in the publications of the Imperial Department of Agriculture on account of its value as a green dressing, is closely related to the velvet bean and the weed known as 'cow itch,' which are perhaps known to some of the readers of the *Agricultural News*, who are not familiar with the Bengal bean. It is a strong, vigorous-growing species, capable of making a dense covering on the land and even over other plants. The accompanying illustration (Fig. 20) shows a field of limes in Montserrat thoroughly covered over by Bengal beans.

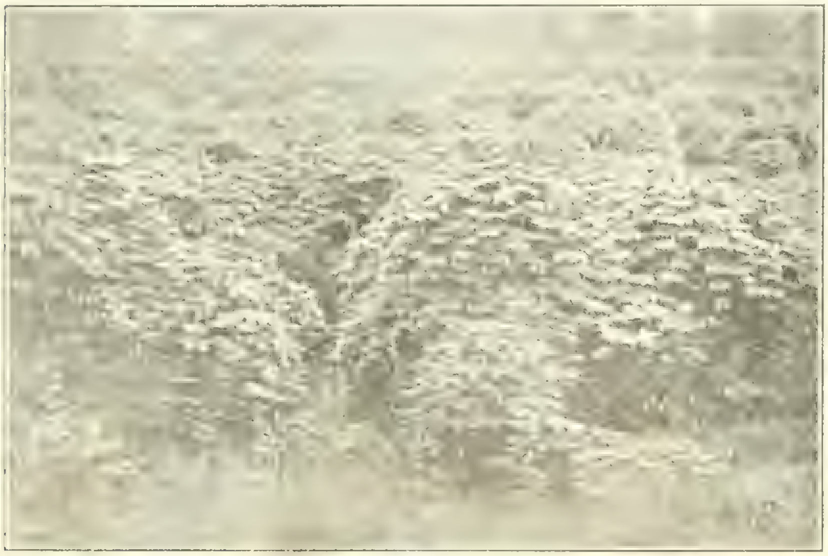


FIG. 20. LIME TREES COVERED BY BENGAL BEANS.

The Bengal bean was at first used at Montserrat purely as a green dressing on account of the large amount of organic matter which it returns to the land, and because of its ability, in common with other leguminous plants, to gather atmospheric nitrogen. It was discovered by chance that certain trees. which had been in a dying state for some time past as the result of attack by scale insects, showed themselves much improved in general vigour and freedom from scales after the Bengal bean plants had climbed over them and covered their branches for a year or two. Since then, extended trials have been made with Bengal beans, and it is reported that good results always follow, and that the results are better the more completely the beans cover in all the trees. The practice in Montserrat is to plant four or five beans around each tree at the time of the first rains in May or June, and to allow them to grow until the beans are ripe in the following March or April. The stems of the beans are then cutlassed near the ground, and any portion of the vines that hang free from the trees is cut off, but the mass of vines on top of the tree is not disturbed. No attempt is made to remove it.

Up to the present time this has been tried only on limes that were badly infested with scales before the beans were planted, and it has been found that many of the scales—perhaps most of them—were dead when the beans were cutlassed. In addition to this, it has been observed that the limes have made particularly vigorous growth immediately after the beans have been cutlassed. It often happens that none of the lime shoots show above the mat of bean vines at the time they are cut, but within a few weeks strong vigorous shoots, 6 or 8 feet long, may be seen, which have penetrated the dead bean vines. So far as observation goes, this growth is healthy, and the improvement in the trees is fairly permanent. One field which received this treatment some seven years ago, and has had no spraying or other treatment of similar kind since, is remarkably healthy and free from scales. One drawback to this method is that the covered-in limes give a short yield for that year.

Although it is known what results follow when Bengal beans are allowed to climb upon lime trees, the exact reason why these results come about is not known. It seems likely that the covering of beans maintains a more moist condition beneath it, and in this way encourages the growth of those fungi which attack and kill scale insects. It is likely also that the conditions under this canopy of bean foliage are favourable to the insect parasites of scales, and enables these to multiply more rapidly than when the trees are exposed to the strong winds which, during a large part of the year, blow across the island of Montserrat.

Fungus parasites and insect parasites of the scales, or in other words, the natural enemies of the scale insects, are present and are encouraged by the covering of Bengal beans. It would seem, however, that there must also be some other agency in operation favourable to the lime trees, for the killing off of the scales could hardly account for the remarkable vigour of the new growth of the limes, which follows immediately after the cutlassing of the beans. Possibly the rest, or partial rest, that the trees have had, while covered, would account in some measure for this vigour.

Sugar in Porto Rico. It is reported that the sugar crop for 1909 in Porto Rico is estimated at from 205,000 to 255,000 tons, which indicates that very great advances have been made in the output during the past seven or eight years. The probable limit of sugar production in the island is generally placed at about 500,000 tons. It is assumed, however, that the latter figure will be reached less by increasing the area now planted with sugar-cane than by the introduction of improvements in machinery and existing plants. An association of sugar growers, with an Experiment Station is to be formed, and preparatory work on an extensive system of irrigation, involving several thousand acres of land, has been started. There are now three central factories in Porto Rico which use twelve-roller mills, and another is in course of erection.

TOGGENBURG GOATS IN THE WEST INDIES.

The Toggenburg goats that are to be found in the West Indies, and which are in most cases the descendants of the pure-bred stock imported by the Imperial Department of Agriculture in 1903, are attracting increasing interest from stock-owners, and it is becoming generally recognized that by crossing a good class of West Indian goat with the Toggenburg, a hardy and serviceable animal is obtained, and one which possesses superior milking qualities.

Many enquiries are being received for young Toggenburg stock, both at this Department, and by private stock-owners who have had experience of this class of goat in the West Indies during the past five years. This increasing demand has naturally led to a rise in value. The general prices for the animals of this breed range from £3 to £4 each, but as much as £5 has been paid for good half-bred rams.

At Grenada nineteen Toggenburg goats have been imported, and in most instances these have proved highly successful. As a result, there exists a very considerable demand in that island for further animals of this kind.

In Dominica, the pure-bred ram 'Wallace,' a son of 'Bruce' and 'Pauline,' the two Toggenburgs originally imported by the Department in 1903, has been very successful in propagating the breed, as there now exist about fifty young half-bred Toggenburg goats in various parts of the island. It does not appear, however, that the value of these animals is fully recognized at Dominica, as little attention has there been given to goats as milk producers—the point in which the Toggenburgs exhibit merit.

The following extracts taken from *Bulletin No. 68* of the United States Department of Agriculture may prove of interest in this connexion :—

The Toggenburg breed is called the aristocrat of the milch goat family. There are some breeds that are more hardy perhaps, some that are more prolific, some that will show occasional individuals of greater milk-producing capacity, and several that present a more robust appearance ; but the Toggenburg seems to combine in itself more of these characteristics in a high degree than any other breed.

This breed is from the Toggenburg Valley, a district forming a considerable portion of the Canton St. Gallen, in the north-east section of Switzerland, and about 70 to 100 miles from Berne. Here they have been bred for centuries.

In discussing this breed Hook points out an important feature which is applicable to all breeds, namely, that the high position occupied by the Toggenburgs as milk producers has been attained by the careful selection of individuals for breeding, and from their offspring preserving those only for breeding which have proved themselves to be good milkers. This practice cannot fail to lead to definite results if the selections are made intelligently. The Toggenburgs are especially noted for their great milking qualities, and in this particular they probably excel most other breeds. In Switzerland there are a goodly number of the more intelligent breeders of these goats who are breeding only the best milkers. These goats give from 4 to 5 quarts a day as a rule, while the best produce from 5 to 6 quarts, and, in extraordinary cases, as much as 7 quarts per day. Their persistence in giving milk is a noteworthy characteristic.

The udder of the Toggenburg when distended is carried high between the legs. The teats are usually very large and long.

The Toggenburg is generally called a hornless breed, but instances are not uncommon where horns are developed.

Notwithstanding the lanky and lean appearance of these animals, the does are quite attractive. The bucks have a harsh and most serious expression, owing principally to the shape of the head, and the large coarse beard. They are not given to fighting, however, and are free to a large extent from the odour that is generally so objectionable in males among most other breeds of goats.

Mr. Bryan Hook, author of 'Milch Goats and their Management,' makes the following observations on the Toggenburg goat in England :—

The Toggenburg goat is, in my opinion, by far the most valuable, and the best suited to our climate of all the pure breeds that have been introduced into this country, and—having now become fairly common and well established with us—is the breed I should unhesitatingly commend to the attention of goat-keepers.

There is no doubt that in England the Toggenburg is now recognized as the most economical and profitable of all the breeds of goat that may be kept for milk-producing purposes. The average value of a good milker was recently placed at from £7 to £8, but prices of £12 have been realized for superior animals. A mature Toggenberg should give about 2 quarts per day, or slightly more for three months after kidding. An exceptionally good specimen of this breed that was on view at the London Dairy Show some five or six years ago, was yielding over a quart of milk per day, although it was more than eighteen months since it had kidded.

It is important that goats imported into the West Indies receive every care and attention, and this is all the more desirable if the animal possesses high economic qualities. It must be borne in mind that even though a goat may belong to a good dairy breed, and come from the best milk-yielding strain, she will not continue to yield large quantities of milk unless she is well fed and receives the best attention.

It is not judicious or economical to feed a goat continuously on one kind of food alone, since if this is done, the animal will never satisfy its requirements. In the West Indies, in most cases, goats have to be tethered at pasture, and it should be remembered that it is well to move them two or three times daily. The goat is very fanciful in its tastes, so that it will be necessary to see that all food and drink are clean, as well as the pan, bucket, or other utensil used in feeding the animals.

In conclusion, it is important to point out the necessity of care in selection and breeding, if Toggenburg goats are to maintain in the West Indies the excellent milk-yielding quality which distinguishes the breed in Switzerland. Unless this care is duly exercised, and indiscriminate breeding prevented, deterioration is certain to result.

In connexion with this question of improved stock, it may be mentioned that the Imperial Department of Agriculture has under consideration a scheme by which it is proposed to grant bonuses to persons importing goats and other animals of good economic quality into the West Indies. The conditions under which these bonuses are to be given will be announced later.

GLEANINGS.

Areas of Crown land in Dominica, which after clearing would be well suited for the establishment of orange groves, can be obtained at a price of 12*s.* 6*d.* net per acre.

An Agricultural and Commercial Society was started at Montserrat in March last. About thirty-five members have joined, and a representative Committee of Management has been appointed.

The quantity of balata exported from British Guiana in 1907-8 was 973,269 ℔., this being an increase of 344,680 ℔., as compared with the previous year. Rubber was shipped from the colony in 1907-8 to the amount of 6,873 ℔.

Grants of Crown lands to the number of 1,157, and comprising 9,494 acres were issued in Trinidad during 1907-8. In 1906-7, the number of grants issued was 991, and the total area alienated, 8,004 acres. (*Annual Report.*)

A notice in the *Trinidad Royal Gazette* draws attention to the fact that the advice and assistance of the two Inspectors lately appointed by the Board of Agriculture of the colony, are available for all planters and small holders, free of charge.

From the commencement of the cane-reaping season up to May 6, there were exported from Barbados 2,081 tons of sugar, and 26,469 puncheons of molasses, as compared with 12,379 tons of sugar, and 23,215 puncheons of molasses shipped to the same date last year.

The sugar exports from Trinidad to Canada during 1907-8 increased by £46,665, in comparison with the figures for the previous year, while the shipments of cacao to the Dominion from the same colony showed an increase in value of £10,560. (*Annual Report.*)

According to one of the Jamaica correspondents of the *West India Committee Circular*, an excellent sugar crop is expected in Westmoreland parish this season. Cane farming is extending in the neighbourhood, and about 1,000 acres of land has been planted in this way, the holders selling their produce to the big estates.

Twelve pupils from the St. Kitt's Grammar School entered for the Cambridge Local Examination held last December, and all were successful. Among the candidates were four from the agricultural side of the school, two of whom entered for the Preliminary Examination, and the remaining two for the Senior. One agricultural candidate (E. Du Porte) obtained Second-class Honours in the Senior Examination, with distinction in Agricultural Science.

In some yam experiments conducted at the Botanic Station, Grenada, twelve varieties were tested as to their cropping power. The kinds which did best were 'St. Kitt's White Flesh' (233 ℔. for 25 holes), 'White Lisbon' (196 ℔. for 25 holes), and 'Red Lisbon' (193 ℔. for 25 holes). The yams were planted at distances of 5 feet by 5 feet.

It may be mentioned, for the information of stock-owners in Barbados who are interested, that the pure-bred Toggenburg ram 'Wallace,' will be returned from Dominica to Barbados, by the R.M.S 'Esk,' due on May 18. 'Wallace' will be retained at Barbados, and will be available for service.

A movement is on foot in Trinidad, supported by the Department of Agriculture, to secure the importation into the colony free of duty, of all materials used for agricultural purposes, more especially fungicides and insecticides. This matter was discussed at a recent meeting of the Board of Agriculture, and referred by the Governor to the Advisory Committee.

In reference to an article headed 'Chinese Vegetable Tallow,' which lately appeared in the *Agricultural News* (Vol. VIII, p. 107), Mr. Joseph Jones writes to say that the tree *Sapium sebiferum*, which yields this product, was introduced to Dominica years ago, and that specimens may be seen at the Botanic Gardens, one of them being 30 feet high. Mr. Jones adds that the tree does not thrive particularly well in Dominica, and is very subject to the attacks of a 'white blight.'

The tenth report of the Woburn Fruit Farm (England) deals with the treatment of trees for insect pests. Experimental work in this direction showed that nursery stock could be entirely freed from woolly aphis by immersion for ten minutes in water heated to 115 °F., at which temperature the plants did not suffer. Treatment with petrol was equally effective so far as the destruction of aphis was concerned, but might be likely to cause more damage to the plants.

The *Journal* of the Jamaica Agricultural Society recommends to planters in the island that they sow cowpeas between the rows of bananas in March and April, cutting the vegetation about two to three months later, and spreading it over the ground to act as a surface mulch beneath the banana trees during the dry months of July and August. The decaying vegetation could, with advantage, be dug into the soil when the rainy season comes on.

As was generally expected, the sugar crop on the majority of Barbados estates is proving to be very small this year. In the coast districts it is reported that the crop is no more than 33 per cent. of an average return, on the whole. Black soils further inland are expected to yield 55 per cent. of their average crop, while on the red soils prospects are not so depressing, although no more than 75 per cent. of an ordinary yield is anticipated.

Messrs. Sandbach, Parker & Co., of Georgetown, state that weather conditions were favourable for rice farmers in British Guiana during the fortnight ended April 30, and large quantities of cleaned rice were brought to town. Shipments to the West Indian islands in the two weeks amounted to about 1,500 bags, principally for Trinidad. The price quoted is 18*s.* 9*d.* to 19*s.* 9*d.* per bag of 180 ℔. gross.

STUDENTS' CORNER.

Seasonal Notes.

MAY.

2nd Fortnight.

The reaping and milling of sugar-canes will continue to be in progress during this fortnight. Careful outlook should be kept for diseased and rotten canes; the cause of the disease should be ascertained, and the varieties most susceptible, and those which are more immune, noted. Root disease (*Marasmius*) should be especially looked for in ratoon canes. Learn to recognize the symptoms which indicate its presence.

An attempt should be made to learn the distinguishing characteristics of the chief kinds of canes. Note, wherever possible, the yield of cane obtained per acre, and the quantity of cane required to give one ton of sugar.

Fields in which cotton was planted last year should now be cleared of old cotton plants. The various insects, fungi, etc., affecting the old bushes, and the attacks of which have prevented their full development, may now be observed. If scale insects are present note whether any of them are parasitized or not. Observe the fact that the scale insects easily spread from the cotton to neighbouring vegetation. Land which has borne cotton for two years in succession will now be planted with green dressings, such as woolly pyrol, etc.

Cacao pruning will still be in progress. Study the different methods and tools, and note the merits and demerits of each. Observe carefully those cacao trees in the plantation which appear especially vigorous and productive, and endeavour to ascertain the causes.

Look through the lime plantations; remove all dead branches, dressing the wounds with tar and resin oil. Remove any mistletoe that may be seen growing, as well as epiphytes which occur in wet districts. When 'black blight' is seen on the lime trees, endeavour to ascertain what scale insects are associated with it.

Preparation of the land, and planting with yams will be done about this time. Observe the amounts of manure given to this crop per acre. Experiments with different varieties of yams have been carried out in many of the islands. Ascertain which kinds have done best in those trials, and compare the returns given with those obtained on estates in your neighbourhood. Note that some varieties of yam are planted on banks and others in the furrow. Ascertain the reason for this.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of the chief changes brought about in a soil as the result of drainage and tillage.

(2) Under what conditions could a soil contain a good supply of plant food constituents, and yet fail to yield satisfactory crops?

(3) What change must sulphate of ammonia undergo in the soil before it is available as plant food?

INTERMEDIATE QUESTIONS.

(1) Write a short account of the method of extracting starch from the roots of arrowroot (or cassava) on a commercial scale.

(2) State the composition of an average sample of cow's milk. Why is milk an especially nutritious food?

(3) Discuss the circumstances under which soils lose respectively the greatest amounts, and smallest amounts, of water by evaporation.

STUDENTS' MEETINGS AT ANTIGUA.

With the object of affording assistance to candidates at Antigua who propose to enter for the Preliminary and Intermediate Examinations in Agriculture of this Department to be held in September or October next, monthly meetings are being held in the island, at which the chief points in the syllabus of work are discussed with the students.

Meetings for Preliminary students, at which elementary theoretical points are considered, are held on the first Monday in each month. The various subjects dealt with are discussed in such a way as to be useful also to intending candidates for the Intermediate Examination. These meetings are under the charge of Mr. A. H. Kirby, B.A.

Since the Intermediate Examination is concerned with the more practical side of Agriculture, efforts are made to assist students in this direction at the meetings which are held on the third Monday in each month for Intermediate candidates. For instance, the students were met at the Cotton Factory, St. John's, on April 19, when the construction, setting, and working of gins, and the ginning and baling of cotton were dealt with by Mr. J. Dew. Later Mr. H. A. Tempany and Mr. T. Jackson discussed seed selection and disinfection, and the judging of cotton lint, etc., with the students. Meetings will also be held at the Antigua Sugar Factory, Botanic Station, Skerrett's Experiment Station, and other centres, for the consideration of various practical points.

COWS AND THEIR MILK YIELDS.

The enormous extent of the dairy industry justifies the attention that has for years past been given in many parts of the world to the question of breeding cows that shall give a maximum return of milk. This is not only a matter of great practical importance, but also one of distinct scientific interest.

The results of numerous experiments have established the fact that when a deep-milking cow is mated with a bull, the dam of which was also a deep milker, it is found that the female offspring yield large quantities of milk, while the males will beget deep milkers. It will be recognized therefore, that the milk records of a herd of cows form data of considerable value to a stock-owner who is anxious to breed and rear animals of special value for dairy purposes.

The *North British Agriculturist* lately contained some statistical particulars in relation to this subject, which show the great variation in the milk-yielding power of different cows. On a farm referred to, a group of Ayrshire cows has been bred, which, with their latest calves, gave the very high average of 1,144 gallons of milk, containing 3·6 per cent. of fat. Acting on the belief that like produces like, a group of young cattle is being carefully raised, the dams of which averaged 1,232 gallons of milk per year, containing 3·8 per cent. of fat.

In relation to the same question, *Bulletin No. 15* of the Edinburgh and East of Scotland Agricultural College shows the kind of variation in milk-yielding capacity which is found in an ordinary herd of Shorthorn cows. For the year ended July 1906, the highest yield given by an individual cow in a certain herd was 1,505 gallons in forty-seven weeks, while the lowest return from a single cow in the herd was 478 gallons in thirty-nine weeks. With the same herd, the highest and lowest yields for the year ended July 1908, were 1,224 gallons in fifty-two weeks, and 438 gallons in twenty-six weeks.

HEDGES AND HEDGE PLANTS AT ANTIGUA.

Very few hedges are in existence in Antigua, and with the purpose of giving an object-lesson to planters in this direction, successful efforts have been made to develop growing fences round the Experiment Station at Skerrett's. The plants mentioned which appear to be especially satisfactory for the purpose of the establishment of hedges are the bread-and-cheese (*Pithecolobium Unguis-cati*), the Barbados cherry (*Malpighia glabra*), and the logwood (*Haematoxylon campechianum*). Since the hedges at Skerrett's have attracted considerable attention at Antigua a number of enquiries have been received by the Curator (Mr. T. Jackson), and it would appear that many people in the island are intending to follow the example thus started and to plant hedges on their own properties. Mr. Jackson recently forwarded to this Department some notes on hedge plants and hedge planting, which may be of general interest outside Antigua.

In addition to the three plants already named, Mr. Jackson mentions the hibiscus, the pomegranate (*Punica granatum*), *Agave Americana*, *Agave vivipara*, wild coffee (*Clerodendron aculeatum*), and several species of bamboo, all of which would be useful in the establishment of fences.

Apart from the use of these plants for larger hedges, trials made at the Antigua Botanic Station have shown that at least one or two of them can be utilized for the formation of low ornamental borders after the manner in which low 'box' hedges are frequently employed in England. These borders, when well cared for, form an attractive feature in an English garden, and in addition to their ornamental value, serve a very useful purpose in defining boundaries, and keeping up the sides of walkes. Mr. Jackson points out that the bread-and-cheese plant, when kept well trimmed, forms a useful substitute for the 'box-edging' referred to, and there is no doubt that such dwarf boundaries (kept about 8 or 9 inches high) could be introduced into West Indian gardens with striking effect.

The 'bread-and-cheese' hedge is established by sowing seeds on a border about 18 inches wide, the seeds being planted in drills from 3 to 4 inches deep. If a thick, rather wide hedge is desired, two rows of seeds can be planted, the rows being about 6 inches apart. When the young plants are about 8 inches high they should be trimmed. The first trimming should consist only of taking off the points of the young plants so as to force them to grow from the bottom and form a shrubby undergrowth. If wet weather ensues, the next pruning should be performed a few weeks after the first. Subsequent trimmings will be at the discretion of the grower.

As already mentioned, in addition to their ornamental value as a dwarf hedge, these plants are capable of forming a useful boundary fence. The foliage is somewhat liable to be attacked by leaf-mining caterpillars, which disfigure it. When so attacked, it should be sprayed with kerosene emulsion.

Another plant which can also be grown to form a dwarf hedge is the logwood. It is not so satisfactory for this purpose, however, as the bread-and-cheese, on account of the fact that its shoots are so much stiffer and stronger growing. The best dwarf hedges of logwood are grown on very poor soil. On the other hand, if it is required to establish a fence for the purpose of keeping out stock, no plant is more useful than the logwood, since it forms a thick serviceable hedge, which is almost impenetrable on account of the thorny growth. Planted around cultivated lands it would certainly prove a formidable barrier against praedial larceny. Like the bread-and-cheese, the logwood plants are best established by sowing seed at the place where the hedge is to be grown.

Two other useful plants for stock-resisting fences are the Barbados cherry and the pomegranate. The bright green foliage of the former makes its appearance very handsome. The seeds of these plants should be sown in a nursery and transplanted when the young plants are about 6 inches high.

The pomegranate makes a fine fence which can be established either by sowing seeds or planting cuttings.

Persons who are intending to plant hedges, which would at once be useful and ornamental, might well utilize the strong-growing hibiscus for the purpose. The best method to establish a fence of this would be to transplant rooted cuttings. A further advantage in favour of this plant is that the numerous varieties which exist offer the grower some scope for a colour scheme.

The Bougainvillaea, it is well known, forms a fence of highly ornamental appearance. Plants of this must be propagated by cuttings or layers. In starting a hedge of this description the best plan would be first to establish a light trellis work, which would serve as a support for the young plants. Later on when the trellis decays, the plants would be able to support themselves. It is advisable that the quick-growing shoots should be tied in, and that pruning should be done freely.

A plant which has given very satisfactory results in Barbados and other islands for hedge purposes is the sweet lime (*Triphasia Aurantiola*). This, if kept well trimmed, forms a thick, bushy growth, which is ornamental, highly useful, and also quite capable of keeping out stock and serving as a general protection to the enclosed area. The only drawback to the more general use of this plant for the purpose mentioned, is that its growth is very slow.

FIBRE CONGRESS AND EXHIBITION.

Arrangements have been made to hold a Fibre Congress and Exhibition at Sourabaya, Java, in October of next year, under the auspices of the Dutch East Indies Agricultural Syndicate, which has received a substantial Government grant, and contributions from private business firms in assistance.

The Congress that is to be held will discuss the cultivation of fibre plants, and the extraction and preparation of the fibre, on a commercial scale. A prominent place in the programme will be given to the consideration of fibre plants that are most suitable for cultivation on a large scale in the tropics, e.g., Sisal hemp (*Agave rigida*, var. *sisalana*), which is especially adapted for growth in dry countries, and Manila hemp (*Musa textilis*), which produces a profitable crop in the more moist districts of tropical countries.

There will be on view at the same time an Exhibition of fibre-producing plants, of the fibres manufactured therefrom, and of the machinery used in preparation of the same. Various medals, diplomas, and prizes will be offered for machinery used in connexion with the fibre industry. The machines sent in for competition will be required to work for a sufficient time before the Committee to show their capacity. Special attention will be paid to this testing of machines, both as regards the extraction and preparation of the fibre.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets during the month of March :—

But very little change can be reported in the condition of the spice and drug markets since our February report. In some articles March has seen a slight improvement, and among such may be mentioned West Indian mace and nutmegs. The general tone, however, remains dull, which condition is attributed to current and prospective disturbances, such as the Balkan difficulty, the changes in the American tariff, and the inevitable British budget.

The following details will show the position held by West Indian products:—

GINGER.

At the first spice sale on the 3rd of the month no Jamaica was offered, but some 350 bags of new crop Cochin were bought in at from 38*s.* to 40*s.* for fair to good washed rough. Some Japan was offered and also bought in at 32*s.* per cwt. A fortnight later, Cochin and Calicut were represented by 500 packages, all of which were bought in at the following prices: Bold and medium native cut at 75*s.*; medium and small from 53*s.* to 55*s.*; brown rough and washed Cochin, at 40*s.* On the 24th, no Cochin or Calicut was offered, but Jamaica was represented by 97 packages, for which there was a good demand at advanced rates, ranging from 1*s.* to 2*s.* per cwt., the prices realized being as follows: Fair bright, 61*s.* 6*d.* to 63*s.*; middling to good middling, 59*s.* to 61*s.*, and good ordinary small, 55*s.* to 57*s.* per cwt. Japanese was quoted at this auction at 32*s.* 6*d.* On the last day of the month a still firmer tone prevailed, although no sales were effected. Fifty-one packages of good dullish washed Jamaica were offered and bought in at 62*s.* to 70*s.* per cwt.; washed Cochin was also held at 40*s.*, and Japanese at 32*s.* 6*d.*

NUTMEGS, MACE, AND PIMENTO.

The offerings of nutmegs at the first auction on the 3rd were unimportant. On the 17th, however, some 210 packages of West Indian were disposed of, at an advance of $\frac{1}{4}$*d.* per lb. over previous prices, while some 33 packages of Singapore were offered without reserve at cheaper rates. A week later, prices again advanced generally, 19 packages of West Indian being offered and disposed of at 5$\frac{1}{2}$*d.* for 85's, 5$\frac{1}{4}$*d.* for 87's to 88's, and 4$\frac{3}{4}$*d.* for 92's. Singapore was represented by 66 boxes, all of which were bought in at 7$\frac{1}{4}$*d.* to 8*d.* for 78's to 79's. At the last spice sale on March 31, the market stood thus: 5$\frac{3}{4}$*d.* for 80's, 5$\frac{1}{2}$*d.* for 85's, 5*d.* for 89's, 4$\frac{3}{4}$*d.* to 5*d.* for 107's, and 4*d.* for 108's. Fifty-seven boxes of Singapore were offered at this auction, 45 of which were sold without reserve at 4$\frac{3}{4}$*d.* to 5*d.* for 110's.

Mace, at the first auction on the 3rd, realized from 1*s.* 6*d.* to 1*s.* 7*d.* per lb. for fair pale, and 1*s.* for broken, 8 packages of West Indian selling at these rates. On the 17th, prices had risen 1*d.* to 2*d.* per lb., 18 packages of West Indian realizing for good palish 1*s.* 8*d.* to 1*s.* 9*d.*, for fair red 1*s.* 6*d.*, and for broken 1*s.* 3*d.* per lb. A week later prices had again advanced. Twenty-six cases of Java were offered and disposed of, fair pale fetching 2*s.* 1*d.*, and good pale and reddish 1*s.* 10*d.* At the last auction on the 31st, West Indian fair sold at 1*s.* 8*d.*, and broken at 1*s.* 3*d.* Good, flat, red Java fetched 1*s.* 10*d.* per lb., 3 cases out of 23 offered being sold at this rate. Pimento at the beginning of the month was quoted at 2*d.* per lb., at which price all the offerings, consisting of 100 bags, were disposed of at the auction on the 10th. A week later 275 bags of ordinary fair were offered and bought in at 2$\frac{1}{8}$*d.* per lb., which price remained steady to the end of the month.

SARSAPARILLA.

On the 25th, some 15 bales of grey Jamaica sarsaparilla were offered and sold steadily at from 1*s.* 4*d.* to 1*s.* 5*d.* per lb. for roughish to fair, and 1*s.* 3*d.* for damp and country damaged. Seven bales of fair Lima-Jamaica realized 1*s.* 1*d.* to 1s. 2*d.*, and a more chumpy quality fetched 1*s.* Twelve bales of native Jamaica were offered, 7 of which were sold at 1*s.* 1*d.* to 1*s.* 2*d.* for fair to good red, 1*s.* for palish red, and 11*d.* for ordinary dull red, and yellow mixed.

KOLA, LIME JUICE, TAMARINDS, ETC.

Of kola, in the early part of the month, 2 bales of fair dried Jamaica halves sold at 1$\frac{3}{4}$*d.* per lb. At the same period, 8 hogsheads of Montserrat lime juice, good pale raw, were offered and disposed of at 1*s.* 3*d.* per gallon, a price which held for a similar quantity at a later period of the month. On the 10th, the offerings of tamarinds amounted to 95 packages, 10 only of which found purchasers at 7*s.* 6*d.* per cwt. in bond, for ordinary dry palish Antigua. At the auction on the 17th, 97 barrels of Barbados were offered and bought in at 12*s.* per cwt., in bond. In chillies there has been firm demand, Sierra Leone being quoted at 50*s.* for good, and 55*s.* for fair Nyassaland. Malta strip orange peel, at the end of the month, was offered and bought in at 10*d.* per lb., while at the same auction 5 cases of dull strip were disposed of without reserve at 4*d.* per lb.

ARENGA SACCHARIFERA.

Several palms are cultivated for their sugar-yielding properties, of which the most important is the wild date (*Phoenix sylvestris*). Another palm valuable for the same reason, and which is largely grown in Malay and other parts of the East Indies, is *Arenga saccharifera*. This species has been introduced into Jamaica, and *Bulletin 142* of the Bureau of Plant Industry, U.S. Department of Agriculture, mentions it as being among the plants introduced into the United States last year by the Department. The specimens were imported from Java.

Sugar is obtained from the palm by evaporation of the sap that flows from wounds made in the young inflorescence. This palm is a kind that needs much room and light, a fact which prevents the establishment of closely planted groves of the palms that otherwise might be very profitable. About 100 trees form the maximum that could develop per acre of land.

The tree flourishes best in Java at an altitude of about 1,800 feet. A sugar yield cannot be obtained from it until it has reached at least its twelfth year, and its term of production lasts from three to five years. During this period a single tree may return as much as 450 lb. of sugar. At this rate, an acre bearing 100 trees would yield about 20 tons, which works out at rather more than 1 ton of sugar per acre per annum. Catch crops may be grown beneath the young palms for the first few years, but at the end of the sugar-producing period the land must be cleared and prepared for a fresh planting.

Arenga saccharifera is sometimes referred to as the sago palm, since the heart of the stem contains large quantities of farinaceous matter. A variety of sago is obtained by washing and granulating this pith.

MARKET REPORTS.

London,—April 27, 1909. THE WEST INDIA COMMITTEE CIRCULAR; Messrs. E. A. DE PASS & Co., April 16, 1909.

ARROWROOT—St. Vincent, 1¾d. to 3¾d. according to quality.
BALATA—Sheet, 2/4; block, 1/8½.
BEES'-WAX—£7 17s. 6d. for dark to pale.
CACAO—Trinidad, 57/6 to 70/- per cwt.; Grenada, 50/- to 57/6 per cwt.
COFFEE—Santos, 33/3 per cwt.; Jamaica, no quotations.
COPRA—West Indian, £19 17s. 6d. per ton.
COTTON—Nevis and St. Kitt's, 12½d. to 13¼d.; Barbados, 13d. to 14d.; Anguilla, 12¾d.
FRUIT—
BANANAS—Jamaica, 4/6 to 9/- per bunch.
LIMES—Not wanted.
PINE-APPLES—St. Michael, 1/6 to 4/-.
GRAPE FRUIT—5/6 to 9/- per box.
ORANGES—Jamaica, 6/- to 9/- per box.
FUSTIC—£3 to £4 per ton.
GINGER—66s. 6d. to 69s. for good middling to fair bright.
HONEY—23s. 6d to 34s. 6d. per cwt.
ISINGLASS—West India lump, 2/2 to 2/6 per lb.
LIME JUICE—Raw, 1/- to 1/3 per gallon; concentrated, £18 per cask of 108 gallons; distilled oil, 2/- per lb.; hand-pressed, 5/6 per lb.
LOGWOOD—£3 to £4 5s. per ton; roots, no quotations.
MACE—Quiet.
NUTMEGS—Steady.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5s. 1¾d. per lb.
RUM—Jamaica, 3/4 to 7/; Demerara, 1/6 to 1/6½, proof.
SUGAR—Crystals, 15/4½ to 16/-; Muscovado, 15s. to 16s.; Syrup, steady; Molasses, no quotations.

New York,— April 16, 1909.—Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 12¾c. to 20c.; Grenada, 13¼c. to 13⅝c.; Trinidad, 13c. to 13¾c.; Jamaica, 11c. to 12½c. per lb.
COCOA-NUTS—Jamaica, select, $23·00 to $24·00; culls, $14·00 to $15·00; Trinidad, select, $22·00 to $23·00; culls, $13·00 to $14·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8½c.; good ordinary, 9c. to 9¼c.
GINGER—9½c. to 10c. per lb.
GOAT SKINS—Jamaica, 50c. to 55c.; Antigua and Barbados, from 45c. to 50c.; St. Thomas, St. Croix, St. Kitt's, 45c. to 48c. per lb., dry flint.
GRAPE FRUIT—Jamaica, $4·00 to $4·25 per barrel.
LIMES—Dominica, $5·25 to $5·75 per barrel.
MACE—33c. to 37c. per lb.
NUTMEGS—110's, 9¾c. per lb.
ORANGES—Jamaica, $1·50 to $2·00 per box, $2·50 to $3·50 per barrel.
PIMENTO—4¼c. per lb.
SUGAR—Centrifugals, 96°, 3·92c.; Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., duty paid

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., May 8, 1909; Messrs. T. S. GARRAWAY & Co., May 10, 1909.

ARROWROOT—St. Vincent, $3·90 to $4·00 per 100 lb.
CACAO—Dominica and St. Lucia, $11·50 to $12·00 per 100 lb.
COCOA-NUTS—$13·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb.
HAY—$1·15 per 100 lb.
MANURES—Nitrate of soda, $62·00 to $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $72·00 to $75·00; Sulphate of potash, $67·00 per ton.
MOLASSES—Fancy, 17c.; Grocery, 20c. per gallon.
ONIONS—Strings, $3·50 to $4·00 per 100 lb.; loose, no quotations.
POTATOS—Nova Scotia, $1·60 to $1·75 per 160 lb.
PEAS—Split, $6·00 per bag of 210 lb.; Canada, $3·40 per bag of 120 lb.
RICE—Ballam, $5·00 to $5·10 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—Dark Crystals, 96° $2·30; Muscovado, 89° $1·80; Centrifugals, $2·20 to $2·40.

British Guiana,—Messrs. WIETING & RICHTER, May 1, 1909; Messrs. SANDBACH, PARKER & Co., April 30, 1909.

ARROWROOT—St. Vincent, $9·00 to $9·50 per 200 lb.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
CACAO—Native, 14c. per lb.
CASSAVA—60c. to 80c.
CASSAVA STARCH—$6·00 per barrel of 196 lb.
COCOA-NUTS—$16·00 per M.
COFFEE—Creole, 12c. to 13c.; Jamaica, 13½c. per lb., slow.
DHAL—$4·90 to $5·00 per bag of 168 lb.
EDDOS—$1·20 to $1·44 per barrel.
MOLASSES—No quotations.
ONIONS—Lisbon, 6c. to 8c. per lb.
PLANTAINS—20c. to 36c. per bunch.
POTATOS—Nova Scotia, $2·50 to $3·25 per 100 lb.
POTATOS—Sweet, Barbados, $1·08 per bag.
RICE—Ballam, $5·50; Creole, $4·40 to $4·50.
SPLIT PEAS—$6·00 per bag (210 lb.); Marseilles, $3·50 to $3·75.
TANNIAS—$2·04 to $2·40 per bag.
YAMS—White, $2·16 per bag; Buck, $2·64.
SUGAR—Dark crystals, $2·35 to $2·55; Yellow, $3·10 to $3·25; White, $3·60 to $3·80; Molasses, $2·35 to $2·40 per 100 lb. (retail).
TIMBER—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—$3·75 to $5·75 per M.
CORDWOOD—$2·00 to $2·40 per ton.

Trinidad,—May 1, 1909.—Messrs. GORDON, GRANT & Co.

CACAO—Venezuelan, $12·00 to $12·25 per fanega; Trinidad, $11·25 to $12·00.
COCOA-NUTS—$22·00 per M. f.o.b. for large selected pealed in bags of 100 lb.
COCOA-NUT OIL—68c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 8½c. per lb.
COPRA—$3·20 per 100 lb.
DHAL—$4·65 to $4·75 per 2-bushel bag.
ONIONS—$2·50 to $5·00 per 100 lb. (retail).
POTATOS—English, $1·25 to $1·30 per 100 lb.
RICE—Yellow, $5·00 to $5·25; White, $4·50 to $4·90 per bag
SPLIT PEAS—$5·25 to $5·50 per bag.
SUGAR—American crushed $5·10 to $5·20 per 100 lb.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Timber Production.

IN most countries the question of the world's supply of timber, and its relation to the increasing demand, has received attention of late years. In earlier times the virgin forests that existed in many parts of the world, even in Europe, proved an adequate source of supply of all the timber required. Rapid increase of population, however, has demanded largely extended areas for food-producing purposes, and as a result the primitive forest lands are being increasingly depleted, and applied to agricultural uses. Further, the advance in population has naturally brought about a greater demand for timber of all kinds, to be used in house construction, and in the manufacture of furniture, and many other necessities of modern life. The manufacture of paper pulp is another industry which of late years has drawn enormously upon the sources of timber supply.

The question of a cheap timber supply is a most important one, but of late years there has been a constant tendency towards increase in price, and in most European countries warnings have frequently been given that the planting up of woodlands will have to be undertaken on a much more extended scale if production is to keep pace with demand. Unfortunately for the general consumer, however, the question of time is the most important factor in raising marketable timber, and a number of years must necessarily elapse before the relationship between supply and demand can be placed on a more satisfactory footing.

In Great Britain the total value of the wood and timber imported each year amounts to over £27,000,000. Of this enormous quantity, the great bulk consists of pine, larch, spruce, etc., from Russia, Scandinavia, and Canada. Smaller quantities of more valuable woods, such as mahogany, teak, ebony, etc., are imported from tropical countries.

Since there exists over 20,000,000 acres of waste land in the United Kingdom, the question has repeatedly been urged that portions of this enormous area might well be utilized in the production of a good proportion of the timber now imported. Three Royal Commissions have within comparatively recent years sat to consider this matter, and the third has but lately issued its report. In this the Commissioners state that they have come to the conclusion that of the waste land existing in the United Kingdom, about 9,000,000 acres are suitable for afforestation, and they suggest that about 150,000 acres should be planted up annually. The return obtained in course of time would be sufficient to repay both capital and interest.

In countries where the natural woodlands have been exploited for timber purposes, and adequate re-planting has not been done, it is easy to recognize the importance of taking measures that shall ensure an increasing supply of home-grown timber, and lessen dependence on declining foreign sources. But when matters have been allowed to drift for a long period of years, there frequently exist peculiar difficulties in the way of the establishment of systematic timber planting operations. Probably the chief difficulty depends upon the great extent to which the time element enters into the question of the monetary return that may be expected. Re-afforestation is a question of national importance in numbers of countries, but it is also an economic question. The great bulk of the waste lands of Great Britain belong to private land-owners, who in the present depressed condition of agriculture, may well argue that they cannot afford to enter upon an undertaking which will involve great outlay, and from which no return can be expected for from twenty to eighty years or more, and the benefit of which will be reaped by another generation.

These considerations, however, should not weigh with the State, the life of which is continuous, and it is the obvious duty of every Government to see that all the waste lands in its possession which are not adapted to give an adequate return if utilized for agricultural purposes, but which are fitted for growing certain kinds of timber, should be planted up with useful species of trees. Such plantations should serve as an object lesson to private estate owners, and be also useful as Forest Experiment Stations, at which valuable data in regard to the cost of establishing and managing woodlands on the most economical basis could be accumulated.

It should be remembered, too, that a poor soil is, in time, vastly improved by bearing a forest crop, if the trees are maintained in a proper condition as regards density, for the spreading roots permeate the subsoil, draw upon its sources of nutrition, and gradually convert it into soil proper. The fall of the leaves too, and their decay, impart a large amount of humus to the soil, keeping it moist and improving its fertility. The relationship between woodlands and water supply was discussed in the last issue of this journal.

Among European countries Germany has long taken the lead in regard to forestry matters. No less than 26 per cent. of the whole area of that country, or 35,000,000 acres, are under woodland, and the average timber return obtained has been estimated at about 40 cubic feet per acre per annum. By means of University Departments and Forest Academies the German Government has provided excellent facilities for obtaining instruction in the subject. Much the same state of affairs, though on a lesser scale, exists in France. In the Scandinavian countries, forestry is at once an art, and a very paying business. In all those countries, the State forests are making very handsome returns on the capital outlay.

But in no country has the subject of forestry increased so much in importance, or received so much attention, as in the United States during the past ten years. It is stated in the *Yearbook* of the U. S. Department of Agriculture, that since 1897 the National Forests have increased from 39,000,000 acres, practically unused and unprotected, to 165,000,000 acres, used, guarded, and improved in productiveness and accessibility. Though the Government forests have not been under expert control for more than a few years, they are already self-supporting, and will no doubt become highly remunerative with the lapse of time. The facilities for forest education have also largely increased, and regular, systematic courses of instruction, extending over two, three, or four years, are given at seven universities, and a large number of forest schools. Advantage is being taken of these facilities, and the number of graduates from the American forest schools increased from three in 1899 to sixty-six in 1907. And yet the article to which allusion has been made calls for more vigorous action in connexion with the national supply of timber, and points out that in the United States as much timber is now being used in one year as can be grown in three.

In the West Indies this matter of re-afforestation has attracted some small amount of attention of late years, although little has been done so far. Large numbers of trees suitable for timber exist in the various islands, and a good deal of useful information in this connexion is contained in two papers entitled respectively, 'The Timbers of Jamaica,' and the 'Timbers of Dominica,' which appeared in the *West Indian Bulletin*, Vol. IX, No. 4, just issued. Useful efforts might be made in the direction of increasing the supply of home-grown timber available for employment in these islands, but the ability to establish an export trade would appear to be limited to particular cases in special islands.

SUGAR INDUSTRY.

Sugar-cane Cultivation in Natal.

Cane cultivation is prospering in many parts of Natal, and there appears to be little doubt that sugar production will soon develop into an important addition to South African industries. While in 1905-6, the output of cane sugar in Natal was 26,603 tons, it increased to 34,000 tons in 1906-7, and in 1907-8 reached 40,000 tons. The entire coast district of the colony is stated to be suited to cane culture, as the soil is fertile, and the rainfall sufficient. An article on the subject of cane cultivation appeared in the *Natal Agricultural Journal* of December last. It should be stated that the 'Uba' cane to which reference is made below, has been extensively tried in some of the West Indian islands, and found to be undesirable.

Many varieties of cane have at different times been grown in Natal. These include the Bourbon cane, and several kinds from Mauritius, and Queensland. At present, however, a variety known as the 'Uba,' which is supposed to have originally come from India, is grown almost exclusively.

The 'Uba' has been described as a deep-rooted, green, woody cane of great vitality. From a milling point of view this cane is undesirable; it is thin, tough, wiry, and fibrous. Mill managers say that from 10 to 30 per cent. more power is required in crushing this cane than for any other variety. But planters like it, since it is hardy, bears drought well, and ratoons readily.

Some years ago a few seedling varieties of cane were introduced into Natal from the West Indies and British Guiana. These included canes B.109, D.95, and B.15. From the comparative results of analysis quoted, however, the seedlings do not appear to give so satisfactory a percentage of saccharose as the standard 'Uba.' While the latter showed an average percentage of saccharose equal to 18·61, the percentage shown by the seedlings ranged only from 12·68 to 15·83. The 'Uba' contained a greater proportion of fibre, however, and it is further added that the seedling canes were gathered somewhat unseasonably. Trials are still in progress, and it is possible that West Indian seedling canes may yet come to be extensively cultivated in Natal.

Sugar-cane appears to be grown on a variety of soils, ranging from light sand to clay, the chief kind being a red, sandy loam, light in texture, and easy to work when broken up. When first cleared of bush this class of land is very fertile, and has been known in good seasons to give yields of 4 to 5 tons of sugar crystals per acre from plant canes.

The cultivation given on cane lands in Natal is very thorough. Disc ploughs are more commonly used than mould-board ploughs. The land is ploughed, cross ploughed, and then harrowed. Very little manure—apart from mill refuse—appears to be used on the cane estates.

The cane rows are planted from 5 to 6 feet apart. Frequently a 'drill plough' working 9 or 10 inches deep, is used for opening a furrow in which to plant the cuttings or tops. Sometimes whole canes are planted; in other cases long cuttings are used, and placed two, three, or four together in the drills or holes. When first set out, only 1 or 2 inches of soil are placed over the planted cuttings, but as the young shoots grow up, the covering of soil is increased until the hole is filled. The general time for planting is in August or September, but it may be done so late as December or January. Weeding operations are regularly performed until the canes have grown sufficiently to cover the ground. At a later period the crops are frequently trashed, although many planters neglect this practice.

The cane crop in Natal takes so long as from twenty to twenty-four months from planting before it arrives at maturity. This not only applies to plant canes, but to ratoons (of which several crops are frequently grown) as well. Cutting generally begins in August, and continues on until January. The question of shortening the period which elapses between planting and harvesting is an important one from the economic point of view, and with increased settlement, and higher land values, this question will demand consideration. It is possible that something might be done by the introduction of more early ripening varieties.

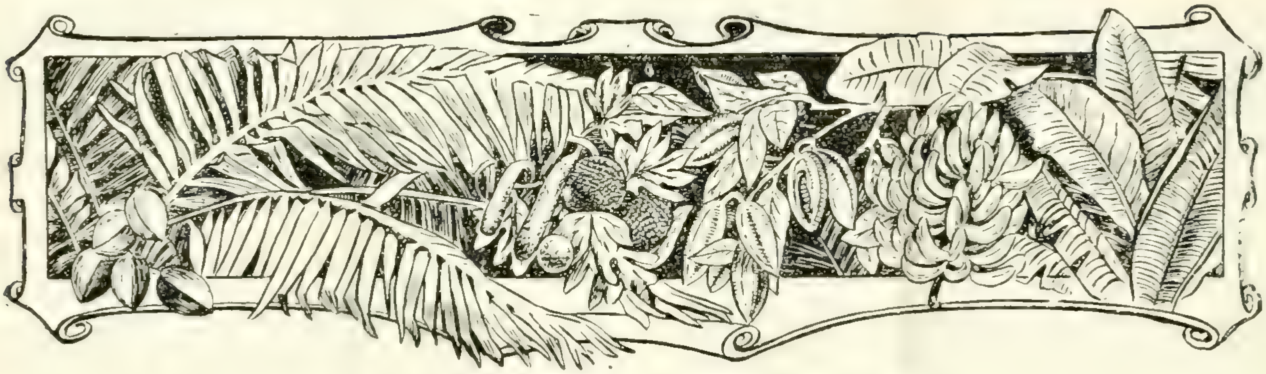
An average cane crop in Natal is about 20 tons to the acre; 30 tons are considered a first-class crop. Trash is sometimes burned in order to destroy grubs. It is not regarded as being of so much value as in the West Indies, since an abundance of bush can be obtained to replenish the stores of humus in the land. In other cases the trash is raked on to alternate rows, leaving the remaining alternate rows clear; these latter are then left free for the cultivation of some quick-growing crop. In the next season the treatment is reversed: the crops that were previously cultivated are now trashed, and *vice versa*.

The Natal sugar estates are usually large in area, and practically all the cane lands are under European management. There are no small native plantings of any consequence. Many large and up-to-date central factories have been erected, although the capacity of these plants has been taxed in recent years as the result of the rate at which the industry is developing. Practically all the work on the sugar plantations is done by indentured Indians.

From the particulars given, it would appear that the biggest central sugar factories are capable of handling 260 tons of cane per diem of twelve hours. The cane is bought from outside estates at a fixed price per ton, but if the expressed juice falls below an arbitrarily fixed Beaumé standard, a reduction in the price is made. The larger factories are usually up-to-date, so far as the machinery and processes are concerned, and in most cases the mills are double, consisting of the first three rollers, an intermediate carrier for maceration, and the second three rollers. It is calculated that 65 per cent. of juice is obtained from the 'Uba' cane, and from 70 to 75 per cent. from softer cane.

It is stated that it takes variously from 12 to 20 tons of Uba cane to yield 1 ton of crystals. A first-class factory has been known to obtain 1 ton of crystals from 12½ tons of Uba cane as a season's average, that is to say, every 100 tons of cane yielded 8 tons of crystals. It will be seen from these figures that a good deal of sugar is lost, and it is estimated that for every 100 tons of canes milled, over 3 tons of sugar pass away in the megass and are burnt. This is a serious loss of profit to the industry, and the writer of the article in the *Natal Agricultural Journal* points out that the best means of preventing this loss is by the introduction and adoption of the diffusion process of extracting the cane juice.

The above particulars are interesting, as applying to a country with a developing cane sugar industry, but it will be noted that some of the findings are not in agreement with West Indian experience.



WEST INDIAN FRUIT.

LIME GROWING AT NEVIS.

The interest that is being shown in many parts of the West Indies in efforts to increase the variety of crops grown is an encouraging sign. An instance in point is reported from Nevis, where—as at Tortola—efforts are being made to bring about the existence of a lime industry. In his report for the month of April last, Mr. J. O. Maloney, Agricultural Instructor, writes:—

At present some attention is being paid to growing limes on a small scale at Nevis. Many thousands of seedlings were distributed from the Experiment Station in 1907, most of which are now growing well. I might also mention that some other spots were planted in 1905, but have not thriven well, on account of the fact that they have not received proper attention.

Orders have just been received at the Station for 70,000 lime seedlings, of which 2,000 have already been delivered, and it is hoped that a large supply will soon be ready for distribution.

It is quite evident that with a certain amount of care, limes can be successfully grown at Nevis, although the rainfall is somewhat small.

LIME INDUSTRY IN VIRGIN ISLANDS.

Allusion was recently made in this journal to the fact that the prospects for the development of a small, but remunerative lime industry in the Virgin Islands appear promising. A short report has lately been received from Mr. W. C. Fishlock, Agricultural Instructor for the Presidency, giving particulars of the work done in this direction during 1908-9.

Limes were purchased at the Experiment Station throughout the year, and up to the middle of March of this year, Mr. Fishlock had bought 40,273 lb. of fruits, or about 252 barrels. The sum paid out for this quantity was £34 11s. 9*d*.

Lime juice was prepared from the purchased fruits, and at first the plan was tried of exporting this juice in the raw state. About 200 gallons were shipped, but it was found, however, that the cost of casks, freight, etc., was too large to allow this method to be remunerative. The raw juice has been boiled down to the concentrated condition, and later shipments have consisted of concentrated juice. In March last about 150 gallons were exported to London, and this quantity was valued at about £45. This plan is likely to prove more profitable than that of shipping the raw juice.

With further experience, and as the industry develops, the cost of preparation may possibly be somewhat reduced, and by-products, such as the essential oil, may be saved.

PREPARATION OF GRAFTING WAX.

A useful recipe for the preparation of grafting wax was lately given in the American *Journal of Agriculture*. It is as follows:—

The best grafting wax is made from 4 parts of resin, 2 parts of bees'-wax, and 1 part of tallow, all by weight. An iron vessel of some kind should be used for melting the components of the mixture, which should be done over a slow fire. The resin is melted first, then the bees'-wax is added, and finally the tallow. The three ingredients are gently stirred so as to bring about a thorough mixture.

The melting process will take from twenty minutes to half an hour, and care must be taken to avoid burning the melted mixture. When properly mixed, a small portion is poured into a bucket of cold water, and in a short time it will be cooled sufficiently to be lifted out with the hand and worked in any way desired. During this process, the hands must be kept moderately greased with tallow to prevent sticking.

When the colour of the grafting wax mixture has become pale yellow, it has been worked sufficiently, and may be made into rolls of convenient size—3 or 4 inches long, by about 1 inch in diameter—and placed in another vessel of cold water to harden.

More of the melted mixture is now poured into the cold water and treated as before, and this process is repeated until the whole lot is worked up. The rolls of wax soon harden, and can be put away until required in grafting.

This wax when applied to the trees will not melt and run down in warm weather. If, however, the weather is very warm at the time grafting is done, it is well to allow the wax to lie in cold water for a time before using in order that it may be of the proper consistency.

In applying the wax around the grafts it should be pressed very closely. It is advisable also that the hands should be rubbed with a very little tallow before starting the grafting process. This, however, must be done with judgment, since if the hands are so greasy as to affect the wax, it will not stick properly to the cut surfaces of the grafts.

WATER IN THE SOIL.

The important bearing which the supply of moisture in the soil exercises upon the fertility of the land has naturally been the cause of much investigation, which has had for its object to ascertain the movements that water undergoes in the soil, how the moisture is retained, the relative proportions of water held by different kinds of soils, and the methods of cultivation which are best adapted to economise and utilise to the best advantage the small supply of moisture which results from a low rainfall. A great amount of knowledge has now been placed on record in regard to these points, the application of which is proving most valuable to the practical agriculturist. The following notes in this connexion are taken from an article which appeared in the *Philippine Agricultural Review* for June last:—

The water that plants use is that which remains in the soil after drainage, and is held in the form of a film of moisture around each particle of earth.

Good agricultural soils hold capillary water equal to about 30 per cent. of their weight. Plants are not able to use this water after it has dried out to about 12 per cent., so that when the soil is in the best condition for plant growth, only about 60 per cent. of the total moisture is available to the plant. During the dry season loss of water takes place by evaporation at the surface of the ground as well as through the leaves of the plant. Fortunately for the roots of the plant, this water tends to maintain an even balance; that is to say, when a portion of the soil dries out, this water moves toward the dry place from the point of greatest moisture. An example of this is when the surface dries, and water from below comes up to take the place of that lost by evaporation. When water has been taken out of the soil by the roots of plants, other water moves towards this spot, and, of course, carries with it soluble plant food, provided there is any in the soil.

The rapidity of movement of capillary water depends upon the size of the soil particles and the proportion of fine and coarse particles. Water will move more rapidly through coarse sand than through clay, but as the water is held in the soil in the form of a thin film around the soil grains—and there being more surface of the soil grains in a cubic foot of fine clay than in the same quantity of sand—there will be more water moved in the clay soil in a given time than in the sand, although the water moves more slowly in the clay than in the sand. Hence clay soils do not suffer from drought as much as sandy soils.

Most agricultural soils, when composed of the proper mixture of sand and clay, have a tendency, under normal conditions, to form small clusters of soil particles, just as small particles of sand tend to cling to larger ones, thus bringing about the best mechanical condition. This mechanical condition is destroyed when the soil is stirred while wet. This is called 'puddling.' Soil so handled, when exposed to the direct rays of the sun, becomes very hard. This condition is known as 'baking,' and simply means that the granular structure has been destroyed, and the soil particles cemented together by drying. Soils allowed to bake in this manner are very difficult to put in good condition again. The mechanical condition may be improved by the use of shade crops, such as velvet beans, etc. The shade allows the slow action of capillary water to restore this cluster condition. Working when the land is in proper condition will also tend to improve the soil.

A controlling factor in soils, so far as moisture is concerned, is humus. Humus is partially decayed leaves, grass roots, or other organic matter in soils, which on account of the great number of cells, has a high water-holding capacity. The presence of humus makes the soil dark or black in colour, so that in most countries a dark soil is regarded as a rich soil, but such is not always the case.

All soils in tropical climates are more or less devoid of humus unless they have been recently cleared of their virgin forest, or are formed of the washings from surrounding hills. The main cause of this absence of humus, however, is the fact that decomposition goes on constantly, and the excessive rainfall washes out the soluble matter.

The presence of humus not only adds fertility to the soil, but makes it more porous and open, thus increasing the water-holding capacity, which is an important factor during the dry season.

The character of the subsoil has considerable influence on the amount of moisture that will be available for the use of plants. As mentioned above, the supply of capillary moisture is the governing factor in plant growth. Also only a limited amount of moisture is held in the soil, hence the storehouse below the surface must be large, so that the capillary water may be drawn up from 6 or 8 feet below the surface. A thin layer of soil underlaid with gravel will suffer much from drought, while, on the other hand, a deep layer of clay insures a good supply of moisture during the dry season, but provides poor drainage in the rainy season, when good drainage is essential except for rice and few grass crops.

DOMINICA AGRICULTURAL AND COMMERCIAL SOCIETY.

A meeting of the Dominica Agricultural and Commercial Society, at which a variety of matters were dealt with, was held at Roseau on March 20 last.

It was announced that a satisfactory arrangement had been entered into with the Royal Mail Company relative to retaining the coasting steamer 'Yare' at Dominica. A contract for five years had been made, in virtue of which the Government were to pay the Royal Mail Company £2,000 a year for three years, and £1,500 for the balance of the period, and the Company was to have the option of withdrawing the steamer at the end of three years.

The President said that the Secretary of the West India Committee had been good enough to make full enquiries in London concerning the packing of oranges for shipment, and had reported as follows: 'I have made enquiries at Covent Garden, and from the information which I have obtained, have no hesitation in saying that the standard Florida box is by far the most suitable package for Washington navel and other fine varieties of oranges. It was pointed out to me by one dealer that if it is too costly to import these boxes, or the material for their manufacture, it would be desirable to imitate them from local woods, or imported woods, as closely as possible. On the other hand, one important firm told me that it would pay shippers to import the American boxes, as the buyers take the packing very much into account. Given oranges of the same variety packed in slatted crates, and standard Florida boxes, the fruit in the latter would undoubtedly command the higher price.

A communication from Martinique was brought forward at the meeting, asking if seeds of the Para rubber tree (*Hevea brasiliensis*) could be purchased in Dominica. It was pointed out that the trees now in the island were not yet mature enough to yield seed, and that planters in Martinique must be recommended to obtain a supply from Ceylon

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, write as follows, under date of May 10, in reference to the sales of West Indian Sea Island cotton :—

Since our last report a good business has taken place in West Indian Sea Island cotton, and prices are very firm.

Upwards of 700 bales have been sold, including Antigua 13½*d.* to 14*d.*, Barbados 11½*d.* to 14*d.*, Barbuda 12*d.*, Montserrat, 12*d.* to 14*d.*, Nevis, 13*d.* to 13¾*d.*, St. Croix 10*d.* to 13½*d.*, St. Kitt's 11*d.* to 13½*d.*, St Vincent 16*d.*, Virgin Islands 13*d.*, and Tobago 17*d.*

COTTON GROWING AT TORTOLA.

The continuous advance in the output of cotton from Tortola would indicate that the small holders who form the main agricultural class in that colony find the crop a remunerative one, in spite of the low prices of the past two seasons.

Cotton planting at Tortola practically commenced in 1903, and the exports for the year 1903-4 were valued at no more than £35. The shipments of lint increased rapidly each year, however, and in 1907-8 reached 32,500 lb., worth about £1,800. For the year ended March 31, 1909, the cotton exports were 240 bales of 200 lb. each (48,000 lb.). Cotton seed is distributed free to the peasants from the Agricultural Department. In his report on agricultural work in the Virgin Islands for the month of April last, Mr. Fishlock reports that cotton picking for the season will soon be completed, and that the last day for purchasing cotton at the Experiment Station will be May 29.

Arrangements are being made to hold meetings of peasant holders in different parts of the Presidency, at which the Agricultural Instructor will give addresses on the chief points to be observed in connexion with cotton growing, and will urge upon the people the advisability of destroying all old cotton plants some time previous to planting the new crop.

COTTON AT MONTSERRAT.

Mr. W. Robson's report on agricultural work at Montserrat for the month of April last, contains the following notes in reference to the cotton industry :—

The rains of April greatly facilitated the preparation of cotton lands, which, on the larger estates, is well in advance. There does not seem, at present, to be much activity amongst the small growers in getting their lands ready. This applies especially to the south district. In the north a good deal of fresh land is cleared up, and interest in cotton in that part of the island is still very keen. The number of peasants planting cotton in the past season was 800, representing an area of about 520 acres. The amount of cotton purchased locally from them was 200,719 lb., having a value of £1,672.

On many large estates visited by me during the month almost all cotton plants were destroyed, and the larger portion of those on holdings belonging to small planters. The latter are very willing to have their old cotton destroyed, and I should say that by the end of May very few plants will be left.

The great scarcity of vegetables in the past season has been much felt by the labouring classes, and it seems likely that many of them will again turn their attention to food crops instead of cotton, in the coming season.

A quantity of cotton seeds have been imported from St. Kitt's for sale to small planters.

Nine of the 'Buco' hand cultivators have been imported for trial in cotton fields.

PULLING OLD COTTON PLANTS.

The Agricultural Instructor at St. Vincent reports that during the month of April he devoted the greater part of his time to work in connexion with the destruction of cotton stalks both on cotton estates and on the lands of small growers. The movement for the early destruction of old cotton plants is making progress, but, for various causes, it is still difficult to get many growers to act on the advice given.

At Argyle estate a very good method of destroying the cotton stalks is practised. Every alternate six rows of plants are first pulled up and left on the ground to dry. A few days later the rows that remain are pulled, and the dry and the green stems are burnt together.

It is observed that it would frequently be of advantage if the cotton plants were pulled immediately cotton picking is finished, instead of being allowed to remain on the land for many weeks afterwards. The Agricultural Superintendent states that experiments made at St. Vincent have shown that if the land was cleared early, and pigeon peas or some other leguminous crop, planted on the cotton banks and in the furrows, there would in many cases be as much as 10 tons of green dressing material available for turning into the soil when it is being prepared for replanting in cotton.

Under present conditions when the plants remain a considerable time in the field after picking has been finished, the bush and green material that grow up are generally collected and burnt with the cotton stalks, and valuable organic material is in this way wasted.

PRIZE-HOLDINGS SCHEME AT DOMINICA.

A cacao growing competition and prize-holdings scheme, that has been attended with very satisfactory and encouraging results, was held in the La Plaine and Grand Bay districts of Dominica in the year ended March 31 last. Mr. Joseph Jones, Curator of the Botanic Station, who visited the districts in question, and inspected the holdings entered for competition, has lately sent in a report on the working of the scheme, and its influence in stimulating the peasants to improve their methods of cultivation.

There were two classes in which holdings could be entered for competition, viz :—

(1) For holdings not over 4 acres, and not less than 1 acre of cacao in bearing ; and

(2) Holdings under 1 acre, but containing not less than 100 trees of cacao in bearing, these trees to be at proper distances apart.

In the Grand Bay district, ten plots entered in Class I, and six plots in Class II, while in La Plaine district there were seven entries, all of them being in Class II. In each district, a planter undertook the duties of local instructor, and gave advice and help to holders entering for the competition.

Mr. Jones' report bears testimony to the satisfactory results that have followed the establishment of this scheme. The following paragraphs may be quoted as showing the manner in which competitions of this nature are likely to influence the cultivation of peasant cacao :—

'The competing plots presented a good appearance in comparison with other cacao areas in the neighbourhood not entered for the competion.

'On the advice of the instructors, the bush had been cut down and the plots weeded ; suckers had been removed and the thinning of the upper branches carefully carried out. The pruning in nearly all cases was very well done, and the wounds in several instances were tarred over. The pods were being cut from the trees when ripe, and not—as is usually the case—torn or twisted off the trunk. In many of the plots inspected the natural drainage was good, but where drainage was necessary, very fair attempts had been made in this direction on the advice of the instructors.

'All the plots had a good mulch of leaves and the value of manure appears to be well understood, especially in the La Plaine district. It was pleasing to observe that the majority of the plots were properly provided with wind belts. The type of cacao grown is the Forastero, which is a very suitable variety for the conditions prevailing in Dominica. Very little disease was noticed in the cultivations. In one instance the brown rot disease of cacao pods was observed, and the chief cause—that of leaving broken cacao shells lying on the ground under the cacao trees—was pointed out.'

From the description contained in the report as to the character of the cacao on peasant-grown holdings in the La Plaine district, it appears that the advice and assistance of an Agricultural Instructor should prove very useful to these small cultivators during the early stages of development of their cacao orchards. The cacao trees at La Plaine were planted very closely, were not thinned, and have been allowed to sucker freely. As a result, the plots consist, in most cases, of tall trees, with very little lateral development, and such trees give very small return. There are very considerable areas of cacao in the above state, and it is important that some effort should be made to improve matters. Mr. Jones advises experimental treatment on the following lines : The plots should in the first instance be thinned ; any strong suckers growing from the base of the trees should then be selected at distances apart that will allow of the side branches becoming well developed. If these could be got to branch in the usual way when about 5 or 6 feet in height, their lateral development should be encouraged. As these develop, the old stems of cacao should be gradually removed. This should result in more profitable returns being obtained, provided regular care is given, and suckers are kept down.

The cacao cultivations in the Grand Bay districts are generally in better condition, the greater part being from ten to twelve years old. The area under peasant cacao in this district is estimated to amount to as much as 400 acres. Although, as mentioned, the plots in this district now appear satisfactory, yet there are already signs that the trees must be carefully thinned, all suckers kept down, and attention given to the development of side branches, if the plots are to be prevented from passing into the condition of those at La Plaine.

The peasantry, both at La Plaine and Grand Bay, appear to regard the inclusion of one or more breadfruit or breadnut trees in their small plots as necessary to cacao cultivation. The breadnut is preferred by many, probably on account of the fact that the fruit of the first-named tree, on falling, damages the branches of the cacao trees, while the breadnut fruit is softer, and no injury results if it strikes a cacao branch in falling. The value of these trees is probably due to their influence on the stiff soil, which they break up, aerate, and assist in draining, so that conditions are made more favourable for the cacao plant.

The cost of the prize-holdings competition last year for the two districts was £33 10s. The names of the prize-winners are as follows :—

GRAND BAY.

Class I.

First prize (£4) : John Thomas. Second prizes (£1 5s. each) : Augustine Darroux and Jean Lewis. Third prizes (10s. each) : John Lewis Angol, and Benjamin John Lewis.

Class II.

First prize (£2) : Jerimie Remi. Second prize (£1 5s.) : Ovan Henderon. Third prize (15s.) : Veney Douglas.

LA PLAINE.

Class II.

First prize (£2) : Alfred Lawrence. Second prize (£1 5s.) : Emile Lawrence. Third prize (15s.) : Sadoc Laronde.

In view of the encouraging and helpful results that have attended the scheme in the past year, and the interest that was aroused among small holders, the competition is to be repeated this year (1909-10) both at La Plaine and Grand Bay, and it promises to attract even wider and keener interest among peasant proprietors than was the case in 1908-9.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals briefly with the question of afforestation, which has of late attracted a considerable amount of attention in a number of countries.

The chief points in connexion with the developing cane sugar industry of Natal (which last year turned out 4,000 tons of sugar) are summarized on page 163.

Efforts are being made to extend lime planting both at Nevis and Tortola (page 164). On the same page is given a useful receipe for the preparation of grafting wax.

The question of water in the soil, and the important influence of soil moisture upon fertility, are discussed on page 165.

'Cotton Notes' include reports on market prices, and notes on points connected with the industry at Tortola, Montserrat, and St. Vincent (page 166).

A very interesting and successful cacao growing competition and prize-holdings scheme, held at Dominica in 1908-9, is reported upon on page 167.

Under 'Insect Notes' (page 170) appear two short articles dealing respectively with Warble Flies, and Mosquitos at St. Vincent.

An article containing interesting information on the subject of tree planting at Antigua, with notes on the species of trees suitable for timber that may be grown in the island will, be found on pp. 174-5.

Kerry Cows.

It is probable that the small settler in the West Indies would find in the Kerry cow a very useful breed of animal. The native home of the Kerry is in Ireland, of which country it is the only distinct breed of cattle. Kerry cows are small in size, an average cow weighing no more than 700 lb., while the average weight of a Jersey is about 850 lb., of an Ayrshire, 1,100 lb., and of a Shorthorn, 1,350 lb. The usual colour of the Kerry is black, with white streaks along the belly and udder, but they are sometimes black and white. This breed possesses short, thick, wiry hair, and long horns, set somewhat widely apart.

The great point in favour of the Kerry cow is that it is hardy and able to exist on the scantiest and roughest fare, and is nevertheless capable of giving excellent yields of milk. In Ireland and parts of England this breed is known as 'the poor man's cow.'

Free Nitrogen-fixing Bacteria.

In addition to the bacteria which live in the root nodules of leguminous plants, there are others living in a free state in the soil, which are capable of fixing free nitrogen from the air, and thus increasing the fertility of the land. Of these by far the most effective is a large organism to which the name *Azotobacter chroococcum* has been given. This bacterium, with its kindred forms, is very widely distributed in soils in all parts of the world. It is aerobic, and needs a sufficient supply of carbohydrate in the soil, since by the combustion of this material it obtains the energy requisite for nitrogen fixation. The fertility of such rich virgin soils as the Russian steppes and the wheat lands of Manitoba must be in large part attributed to the work of *Azotobacter chroococcum* and related bacteria. These organisms have been found to be present in West Indian soils, and possibly play a greater part in the fertility of these soils than has been supposed.

Nicaraguan Shade Tree.

The 'Nicaraguan Shade Tree' (*Gliricida maculata*) is frequently grown in cacao plantations for shade purposes. This tree is usually raised from seed, but a correspondent of the *Bulletin of Agricultural Information*, issued by the Trinidad Department of Agriculture, states that, as the result of experiment, he has found that *Gliricida maculata* grows much more quickly from cuttings than from seeds. Over 95 per cent. of cuttings, set out 12 feet apart, have grown successfully, and the plants flower and bear pods at the end of a few months.

By setting out cuttings in the way indicated, a suitable amount of shade for a young cacao plantation can soon be established. The tree needs topping to make it spread properly. Whenever the top branches of the shade trees reach the cacao, they can be cut back, and material is thus obtained which is useful for mulching purposes. The flowers of *Gliricida maculata*, analysed at the Trinidad Government Laboratory, were found to contain from 2·4 to 3·36 per cent. of nitrogen.

Eucalyptus Culture in California.

Bulletin 196 of the California Experiment Station gives the results of extensive observations on eucalyptus cultivation in that State. The importance of the different species of eucalyptus for timber, fuel, and oil production is discussed, together with the soil requirements, methods of treatment, and financial return that may be expected. Over sixty-five different species of eucalyptus are growing on the University of California Forestry Station grounds, of which eighteen are considered to be particularly useful from the commercial point of view. These receive special attention in the bulletin. Since several varieties of this tree have been planted in the West Indies, and one or two kinds have made very good growth, the data on the subject contained in this pamphlet may prove useful to those interested.

Fruit Trees on Grass Land.

When fruit trees are to be planted on grass land it is now generally recognized that care should be taken for the first few years, at least, to keep a ring around the young trees free from grass, and well cultivated or mulched. Otherwise the fruit trees make very slow growth during the early stages. This is due to the fact that a compact growth of grass makes very extensive demands on the supply of soil moisture, and hence young fruit trees, which, at the time of planting, are but indifferently supplied with water-collecting roots, are usually unable to obtain all the water they need if they have to compete with the extensive mass of fibrous roots possessed by the grass. Few crops so effectually dry the surface soil as grass does, and hence any plant growing in pasture land is likely to suffer so long as the two sets of roots are in the same layer. After the lapse of two or three years, when the root system of the trees has gained a more extensive range, the trees are not likely to suffer from the presence of grass.

Rubber Coagulation by Leaf Infusions.

Many chemical agents have been used for the coagulation of rubber latex, but it is worthy of note that two samples of Funtumia rubber which had been coagulated by adding an infusion of the leaves of a leguminous plant—*Bauhinia reticulata*—and which were sometime ago forwarded to the Imperial Institute, London, by the Agricultural Department of the Gold Coast, were reported upon as being very satisfactory in character, and valued at from 4*s.* to 4*s.* 3*d.* per lb., when fine, hard Para was worth 4*s.* 7*d.* per lb.

The infusion of the Bauhinia leaves is acid, and contains a considerable amount of tannin. It is believed that this tannin is the active coagulating agent, since other astringent materials are found to have a similar effect. This suggests that many other products might well be tried by rubber growers in the coagulation of latex. The pods of *Acacia arabica* have been found to answer the same purpose as the Bauhinia leaves. This method of coagulation obviates the necessity of applying heat directly to the latex.

Calcium Cyanamide or 'Nitrolim.'

The new nitrogenous fertilizer calcium cyanamide, or lime nitrogen, which is prepared from the atmosphere by the aid of a powerful electric furnace, has now been placed on the market under the name 'Nitrolim.' This manure is manufactured in different parts of the world by a number of companies, and the total output is at present estimated at about 150,000 tons per year.

'Nitrolim' is guaranteed to contain 20 per cent. of nitrogen—equal to 24½ per cent. of ammonia—together with a proportion of lime ranging to 40 per cent., about 18 per cent. of which is in the form of quicklime. The presence of the lime naturally adds considerably to the value of the manure on soils which are deficient in that element. 'Nitrolim' will be sold on the basis of the content of nitrogen, but in view of the source from which the nitrogen is derived, and the comparatively low cost of production, it is believed that it will be possible to sell the manure at a lower unit value than in the case of nitrate of soda or sulphate of ammonia, i.e. about £11 per ton—in England. A small quantity of 'Nitrolim' has lately been purchased by this Department for trial in the sugar-cane experiments in the Leeward Islands and at Barbados.

Agricultural Work at the Gold Coast.

The latest report on the Botanical and Agricultural Department of the Gold Coast has recently come to hand, and shows that much useful work is being done in that colony in introducing new kinds of cultivated plants, improved varieties of crops previously grown, and in the distribution of superior seed.

Four experiment stations now exist in the Gold Coast Colony, viz., the Aburi Botanic Gardens, and the Agricultural Stations at Tarkwa, Coomassie, and Asuantsi. The last was established in 1907.

Large quantities of seeds and plants were distributed from Aburi and Tarkwa in 1907, and in future years will be sent out from the other two stations as well. Plants and seeds of cacao and rubber are those which are in chief demand. Over 10,000 plants and 210,000 seeds of Forastero cacao were distributed from Aburi during the year, and 3,743 plants from Tarkwa. Of Funtumia rubber, 34,000 plants, and nearly 2½ million seeds were distributed, together with about 16,000 plants and 6,000 seeds of Hevea rubber.

Specimens of Funtumia rubber from the Gold Coast, prepared by different means, were favourably reported on at the Imperial Institute, London, and valued at prices varying from 4*s.* to 4*s.* 6*d.* per lb., at a time when fine, hard Para rubber was worth 4*s.* 7*d.* per lb. The value of 'biscuits' of rubber from *Landolphia owariensis* was placed at from 3*s.* to 3*s.* 3*d.* with fine, hard Para at 3*s.* 5½*d.* per lb. Other rubber trees under trial are the Ceara, Manihot, and Castilloa.

Propagation of cacao by grafting has been undertaken, and in 1907 over 100 stocks of Forastero were grafted with scions from *Theobroma pentagona.*

INSECT NOTES.

Warble Flies.

The Agricultural Superintendent at St. Lucia recently forwarded to the Head Office insects taken from the backs and flanks of the Ayrshire cows at the Agricultural School at Union. In the letter forwarded at the same time Mr. Moore states: 'I am of opinion that they are maggots of the Warble Fly. The cows arrived here from Canada last August, and the maggots are maturing now, so I conclude, as they are found only on the imported animals, that the eggs were in the cows on arrival. August to September is, I think, the egg season for this fly, and April is the season for the maturing of the maggots. We are trying to capture all the maggots by squeezing them out as soon as ripe enough. Each puncture is then dressed with a disinfectant to keep off the screw worm fly.'

Mr. Moore was correct in supposing the insects to be the warble fly, and that the cows were infected before their arrival in the colony. The ox warble flies belong to two very closely related species, *Hypoderma bovis* and *Hypoderma lineata*. Both species are widely distributed, and as they are alike in the general points of life-history, method of attack, and damage done, and as similar remedies may be used for their control, they can be dealt with in this paper under the common term of warble flies.

The female warble flies deposit their eggs on the hair of the shoulders, neck, and groins of cattle. The eggs or the newly hatched larvae are licked off and swallowed by the animal, and from the alimentary canal the maggots make their way to the subcutaneous tissue along the back.

Several months elapse from the time when the animal swallows the insect before the latter arrives at its destination in the back of its host.

Here development is rapid, and after some weeks the larvae make their way out through the skin of the animal, and fall to the ground. The larvae seek a suitable place, and enter the ground, where they pupate at a depth of from 1 to 2 inches below the surface. About a month later the adult flies emerge and mate, and the females immediately set about the business of egg-laying.

The usual time for the appearance of the adult warble flies in America is during the summer months, when the eggs are deposited, and the young larvae are taken into the mouth of the cattle not later than October. In January small swellings begin to appear along the back, and by April or May the swellings are large, and the full grown larvae are ready to leave the animals and enter the ground to pupate.

PREVENTION AND REMEDIES.

When the warble flies are very abundant they may be prevented from laying eggs on the cattle, by coating the necks and backs of the animals each week during the egg-laying period with a repellant mixture. The following is recommended:—

Sulphur, 4 oz.
Spirits of tar, 1 gill.
Whale oil, 1 quart.

It is stated that the warble flies will not fly over water, nor follow cattle into deep shade for the purpose of egg-laying, so that the attacks of these pests are liable to be less where cattle have access to deep-shade, and ponds of water in which they can wade.

When the swellings on the backs of the animals are first seen, as in January, a very light rubbing with kerosene will kill the grubs. This is due to the fact that the kerosene enters the small holes in the skin of the cattle through which the insect breathes. Later in the year, March or April, any larvae which are still to be found in the back of the animals should be squeezed out and destroyed.

Mosquitos at St. Vincent.

Mr. W. N. Sands, Agricultural Superintendent of St. Vincent, has sent in the accompanying notes in reference to the various species of mosquitos that are found in the island:—

The following mosquitos are known to occur in St. Vincent, and Dr. C. W. Branch, M.B., C.M., who is making a systematic study of them, has kindly supplied me with their names:

1. The common malaria-carrying mosquito *Cellia* (Anopheles) *argyrotarsis*.
2. Wild pine mosquito, *Wyeomyia* sp.
3. Yellow fever mosquito, *Stegomyia calopus* (fasciata).
4. Steel-blue bush mosquito, *Haemagogus* sp.
5. Filaria mosquito, *Culex fatigans*.
6. Crab-hole mosquito, *Deinocerites* sp.

A study of the habits of the two first mentioned has brought to light the one or two interesting points I now wish to record.

For some time past a small, and nearly black mosquito had been commonly observed at the Botanic Gardens, where it attacked us most persistently, and it was also seen feeding on domestic animals. After searching likely places without result, I examined various plants which were so modified as to hold water, and at last found larvae in abundance in water which had collected at the bases of the leaves of the so-called 'Wild Pines.' These epiphytic bromeliads occur in large numbers on various trees, and belong to various species of *Pitcairnia*, *Aechmea*, and *Tillandsia*. Nearly every plant with water that I examined contained larvae—even those brought down from a height of 30 to 40 feet.

Only this one species of mosquito has so far been found in these 'Wild Pines.' Although it is not known as a carrier of disease, still it might be, and it is obvious that to avoid annoyance it is desirable to destroy the plants in which they breed. This is now being done in Kingstown, the Botanic Gardens, and other places.

The Entomologist has supplied the following note for addition to the above:—

In addition to the species given by Dr. Branch there are several other mosquitos listed in Theobald's *Monograph on the Culicidae of the World* as occurring in St. Vincent. Theobald's list is as follows:—

Megarhinus-portoricensis	*Culex scolasticus*
Aedes perturbans	*Deinocerites Cancer*
Cellia argyrotarsis	*Haemogogus Cyanens*
Cellia albipes	*Stegomyia fasciata*
Culex palus	*Uranotarnia Lowii*

From a comparison of these lists it will be seen that there are apparently six species known in addition to the six given in Dr. Branch's list. With so many kinds of mosquitos existing in a small island it is certainly worth while to take all possible precaution against them. Only a few are known to be carriers of disease, but they are all pretty sure to be annoying, and some of them may later be proved to have a relation to the spread of disease not at present suspected.

MILKING A GOAT.

The accompanying notes dealing with points to be observed in connexion with the operation of milking goats, appeared in *Farm Life* of April 17 last:—

Milking a goat is not a difficult operation by any means, although it is much easier in the case of some animals than of others. It is easiest with those goats that have nicely pointed teats of a size readily grasped by the hand.

There is a certain knack in the process which is soon gained after a few days' practice. It consists in causing pressure on the teat by each of the fingers alternately from the first to the little finger, but in such rapid succession that the pressure is almost simultaneous. At the same time the hand draws down the teat, pushing the latter again up towards the udder as the stream is reduced, in order to encourage a fresh flow. Both hands should be used, each working alternately.

The great point is to draw off all the milk contained in the udder at each 'meal,' as it is termed, because if any is left behind, the yield tends to fall off, and a less quantity is drawn on the following occasion. This being repeated often, the animal soon goes dry.

To ensure a thorough extraction of all the milk in the udder, the latter should, when the flow ceases, be worked about in the hand, and the teat pushed rather violently up into it, in imitation of the action of the head of the kid, when it does not find enough milk present. This often results in adding another quarter-pint, or even half-pint, to the pail.

PROTECTION OF COWS FROM FLIES.

Flies are frequently a source of great annoyance to cattle, including milking cows, and the opinion is generally held that in such cases the worry entailed on the animals results in a loss of weight, or—in the case of cows—in a diminution of the milk yield. In the United States and Canada during the hot seasons various contrivances have been adopted with the object of protecting the animals from attack by flies, and the best means of doing this is to wash over the coats of the cattle with a mixture containing some material which is repellant to the worrying insects.

At the Kansas Experiment Station several mixtures have been tried for this purpose, the best results being given by a preparation consisting of 1½ lb. of resin, 2 cakes of laundry soap, ½-pint of fish oil, and enough water to make the whole up to 3 gallons. This mixture was either applied with a brush or sprayed over the animal. In the latter case ½-pint of kerosene oil may be added with the other ingredients. The cost of the mixture is not more than 7c. or 8c. per gallon, and ½-pint is considered enough for a single application to each cow. It was found that at first two or three applications per week were necessary, but later on treatment need not be given so often, since the tips of hair become coated with resin.

At the Missouri Experiment Station a patent preparation for protecting cows from the worrying attacks of flies was tried for some time. It is reported that the chief observed result was that the cows stood more quietly during milking.

Observations made at the Virginian Experiment Station indicated that during the season when flies were most prevalent, the milk yields of the cows fell off by as much as from 25 to 50 per cent. Various mixtures for repelling the flies were tried without avail, but success was obtained when an emulsion of kerosene oil was employed. The emulsion consisted of ½-lb. yellow soap, 1 gallon soft water, and 2 gallons kerosene oil, to which was finally added a second gallon of water. This formed the stock solution, which was diluted just before using by adding 1 part to 5 parts of water. The mixture was applied to the animals daily, by means of a spray pump. It was found that 15 gallons of the diluted solution was sufficient for one treatment of 100 cattle.

PROPOSED FARM SCHOOL AT JAMAICA.

Distinct advances in the provision of facilities for agricultural instruction have been made in the British West Indies of recent years, and practically every colony has benefited thereby. At Jamaica up to the present there have been three distinct agencies for giving instruction in different branches of agricultural work to young men in the island. These are the Industrial School, the scheme of apprenticeship at the Botanic Gardens, and an agricultural course at the Government Laboratory. It has been thought, however, that the present condition of affairs can be improved upon, and in his speech at the opening of the Legislative Council in March last, the Governor of Jamaica brought forward a scheme under which the disconnected efforts at present in operation shall be abolished, and a Farm School established.

The object of this proposed Farm School will be to give young men, and youths over fifteen years of age, a sound knowledge of the elementary principles of agricultural science, and as complete a training as possible in all branches of practical tropical agriculture, the management of live stock, dairying, farriery, carpentry, veterinary work, etc.

To quote from the Governor's speech: 'It is not intended to give an elaborate scientific course, but to aim at the training of a body of young men competent to take up practical work and supervision on small or large cultivations, with some sound foundation of general knowledge and practical training. It is not proposed to offer free scholarships, but to make a uniform charge of £15 per year for each pupil, to cover the cost of board and lodging at the Farm School.'

The capital outlay required for starting the school has been estimated at £2,000. It is also calculated that the cost of upkeep each year will amount to £1,473 16*s*. Against this latter sum, however, can be set off £1,038, which represents savings that will be effected by the abolition of present establishments, together with students' fees, sales of produce, and rents. The net annual cost of the school proposed by Sir Sydney Olivier, therefore, would be only £390 in excess of the appropriations at present made for the existing establishments.

In view of the scope and variety of the agricultural industries of Jamaica, and the advantages that would accrue from having a good number of young men trained in up-to-date methods of cultivation, and preparation of produce for export, the establishment of a school such as that suggested should be a real boon to the island.

GLEANINGS.

The Tobago correspondent of the *West India Committee Circular* draws attention to the fact that a more plentiful and better supply of latex is yielded by Castilloa rubber trees in periods of dry weather than during the rainy season.

During the month of April last, 100 lb. of Barbuda beans, 50 lb. of woolly pyrol, 15 lb. of broom corn, and 11 packets of miscellaneous seeds were sent out from the Antigua Botanic Station.

Arrangements have been made at Nevis by the Agricultural Department to supply cotton growers in the island with the best locally raised cotton seed selected and disinfected, at 1*d*. per lb.

With the object of encouraging the production of fruit of better quality for market purposes, the Trinidad Department of Agriculture is offering grafted mango plants for sale at 25c. each. Plants are only sold at this low figure, however, for cultivation within the colony.

Mr. Robson, Curator of the Montserrat Botanic Station, reports that planters in the island are tending to grow green dressing crops on an increased scale. At present Bengal beans are in great demand, and on one estate several acres of growing limes have been planted through with horse beans.

The seeds and plants distributed from the Montserrat Botanic Station for the quarter ending March 31 last, include 530 cacao plants, 583 sugar-cane cuttings, 125 Longfoot cabbage, 115 bay plants, 900 ornamental cuttings and plants, 12 lb. cowpeas, and 4 lb. horse beans.

The cultivation of coco-nuts is evidently attracting increasing attention in British Guiana. While the area under this crop in 1907-8 was 6,828 acres, it reached 8,315 acres in 1908-9. The cacao area has also increased from 1,832 to 2,181 acres, and that under coffee from 1,097 to 1,431 acres.

As many as thirty-six varieties of cassava are under cultivation at the Experiment Station, Tortola. Mr. Fishlock reports that some 200 pods were recently gathered from the cacao trees at the station, and that the trees are in fair condition.

The exports of rice from British Guiana from January 1 to April 28 last were 2,789,352 lb., as compared with 3,642,279 lb. shipped in the corresponding period last year. The distribution this year has been as follows: British West Indies, 2,689,342 lb.; French Guiana, 56,550 lb.; and Germany, 43,460 lb.

Ecuador exports a considerable quantity of vegetable ivory nuts—the product of the palm *Phytelephas macrocarpa*. The average annual production is about 48,000,000 lb., all of which is exported. The vegetable ivory is used as a substitute for the more costly genuine article in the manufacture of buttons, etc. (*U. S. Consular Report.*)

'Gum disease' is very common in plantations of citrus fruits in California. A pamphlet (*Bulletin No. 200*) has lately been issued by the Experiment Station, Berkeley, which deals in a thorough manner with the causes and methods of control of this disease. The pamphlet is well illustrated.

The report for 1907-8 of the Forest Officer for Trinidad has lately been issued. It is stated that good progress has been made with the demarcation of forest reserves during the year, an additional 36½ miles having been marked off. The receipts from the sale of timber and other forest produce in 1907-8 were £1,472, or an increase of £66 on the average of the past fifteen years.

The Agricultural Instructor at Nevis reports that fairly good returns are being obtained this season from the sugar-cane crop in the island. In most districts the average yield of sugar is about 1½ tons per acre, some areas giving slightly more. These results are due to the favourable rains which occurred from November to February last. The canes were planted late, and growth had not stopped when the rains came on.

Bulletin 344 of the Bureau of Entomology, U. S. Department of Agriculture, deals—from the farmer's standpoint—with the cotton boll weevil, which does so much damage in the United States each year. The loss caused by the weevil, since it invaded the United States, is estimated at $125,000,000. It is a matter for congratulation that this pest has not appeared in the West Indies.

Shea butter nuts, the produce of *Butyrospermum Parkii*, grow very extensively in many parts of Northern Nigeria, and with the development of better facilities for transport a flourishing trade in this article is likely to grow up. The percentage of fat in the nuts varies from 40 to 55. This fat is suitable for candle and soap manufacture, and at the Imperial Institute it has been valued at £27 to £27 10*s*. per ton, or about the same as soft palm oil. (*Annual Report, 1907-8.*)

An article in the *Mirror*, published at Port-of-Spain, gives particulars as to the extent of the operations carried on at the Usine St. Madeleine, Trinidad. The factory mills the canes from seven estates, and the area covered by the crop for the present year, which began in January, was about 6,000 acres. About 1,800 tons of canes can be crushed per day, and this year it has needed about 13 tons of cane to yield a ton of sugar. From this it will be seen that the factory turns out approximately 1,000 tons of sugar per week. The estimated output from estate-grown cane this year is expected to reach 14,000 tons of sugar. Peasant-grown canes are also bought in large amount, the quantity purchased last year being 31,900 tons.

STUDENTS' CORNER.

JUNE.

1st Fortnight.

Seasonal Notes.

When sugar-canes are being reaped, students should note the effect of the lady-bird borer (*Spenophorus sericeus*), and how the fibrous cocoons are formed. So far as possible the life-history of this insect should be studied. Search should also be made for the root borer (*Diaprepes abbreviatus*). On the leaves of the young canes, too, may be seen the cane fly (*Delphax saccharivora*). Students should search for the insect enemies of all the above pests.

Note in detail the various operations connected with the manufacture of sugar. In the factory and boiling house observations should be made of the quality of the juice, and where possible its analytical composition should be studied. The milling qualities of the different varieties of cane form a point that should be noted by the student, and the characteristics of the juice yielded by the different kinds, as regards its saccharine richness, and sugar-making qualities, should also be known.

Fields to be planted in cotton in the coming season will now be ploughed or forked, and in many districts cotton will be planted with the first rains in May or June. Make a point of visiting different estates, and inspecting the methods adopted in preparing land for planting. Note how different manures are applied, and how green dressing plants are dealt with.

In cacao districts students will note the manner of dealing with the land under cacao trees. The months of April, May, and June form a suitable period for manuring cacao. Mulches of pen manure, bush, and fallen leaves should be distributed around the trees to keep the ground cool in the dry season, while special manures should be applied when the first light rains come on.

Look out for lime trees with yellow leaves, and try to ascertain the cause. Observe if any insects are present, and if so, what kinds. Note the condition of the subsoil, and ascertain if the roots are healthy.

In Montserrat, and any other districts where bay trees are grown, distillation of bay oil will be in progress, or be completed by now. The dry months are preferred for this work.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is sulphate of ammonia? What is nitrate of soda? Of what use are these as manures?

(2) Describe the structure (*a*) of a bean seed and (*b*) of a grain of maize.

(3) How do you ascertain the germinating power of seeds? What percentage of germination do you expect a good sample of cotton seed to show?

INTERMEDIATE QUESTIONS.

(1) Write a brief account of the life-history of the moth borer. How does this pest damage the canes, and what means should the planter employ to keep it in check?

(2) Draw a diagram showing the principal bones in the hind leg of a horse, together with the principal muscles and their attachments. Briefly explain the mechanism of the movements of the limb.

(3) Ascertain as far as possible the relative proportions of water lost by evaporation from soils lying fallow, and from those bearing the chief agricultural crops.

PRIZE-HOLDINGS COMPETITION AT GRENADA.

The Acting Agricultural Superintendent at Grenada reports that adjudications have lately been made in the prize-holdings competition held in the past year in the parishes of St. Patrick and St. David. Meetings were held in each parish at which the prizes were distributed, and Mr. Branch gave short addresses on agricultural matters. A competition among small holders is also in progress in the parish of St. John.

Mr. Branch, in his latest report, comments on the improvement that took place during the season on the holdings entered for the competition. This was particularly noticeable in the parish of St. David's, where the competing holdings were in especially good condition.

At the last meeting of the Grenada Agricultural Society it was proposed to approach the Government with a request to give a grant sufficient to cover the amount required for the purpose of arranging a prize-holdings competition in all the parishes of the island simultaneously.

COWPEAS IN AUSTRALIA.

Cowpeas have been under experimental trial in the Australian colony of Victoria, and the Victorian *Journal of Agriculture* lately contained a report on the results achieved. For green manure and for fodder purposes, it is stated that the crop has proved itself of great value. The cowpeas are drought-resisting, and did fairly well in the dry season that was experienced in 1907-8. When irrigation water was supplied an excellent crop was produced.

The four varieties of cowpeas under cultivation were 'New Era,' 'Iron,' 'Wonderful,' and 'Whip-poor-Will.' There were two kinds of seed of the 'Iron' variety, one being white and the other red. These two kinds were sown separately.

All the peas were sown on October 18, and they produced ripened seed in periods ranging from 106 to 139 days. The plants raised from the white seeds of the 'Iron' variety were the first to yield ripened seed, which was produced at the end of 106 days. Then followed in order 'New Era' (112 days), 'Red Iron' (115 days), 'Wonderful' (115 days), and 'Whip-Poor-Will' (139 days). The heaviest gatherings of pods were obtained during the third and fourth weeks in March, and the first week in April. The plants were ploughed into the soil about the middle of April.

The 'White Iron' and 'Red Iron' varieties are similar in growth and yield, the plants are about 20 inches high, the seeds ripen early, and pods are borne in succession for three months or so. The pods are about 7 inches long.

'New Era,' the second earliest variety, is a low-growing slender bush with delicate foliage. The pods and seeds are somewhat smaller than in the case of the 'Iron' cowpea.

'Wonderful' is a cowpea of vigorous and robust growth, possessing strong branches and large leaves. The plants are about 14 inches high, and cover the ground quickly. The pods are some 8 inches in length, and contain from twelve to eighteen medium-sized peas.

'Whip-Poor-Will' was the variety which ripened latest in these experiments. This is a plant strong in growth, with an abundance of large foliage. The plants grew to a height of 18 inches, with numerous and spreading branches. The pods are fleshy, about 9 inches long, and contain a good number of large peas.

TREE PLANTING AT ANTIGUA.

Compared with many other of the West Indian islands, Antigua is singularly destitute of woodland, or even of small groves of trees. This lack of suitable vegetation tends to give the hillsides and waste places a somewhat barren appearance, and the lack of shelter that would be provided by extensive wooded areas increases the tendency of the island to suffer from drought. Tree planting on a large scale would not only improve the appearance of the landscape, and provide a source of timber and fuel, but would also be of advantage in providing shelter belts of woodland, and have a certain amount of influence in modifying the dryness of the atmospheric conditions, and economising the water supply by reducing evaporation.

Some efforts in this direction have been made by the Agricultural Department, and two afforestation plots have been started in the neighbourhood of the Botanic Station. One is situated to the north of the Station, and is about 1½ acres in extent. The second plot is to the east of the station, and about ¼-mile distant. It is some 2½ acres in area.

The plots were established in 1902; the soil is poor in both, and they are fully exposed to the prevailing trade winds. They had received very little cultivation at the time of planting, and are similar in character to the bare hillsides in the island, so that from the progress which the trees have made, some deductions can be drawn as to the results which would probably follow tree planting on other waste spots.

The plot situated to the north of the Botanic Station has made the best growth, and the shelter that it at present affords to the Station has had a markedly beneficial effect. In the year 1907-8, the growth of the trees in the plot to the east of the Botanic Station showed marked improvement. It would appear, however, that it is advisable, in planting trees on land where the soil is poor and the situation exposed, to give a greater amount of cultivation during the first years of their growth than was given to the two plots attached to the Botanic Station. The results so far attained also indicate that expenditure, within reasonable limits, on starting woodlands in bare districts of these islands will, in course of time, be amply repaid, in view of the advantages to be derived from their establishment.

In 1905, two wind-breaks of forest trees were planted to the north-east and south-east of the Antigua Botanic Station. These have made good growth, and now afford considerable shelter to the gardens.

The efforts that have been made on Arbor Day in each year to encourage an interest in planting out young trees, on the part of all classes of the community have also had good effect. In this way large numbers of young trees have been planted in the Victoria Park, and at other spots in and around the town.

The example which has thus been set would appear to have encouraged a considerable amount of interest in tree planting at Antigua, and numerous enquiries are received at the Botanic Station on the subject. Mr. Thomas Jackson, Curator of the Station, has lately sent in some interesting and useful notes on the matter, the points of which are here reproduced:—

It is likely that the planting of trees suitable for timber purposes will receive more attention at Antigua in the future than it has done in the past. There is naturally, a good local demand for timber, and the construction of 18 miles of railway, involving the utilization of a large quantity of timber for sleeper purposes, will naturally increase this demand. At present the amount of timber grown at Antigua is very small, but efforts are already in progress which indicate that the home supply will in time tend to increase.

In the West Indies, as in other countries, the great drawback to any scheme of afforestation is the length of time that must elapse before any return can be obtained. This difficulty is inevitable at the start, however, and a certain number of years must necessarily elapse before an area of newly planted woodland returns the outlay that has been expended upon it, and becomes self-supporting.

In view of this fact, it becomes a matter of chief importance, when any scheme of tree planting is to be carried out, to choose those species for planting which are likely to give an early return, and to be in good demand for special purposes.

In his paper, Mr. Jackson enumerates a list of trees which might be expected to do well at Antigua. Special reference is made to the species *Eucalyptus rostrata*, or 'Red Gum.' This grows satisfactorily even under somewhat unfavourable conditions At the Botanic Station there is a sample of this species, which, although no more than seven or eight years old, and growing in poor, shallow soil has a height of 35 feet, and a circumference of 3 feet 8 inches at 10 feet from the ground. Although the trunk of this specimen divides into four at about 12 feet from the ground, each stem possesses serviceable timber. *Eucalyptus rostrata* is well known as a particularly hardy species, and thrives well under a fairly wide range of conditions. It stands drought well. The wood of the tree is durable both in the air, and when buried in the soil. Pieces of 'Red Gum' timber which have been under the soil for two years at the Antigua Botanic Station are still in an excellent state of preservation. In colour the wood varies from light red to very dark red. If rapid growth and good quality of timber are required, *E. rostrata* can be recommended.

Other species of Eucalyptus, which are suitable for planting in parts of the tropics, and yield useful timber, are *E. citriodora*, *E. corymbosa*, *E. tereticornis*, *E. cornuta*, *E. crebra*, and *E. microtheca*.

At the Antigua Botanic Station there exist, in addition to *E. rostrata*, specimens of *E. citriodora* and *E. cornuta*. Both of these have an erect growth. The wood of the former makes a useful timber; it has a close grain and splits readily. *E. cornuta* stands drought well. Its wood is tough, hard, and elastic.

Estate owners and others who may think of planting up waste lands, or at least of increasing the number of trees on their estates, may usefully make selections from the following list of timber trees:—

Lignum-vitae (*Guaiacum officinale*). A slow-growing tree yielding wood which is exceedingly dense, hard, heavy, and tough. This is extremely useful for a variety of turnery purposes.

Galba (*Calophyllum Calaba*). A tall and somewhat quick-growing tree, which reaches a diameter of 4 or 5 feet. The wood is durable, and is suitable for mill rollers, frames, and for shingles, etc. It bears exposure well.

Mammee apple (*Mammea americana*). This tree reaches 40 to 60 feet high, and yields durable timber that is adapted for use in exposed situations. The mammee apple tree is not common at Antigua, and it is probable that it would not grow well in the drier parts of the island.

The 'red mangrove' (*Rhizophora Mangle*) and the 'black mangrove' (*Avicennia nitida*) both grow in swamps, and the wood in each case is valuable for piles, posts, etc.

White cedar (*Tecoma leucoxylon*). This tree is common at Antigua. The wood is used largely in house-building, and is valuable for piles, posts, and in making shingles.

Logwood (*Haematoxylon campechianum*). This tree, which seldom reaches more than 20 feet high, is also common at Antigua. A very serviceable hedge is formed by setting out the young plants closely in rows. The wood is hard and suitable for posts, and cabinet work. It is also of considerable value as a dye-wood.

Cashaw (*Prosopis juliflora*). The cashaw grows to as much as 30 feet in height, but its diameter is seldom more than 1 foot. The timber is very strong and durable, suitable for railway sleepers, fence posts, etc. The pods of the cashaw, when dry, form a good article of fodder, and are greedily eaten by stock of all kinds. The wood also makes excellent fuel.

Bastard mahogany, walnut or angelin (*Andira inermis*). A large and handsome tree, somewhat common in the southern part of Antigua. It is of erect growth, and with a trunk from 1 to 2 feet in diameter. The wood is strong and hard, lasts well in water, and is suitable for turnery purposes.

Woman's tongue (*Albizzia Lebbek*). The wood of this tree is fairly durable, and polishes well. It is used in making furniture, boat building, and for general purposes.

Red cedar (*Cedrela odorata*). On good soil this tree frequently attains a height of from 40 to 60 feet, with a trunk diameter of from 3 to 4 feet. It is quick-growing, the wood being open-grained, but soft and porous. Cedar wood is in request for furniture making, especially wardrobes, shingles, interior house-work, etc. The drier parts of Antigua would perhaps be unsuitable for this tree.

Casuarina equisetifolia. The Casuarina is a straight and quick-growing tree, which yields good timber, that is found especially useful in making cattle yokes.

Locust (*Hymenaea Courbaril*). This tree has a trunk which reaches up to 5 feet in diameter. The wood is tough and somewhat resembles mahogany, but is harder. It is used for cabinet and furniture work. It is liable to rot in the ground.

White-wood (*Terminalia Buceras*). The White-wood is a large tree that yields timber which is useful for a variety of purposes. This is one of the best woods for shingles. It is very durable in water.

Other trees suitable for planting in Antigua, and which yield wood of value, are the following:—

Mahogany (*Swietenia Mahagoni*), Sapodilla (*Achras Sapota*), Star apple (*Chrysophyllum Cainito*), Almond (*Terminalia Catappa*), Torch wood (*Tecoma stans*), and the sea-side grape (*Coccoloba uvifera*), which grows on indifferent lands near the sea-shore.

It may also be added that the wood of the mango and acacia makes excellent fuel.

Forests and Soil Temperature. Reference was made in the last issue of this journal to the relationship between woodlands and water supply. It may also be pointed out that forests exercise a considerable influence on soil temperature. The observations of a number of European forest stations show that woods of various species and ages depressed the mean annual temperature at the surface of the ground by about 2·6°F.

RICE IN BRITISH GUIANA.

Messrs. Sandbach, Parker & Co's. fortnightly report, dated May 14 last, gives the following informatiom in regard to present conditions and outlook of the British Guiana rice industry:—

The weather during the past fortnight has continued favourable for milling, and deliveries to town have been large. Several holders have displayed anxiety to sell, with the result that the market has weakened, and sales are being effected at from \$4·30 to \$4·40 per bag of 180 lb. net. Stocks are not very large, however, and we fully expect to see better prices later on in the year. The importation of cheap grades of 'Nagra' and 'Saigon' [East Indian] rice into the markets of the West Indian islands has undoubtedly affected the sales of the Demerara product, and is largely responsible for the present decline in price.

Shipments to the West Indian islands during the fortnight amount to about 3,000 bags, principally for Barbados and Trinidad.

Prices for Demerara rice of good export quality, at date of report, are—per bag of 180 lb. gross, 17*s*. 10½*d*. to 18*s*. 10½*d*.; and per bag of 164 lb. gross, 16*s*. 4½*d*. to 17*s*. 4½*d*.

AGRICULTURAL PRODUCTS OF ECUADOR.

The United States Consul at Guayaquil lately reported as follows on the agricultural products of Ecuador:—

Cacao, which is the principal product of Ecuador, is harvested or gathered during the months of February, March, April, and May. A small amount of cacao is gathered and brought to market during every month of the year, but it is safe to say that at least three-fourths of this crop is gathered during the months mentioned, and by the end of June or July has already been placed on the market. During the year 1907, 43,348,369 lb. of cacao were exported from Ecuador, of which 7,653,756 lb. were sent to the United States.

The rice crop is principally harvested during the month of May, and is generally placed on the market during the months of June and July. The estimated annual production is 40,000,000 lb., which is not quite sufficient to supply the home demand. A small quantity is imported every year from various countries.

The growing of sugar-cane is of considerable importance in this country. The cane is cut and taken to the plantation mill during the months of July, August, September, October and November. Some plantations work up to the middle of December to finish gathering the crop. Approximately, the various plantations in Ecuador produce 160,000 bags (of 100 lb.) of sugar annually, which is about equal to the home consumption, although a small amount of sugar is imported and exported every year.

The crop of coffee raised in this country is almost completely gathered during the months of August and September, and as soon as possible is placed upon the market. No statistics are to be had showing the annual production, but it is estimated to be about 7,000,000 lb. During the year 1907, 2,515,368 lb. of coffee were exported from Ecuador, of which only 72,989 lb. were sent to the United States.

Rubber is gathered and brought to market during all the months of the year. The amount of rubber exported from Ecuador in 1907 was 1,031,510 lb., of which 816,684 lb. were sent to the United States.

MARKET REPORTS.

London,—May 11, 1909. THE WEST INDIA COMMITTEE CIRCULAR; Messrs. E. A. DE PASS & Co., April 30, 1909.

ARROWROOT—St. Vincent, 1⅞*d.* to 3¾*d.* according to quality.
BALATA—Sheet, 2/4; block, 1/8½.
BEES'-WAX—£7 10*s.* to £7 12*s.* 6*d.* for dark to pale.
CACAO—Trinidad, 56/6 to 70/- per cwt.; Grenada, 50/- to 56/- per cwt.
COFFEE—Santos, 32/4½ per cwt.; Jamaica, no quotations.
COPRA—West Indian, £19 10*s.* per ton.
COTTON—Nevis, 13*d.* to 13¾*d.*; Barbados, 11½*d.* to 14*d* St. Vincent, 16*d.*; and Antigua, 13½*d.* to 14*d.*
FRUIT—
  BANANAS—Jamaica, 4/6 to 9/- per bunch.
  LIMES—Not wanted.
  PINE-APPLES—St. Michael, 1/6 to 4/-.
  GRAPE FRUIT—5/6 to 9/- per box.
  ORANGES—Jamaica, 6/- to 9/- per box.
FUSTIC—£3 to £4 per ton.
GINGER—58*s.* 6*d.* to 59*s.* for middling bright.
HONEY—23*s.* to 33*s.* 6*d.* per cwt.
ISINGLASS—West India lump, 2/2 to 2/6 per lb.
LIME JUICE—Raw, 1/- to 1/3 per gallon; concentrated, £18 per cask of 108 gallons; distilled oil, 1/10 to 1/11 per lb.; hand-pressed, 5/- to 5/6 per lb.
LOGWOOD—£3 to £4 5*s.* per ton; roots, no quotations.
MACE—Firm.
NUTMEGS—Steady.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5*s.* 3*d.* per lb.
RUM—Jamaica, 3/- to 7/6; Demerara, 1/6 to 1/6½, proof.
SUGAR—Crystals, 15/6 to 16/-, Muscovado, 15/- to 16/-; Syrup, Trinidad, 11/-; Molasses, no quotations.

New York,— April 30, 1909.—Messrs. GILLESPIE, BROS. & Co.

CACAO—Caracas, 12½c. to 14c.; Grenada, 13c. to 13½c.; Trinidad, 13c. to 13½c.; Jamaica, 10½c. to 12c. per lb.
COCOA-NUTS—Jamaica, select, \$22·00 to \$24·00; culls, \$14·00 to \$15·00; Trinidad, select, \$21·00 to \$23·00; culls, \$13·00 to \$14·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8¼c.; good ordinary, 8½c. to 9c.
GINGER—9½c. to 10¾c. per lb.
GOAT SKINS—Jamaica, no quotations; Antigua and Barbados, 50c.; St. Thomas, St. Croix, St. Kitt's, 45c. to 48c. per lb., dry flint.
GRAPE FRUIT—Jamaica, \$4·00 to \$5·00 per barrel.
LIMES—Dominica, \$5·00 to \$6·00 per barrel.
MACE—35c. to 40c. per lb.
NUTMEGS—110's, 10c. per lb.
ORANGES—Jamaica, \$1·75 to \$2·25 per box, \$2·75 to \$4·00 per barrel.
PIMENTO—4¼c. per lb.
SUGAR—Centrifugals, 96°, 3·92c.; Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., May 22, 1909; Messrs. T. S. GARRAWAY & Co., May 25, 1909.

ARROWROOT—St. Vincent, \$4·00 per 100 lb.
CACAO—\$12·00 per 100 lb., in demand.
COCOA-NUTS—\$12·00 for unhusked nuts.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb.
HAY—\$1·15 to \$1·25 per 100 lb.
MANURES—Nitrate of soda, \$62·00 to \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$72·00 to \$75·00; Sulphate of potash, \$67·00 per ton.
MOLASSES—Fancy, 16c.; Grocery, 18c. per gallon.
ONIONS—Strings, \$3·00 per 100 lb.; Bermuda, \$1·50.
POTATOS—\$2·60 to \$2·75 per 160 lb.
PEAS—Split, \$5·75 per bag of 210 lb.; Canada, \$3·40 per bag of 120 lb.
RICE—Ballam, \$5·00 to \$5·20 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
SUGAR—Dark Crystals, 96° \$2·15; Muscovado, 89° \$1·85; Centrifugals, \$2·10 to \$2·30.

British Guiana,—Messrs. WIETING & RICHTER, May 15, 1909; Messrs. SANDBACH, PARKER & Co., May 14, 1909.

ARROWROOT—St. Vincent, \$9·00 to \$9·50 per 200 lb.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
CACAO—Native, 13c. to 14c. per lb.
CASSAVA—50c. to 60c.
CASSAVA STARCH—\$5·00 per barrel of 196 lb.
COCOA-NUTS—\$16·00 per M.
COFFEE—Creole, 12c. to 13c.; Jamaica, 13½c. per lb., slow.
DHAL—\$4·50 to \$4·70 per bag of 168 lb.
EDDOS—\$1·08 per barrel.
MOLASSES—Yellow, 23c. to 24c.
ONIONS—Teneriffe, 4c. per lb.
PLANTAINS—16c. to 36c. per bunch.
POTATOS—Nova Scotia, \$3·00 per 100 lb.
POTATOS—Sweet, Barbados, 96c. per bag.
RICE—Ballam, \$5·50; Creole, \$4·40 to \$4·50.
SPLIT PEAS—\$6·00 per bag (210 lb.); Marseilles, \$3·50 to \$3·75.
TANNIAS—\$1·68 per bag.
YAMS—White, \$2·16 per bag; Buck, \$3·00.
SUGAR—Dark crystals, \$2·15 to \$2·55; Yellow, \$3·10 to \$3·25; White, \$3·60 to \$3·80; Molasses, no quotations.
Timber—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—\$3·75 to \$5·75 per M.
——CORDWOOD—\$2·00 to \$2·40 per ton.

Trinidad,—May 15, 1909.—Messrs. GORDON, GRANT & Co

CACAO—Venezuelan, \$11·40 to \$11·60 per fanega; Trinidad, \$11·25 to \$11·75.
COCOA-NUTS—\$22·00 per M., f.o.b., for large selected peeled in bags of 100 lb.
COCOA-NUT OIL—70c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 8¼c. per lb.
COPRA—\$3·20 per 100 lb.
DHAL—\$4·40 to \$4·50 per 2-bushel bag.
ONIONS—\$2·30 to \$3·00 per 100 lb. (retail).
POTATOS—English, \$1·25 to \$1·30 per 100 lb.
RICE—Yellow, \$4·75 to \$4·80; White, \$4·50 to \$4·90 per bag.
SPLIT PEAS—\$5·25 to \$5·50 per bag.
SUGAR—American crushed \$5·10 to \$5·20 per 100 lb.

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AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW OF THE IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Treatment of Soils in 'Orchard' Cultivation in the West Indies.

DURING the past ten years the question as to the best method of treatment of soils planted with permanent crops as cacao, limes, rubber, etc., has received considerable attention, both in the West Indies and in Eastern tropical colonies, as Ceylon and the Malay States, with the result that older ideas on the subject have been a good deal revised.

In starting cultivations in the tropics, the earlier planters were naturally much influenced by the methods of agriculture practised in such countries as England, where clean weeding was a primary article of faith, and good evidence of careful farming. The fact that the conditions of climate which prevail in the two parts of the world differ so widely as to render it unlikely that methods applicable in northern countries could be adopted without considerable modification in the tropics was evidently not taken into sufficient consideration. Over and above this there are the important differences which arise from the methods employed in arable cultivations, and those adopted in orchard work. The older (European) ideas of agriculturists were largely based on arable work, and with pioneering effort there was a tendency to carry these ideas into the tropics with insufficient modifications.

The result was that the practice of keeping land between the rows of crop plants free from weeds, when once started, became an established custom, and came to be regarded as a necessary part of tropical cultivation

At the Agricultural Conference of 1901, this matter was brought forward for discussion by Dr. Francis Watts, in a paper entitled 'The Treatment of Soils in "Orchard" Cultivation in the Tropics' (see *West Indian Bulletin*, Vol. II, p. 96). In this paper, the economy of efforts made to keep the soil beneath such permanent crops as limes, cacao, oranges, etc., free from weeds was questioned, and the good effect on the tilth of the land which is brought about as the result of allowing the weeds to grow to a certain height, then cutlassing them down, and spreading them as a mulch upon the surface of the soil, was pointed out. It is frequently thought advisable not to allow the vegetation to grow close up to the trees, but by occasional hoeing and forking, to keep a circle immediately around the trunks clear of weeds. The good results following this practice had already been noticed in one or two lime orchards at Dominica and elsewhere, where the weeds had been allowed to grow for some time before being cut down. Under this system the soil, though quite untilled by implements, remains in a good state of tilth, and the roots of the weeds that have been cut down decay and leave air spaces, which reach to a considerable depth in the soil. The weeds, spread over the surface, form an excellent mulch, conserving moisture and adding steadily to the store of humus. They increase, it is true, the evaporation of moisture from the soil, but all plant food removed is returned when the weeds are cut down and undergo decay. These conditions approach very closely to those which prevail on natural forest land where fertile virgin soil is in process of formation. Another advantage in favour of this system is the saving of labour effected, as compared with estates on which continuous weeding is carried on.

On the other hand, everyone who has considered the subject must realize that great harm is necessarily done to the soil, and to the crops growing thereon, by exposure of the land to the alternate influences of a baking tropical sun, and heavy downpours of rain, both of which have a very injurious influence. Where the rainfall is heavy, and on steeply sloping land, an uncovered state of the ground offers the conditions under which the lighter surface soil is most readily washed away. There is further the loss of the large supply of humus that would be provided to the soil if a crop of wild vegetation were grown upon it, and afterwards mulched on the surface or dug into the land. Under such conditions the crops suffer, not only because such a soil has a small water-retaining capacity, but because the bacteria that are responsible for the chemical changes which result in the production of a continuous supply of plant food cannot exist in a dry, baked soil, and the roots themselves cannot therefore find means for a living.

The suggestions brought forward by Dr. Watts in 1901 were somewhat critically received at the time, although they found support in one or two quarters. These principles have, however, since been applied in a number of lime and cacao plantations, with beneficial results.

Reports and other agricultural publications from Ceylon and the Federated Malay States show, that in those parts of the world also, the utility of the practice of clean weeding in permanent cultivations has been very much questioned during recent years, and encouragement given to the judicious growth of certain weed plants under tree crops. This is particularly the case in connexion with rubber cultivation, as on estates where this crop is largely planted the cost of keeping down the weeds was found to reach an enormous figure. In the 1907 report of Mr. J. B. Carruthers, lately Director of Agriculture in the Federated Malay States, and now appointed to Trinidad, this point is dealt with, and he recommends that rubber planters should give a trial to three quick-growing leguminous weed plants, i.e., *Crotolaria striata*, *Mimosa pudica*, and *Desmodium triflorum*, which rapidly cover the soil, keep down weeds, and increase the fertility of the land by their nitrogen-assimilating properties. No doubt the practice might also be beneficially applied in connexion with coffee cultivation, which in the Malay States is carried on over an area of about 11,000 acres.

Similar recommendations to those of Mr. Carruthers are being urged upon the attention of planters in Ceylon. A recent issue of the *Tropical Agriculturist* (October 1908) discussed this question in a leading article. It was pointed out that where machinery was available, on rubber and other estates the practice of clean weeding was cheap and efficient, not on account of the removal of the weeds, but because the process necessarily involved a certain amount of surface cultivation, which resulted in the provision of a mulch of loose soil that retarded evaporation of moisture. In other cases, it was probably better to grow *selected* weeds, more particularly certain species of Leguminosae.

The question is one which demands a considerable amount of investigation by means of well planned experiments. The conditions of soil and climate in relation to the use of weeds have all to be investigated on the spot. Doubtless there must be a wide range of method in practice, and the correct method for any particular place must be determined experimentally.

The point is, that the modern agriculturist is not satisfied that the best is being done in a rubber, cacao, lime, or other orchard simply because there may be an absence of weeds.

Trinidad Cacao Exports. The amount of Trinidad cacao exported during the three months ended March 31 last, was 21,472,378 lb., which was 1,504,672 lb. in excess of the quantity shipped in the corresponding period of 1908, and a record for the first quarter of the year, with the exception of that of 1904, when 22,000,000 lb. were exported. It is interesting to note that 9,500 lb. of cacao were shipped to Australia. (*Official Returns.*)

SUGAR INDUSTRY.

Sugar in Cuba.

The fortnightly Produce Market Report of Messrs. Gillespie Bros., dated May 14 last, contains the following in regard to the Cuban sugar crop of the present season :—

Heavy rains commenced to fall on May 10, with the result that the number of centrals still grinding fell from 119 last week to seventy-five at the present time. This number, however, is still much larger than during the previous two years, as there were only twenty-three grinding in 1908, and twenty-eight in 1907. The total output of the island to date is 1,260,000 tons as compared with 851,000 tons last year, and 1,290,000 tons in 1907. During the latter year, 137,000 tons were produced at a later date than this, the total output—1,427,673 tons—being a record crop. With the large number of centrals still grinding this year, it is to be expected that the output will be a large one and the final figure should be very close to the record crop of 1907. The average prices for sugar during the present season have been considerably better than in 1907, and the Cuban planters have had a good year. The total stock of sugar now held in these ports is estimated at 337,000 tons, against 160,000 tons last year, and 414,000 tons in 1907.

Useful Data for Sugar Planters.

At a meeting of the Barbados Agricultural Society, held on Friday, May 28 last, the Imperial Commissioner of Agriculture read a paper on the subject of Central Sugar Factories. In order to make clear his arguments, Dr. Watts brought forward a good deal of useful data. The following notes; formulae, tables, etc., having reference to the relationship that exists between the percentage of fibre in canes, and the yields of juice and sugar that may be expected under different manufacturing conditions, are here reproduced from the paper, as being of general interest and value to sugar planters:—

Our ideas concerning the composition of canes and the amount of juice which it is possible to obtain from them may be rendered much clearer by a very simple formula, which, although not perfectly accurate, affords approximations that are sufficiently near for our purpose. The quantity of juice contained in a cane may be calculated approximately thus :—From 100 deduct one and one-third times the percentage of fibre in the cane. On this assumption we obtain the following :—

10	per cent. of fibre	= 86·7	per cent. of juice.
11	,, ,, ,, ,,	= 85·3	,, ,, ,, ,,
12	,, ,, ,, ,,	= 84·0	,, ,, ,, ,,
13	,, ,, ,, ,,	= 82·7	,, ,, ,, ,,
14	,, ,, ,, ,,	= 81·3	,, ,, ,, ,,
15	,, ,, ,, ,,	= 80·0	,, ,, ,, ,,
16	,, ,, ,, ,,	= 78·7	,, ,, ,, ,,
17	,, ,, ,, ,,	= 77·3	,, ,, ,, ,,

A number of experiments have demonstrated that the ordinary three-roller mill leaves in the megass from 150 to 180 parts of juice per 100 of fibre, or even more if very poor work is being done. The megass from a single mill with a cane splitter contains about 120 to 130. That coming from a train of mills consisting of a Krajewski cane crusher and two three-roller mills, in which maceration is effected, contains from 65 to 70; while the megass coming from a train of mills consisting of a Krajewski cane crusher and three three-roller mills employing maceration may be reduced to a content of 25 to 30.

If we tabulate the results which may be obtained from various systems of milling as effected on canes of different fibre contents, we obtain interesting figures :—

Type of Milling Plant.	Juice per 100 of fibre in Megass.	Juice per 100 of cane when fibre content of cane is :— 10 %	12 %	14 %	15 %	16
Bad single mill — —	200	56·7	60·0	53·3	50·0	46·7
Fair ,, ,, — —	180	58·7	62·4	56·1	53·0	49·9
Good ,, ,, — —	150	71·7	66·0	60·3	57·7	54·7
Cane splitter and single mill — — —	130	73·7	68·4	63·1	60·5	57·9
Krajewski and two 3-roller mills with maceration —	70	79·7	75·6	71·5	69·5	67·7
Krajewski and three 3-roller mills with maceration — — —	30	83·7	80·4	77·1	75·5	73·9
Krajewski and three 3-roller mills with maceration, best work —	25	84·2	81·0	77·8	76·2	74·7
Total juice in cane —	0	86·7	84·0	81·3	80·0	78·7

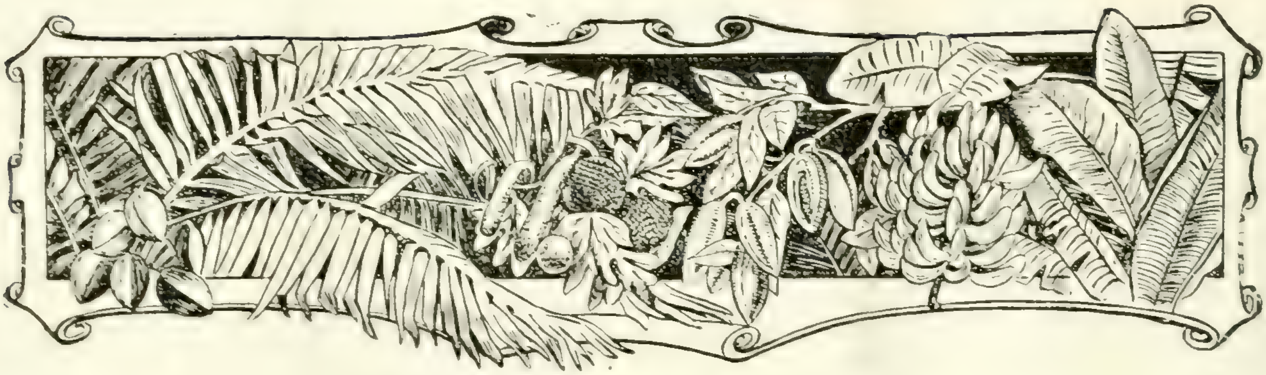
Such a table enables us to realize at once the enormous influence exerted by the fibre of the cane upon the quantity of juice which is obtainable. Thus, a good single mill will obtain from 71·7 to 54·7 per cent. of juice according as the cane contains from 10 to 16 per cent. of fibre. The table also enables us to see at a glance the influence, on the crushing, of the perfection or imperfection of the mills employed.

In order to show the influence of the fibre in the canes, and the influence of the mill on the number of tons of cane required to make a ton of sugar, the following table has been prepared :—

Table showing the tons of cane required to make 1 ton of sugar from canes of different fibre contents under different milling conditions, assuming juice to contain 1·95 lb. of sucrose per gallon.

Kind of Mill.	*Fibre in Canes.*		
Muscovado.	14%	15%	16%
Bad single mill —	13·7	14·6	15·6
Fair ,, ,,	13·0	13·7	14·6
Good ,, ,,	12·1	12·6	13·3
Factory (Crystals).			
Double crushing and Krajewski	8·8	9·1	9·3

All these figures justify the general conclusion that under conditions where 13½ tons of canes are required to make a ton of muscovado sugar, a ton of crystals can be made in a modern factory from 9 tons of canes. If the canes dealt with are of such a quality that more or less is required in one case, a corresponding amount more or less will be required in the other.



WEST INDIAN FRUIT.

'MULGOBA' MANGO AND 'TRAPP' AVOCADO.

An interesting communication relating to the 'Mulgoba' mango and the 'Trapp' avocado, both of which are regarded with great favour in Florida, has been received from Mr. John Belling, B.Sc., of the Agricultural Experiment Station, Gainsville, Fla.

The 'Mulgoba' is undoubtedly one of the very best of the East Indian grafted mangos, and extensive groves of it are being planted in Florida and Porto Rico. Fruits of the 'Mulgoba' variety ship remarkably well, and it is stated that individual mangos have been sold in New York at as much as 25c. each, wholesale price.

Budded 'Mulgoba' trees, packed in wooden crates, can be obtained in Florida at \$2 each. Inarched plants are also obtainable. These are usually preferred to those that have been budded, and sell at a somewhat higher price. The mango region of Florida is confined to the southern portion of the State.

Of the many excellent varieties of avocado pear grown in Florida, the 'Trapp' is regarded as the choicest. Fruits of the 'Trapp' avocado are greatly superior to those commonly produced in the West Indies. They are shipped to New York, where prices ranging up to 50c. per pear are realized.

Budded 'Trapp' avocado trees are sold in Florida in large quantities at \$1·50 each, or \$125 per 100.

LEMON INDUSTRY OF SICILY.

An interesting and detailed account of the lemon cultivation industry of Sicily, the harvesting of the fruit, the preparation of lemon juice, and the manufacture of citrate of lime was prepared by the United States Consul at Messina just previous to the earthquake of December last (in which the Consul perished). This report has lately been published, and the following notes form an abstract of the chief points :—

The principal lemon-growing districts of Sicily are on the northern and eastern coasts, chiefly at sea-level and at low altitudes. The character of the soil has a great influence upon the maturing and keeping qualities of the fruit, while adequate manuring, steady irrigation, and proper drainage of the orchards are all essential factors in the production of a good crop. Clay soil is most suitable for lemons. Fruit grown on light, sandy soil is smaller, of a lighter colour, ripens earlier, cannot be left so long on the trees without deteriorating, and, in general, does not possess such good keeping qualities as that grown on a clay soil.

What is known as 'Verdelli' lemons are produced early in the season as the result of peculiar treatment of the tree. These lemons command an especially good price. The trees yielding them are allowed partially to dry up during the summer, water being withheld, and a portion of the root system laid bare. In September the roots are covered with a liberal supply of earth and fertilizer, and the trees plentifully irrigated. Blossoms are produced in profusion in October and November, the fruit from which matures in the following August, when the supply on the market is low.

The returns obtained per adult tree vary considerably. From 500 to 1,200 fruits per annum may be regarded as the usual yields, but a good deal depends on whether irrigation can be practised or not. Under the most favourable circumstances, well developed and vigorous lemon trees in Sicily have yielded as high as 1,700 to 2,000 lemons and even more.

In the year 1908 there were produced about 23,000 pipes of citrate of lime in Sicily. About 100,000 lemons are required to make 1 pipe (672 lb.) of citrate, and it is estimated that about one-third of the total crop is used in the manufacture of citrate of lime. The total production of lemons has more than doubled in the past ten years. In 1897-8 there were manufactured 9,500 pipes of citrate of lime as compared with 23,000 pipes in 1907-8. The chief reasons that account for this extension of the industry are the improved facilities that have been introduced for irrigation of the groves, and for transport of the fruit.

For the first ten years after setting out a plantation, the spaces between the fruit trees are utilized for the production of minor crops. During this period the average profit from the lemons does not exceed \$18 per acre per annum. There is, however, a natural increase in the returns from the first year to the tenth. When a plantation has arrived at maturity, and is in full bearing, the average annual expenses per acre may be taken as somewhere about \$56, and the average returns at \$198, leaving an annual profit of \$142. These figures, however, do no more than illustrate an average result, and it would appear that the returns obtained, vary very considerably.

The lemon trees frequently bear at one time not only ripe fruit, but smaller fruits in all stages of development, and also blossoms. The lemons are all hand-picked and carefully spread upon beds of straw, where the stems are removed and a preliminary sorting of the fruit into different grades is carried out. It is estimated that a crop of 70,000 lemons can be gathered at a cost of 7c. per 1,000.

The final grading of the lemons is done at the storehouses. They are sorted into three classes, the first comprising naturally the largest and finest fruits, the second containing the healthy but smaller and less fine fruits, while in the third class are placed the small, deformed, and blemished fruit. The great bulk of Sicilian lemons are exported to European countries, i.e., Russia, Germany, the United Kingdom, etc.

It is not necessary to carry out the processes of selection and grading in the case of lemons used in the preparation of juice, citric acid, or citrate of lime. All grades of fruit are available for these purposes.

Before the juice is expressed, the lemons are split and the pulp is scooped out from the peel, the latter being treated for the extraction of the essential oil it contains. The fruits are crushed by means of toothed cylinders, the juice being caught and led off to a vat. About 11 gallons of raw juice is an average return from 1,000 lemons. A number of efforts made in the past to preserve the lemon juice without fermentation have failed, on account of the contained sugar, but very recently an English firm has established a finely equipped factory near Messina for putting up, by a special patented process, pure unaltered lemon juice for the trade.

Formerly large quantities of concentrated lemon juice were exported from Sicily, but in recent years almost all of this product is used in the manufacture of citrate of lime. The manufacture of citrate of lime commenced in Sicily about fifteen years ago, increasing every year, and in 1907-8, 95 per cent. of the production was exported in this form, and only 5 per cent. as concentrated juice. The cost of making citrate is about \$7·75 per pipe less than for the same quantity of juice. Further, a pipe of citrate is produced in two hours, whereas it takes three days to boil a pipe of juice. The boiling process carried on for three days causes a considerable loss in acidity. It is mentioned that it takes 120,000 lemons to make 1 pipe of concentrated juice, while only 100,000 are required to make a pipe of citrate.

Details of the method employed in the manufacture of citrate of lime in Sicily were supplied to this Department some two years ago by the British Consul at Palermo, through the Foreign Office. These were published in the *Agricultural News*, Vol. VI, p. 83.

RUBBER CULTIVATION IN BRITISH GUIANA.

The progress that has of late been made in rubber cultivation in British Guiana was summarized by Professor J. B. Harrison, C.M.G., at a recent meeting of the Board of Agriculture of the colony.

At the Botanic Gardens, Georgetown, the rubber trees that have been planted are doing fairly well. These include *Hevea brasiliensis*, *Castilloa elastica*, *Sapium Jenmani*, *Manihot Glaziovii*, and *Manihot piauhyensis*.

In the Gardens, as well as at the Issoruru Experiment Station in the North West, and at the Christianburg Station, the Department is making special experiments to settle the question as to whether it is advisable to keep the land clean, or whether it is better to allow the weeds to grow, and to cut them down at certain intervals. The general opinion formed by the Department so far is that perfectly clean weeding is not conducive to the healthy growth of the species of rubber trees mentioned, and, so far as experiments have gone, that the trees grow best when the soil is protected from the direct rays of the sun, and from heavy rain by the undergrowth of grass, etc. It is of course advisable to keep an area immediately around the young trees clear of all weeds. Special experiments are in progress with the object of thoroughly investigating this matter. Probably the growth of certain species of leguminous plants beneath the rubber trees would be most advantageous.

The North West Rubber Station at Issoruru is being gradually extended. The two kinds *Sapium Jenmani* and *Hevea brasiliensis* are chiefly grown at Issoruru, but *Castilloa elastica*, *Funtumia elastica*, and two varieties of *Manihot* lately received from Kew are also being tried. Altogether about 5,000 rubber trees of various kinds are planted at this station.

Some useful information has already been obtained in regard to the modes of growth of *Sapium Jenmani* and *Hevea brasiliensis*, and the proper treatment that should be given them when under cultivation, as the result of the experimental work that has been done. Land on which these two kinds of rubber are planted should be fairly well drained, and they will not grow on land subject to flooding. Another important point to be borne in mind is that planting under forest shade is absolutely fatal to the growth of both the *Sapium* and the *Hevea*.

Near the Issoruru Station are the very extensive rubber plantations of Mr. David Young, and of Messrs. Farnum and Smyth. From 30,000 to 40,000 rubber trees (*Hevea* and *Sapium*) have been planted by Mr. Young, while on the other plantation from 16,000 to 18,000 trees are growing. In both cases the rubber trees are doing remarkably well, and offer a useful object lesson to persons who may think of starting rubber planting.

The total area under rubber cultivation in the North West Territory is about 418 acres. The services of the officers of the Agricultural Department are taken full advantage of by those who have made a start in the industry.

Another rubber experiment station, about 20 acres in extent, exists at Bonasica. This contains some sixty trees of *Sapium Jenmani*, of different ages and sizes, the larger being from 6 to 7 feet in circumference. Experiments in tapping, collecting the latex, and preparing the rubber, are carried on at Bonasica, and specimens of the Sapium product here prepared have been valued in London as equal in quality to the best *Hevea* rubber from Ceylon.

At Christianburg on the Demerara river 15 acres were cleared in 1908, and of this area, 10 acres have been planted experimentally with rubber trees under the direction of the Department of Agriculture. Trees of *Hevea brasiliensis* formed the chief kind planted.

In addition to the cultivations mentioned, about 550 acres of rubber have been planted in Demerara during the past few years.

Between 70,000 and 80,000 plants of *Hevea brasiliensis* have been sold from the Botanic Gardens in the past two years. In 1908 the value of the young rubber plants raised was about \$15,000.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Esk' on June 8, for an official visit to St. Lucia. Dr. Watts is expected to return to the Head Office on Tuesday, June 15.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland, of Liverpool, writing under date of May 24 last, report as follows on the sales of West Indian Sea Island cotton :—

Since last mail from 300 to 350 bags of West Indian Sea Island cotton have been sold at firm prices. The sales include Anguilla, 14*d.* ; Antigua, 13½*d.* and 14*d.* ; Montserrat, 12½*d.* and 13½*d.* ; Nevis and St. Kitt's, 13*d.* and 13½*d.* ; St. Martin, 13½*d.* and 14*d.*; Virgin Islands, 13*d.* ; and St. Vincent, 16*d.*

Although there has been rather too much rain in the Carolina district, there is plenty of time for the crop to recover, and we expect the acreage will be a fair average one.

PERUVIAN GUANO.

In reference to the article entitled 'Guano' appearing in the *Agricultural News* of April 3 last (page 103), a correspondent draws attention to the remark contained therein : 'In passing, it may be said that the *best* Peruvian guano deposits have been exhausted.' This is strictly correct, having in mind the old Chincas deposits, but our correspondent suggests that the sentence is partially misleading, in that it leaves the reader to infer that there are no longer any high-grade guano deposits, whereas stocks of Peruvian guano are now obtainable on the market, which analyse 12 per cent. and over of ammonia.

CENTRAL SUGAR FACTORY AT VERE, JAMAICA.

A new series of the *Bulletin* of the Jamaica Department of Agriculture has just been started under the editorship of Mr. H. H. Cousins, M.A., Director of Agriculture. Part 1 of Vol. I has just come to hand, and contains the following brief, but interesting account of the Central Sugar Factory at Morelands, the property of the Vere Estates, Ltd. :—

The largest sugar enterprise that has been launched in Jamaica since the Brussels Convention put fresh courage into the hearts of the West Indian sugar planters is that of Vere Estates, Ltd. Hillside and Raymonds estates, together with Morelands, formed the initial basis of the combination, with 1,000 acres of cane in cultivation.

A total area of 9,560 acres of land, and wharf accommodation at Salt River represent the scope of the concern, and already a large extent of new lands has been planted in canes.

The railway system connects all the fields with the factory, and this again with the wharf on the Salt River, from which the produce is despatched by boat.

The upper waters of the Salt River are fresh, and evidently result from the overflow of an enormous subterranean catchment in the limestone hill, to the north of the plains. The possibilities of utilizing this water for the irrigation of the Vere lands are now receiving the attention of the leading proprietors, and there is no doubt at all that the project is feasible and bound to succeed, if the necessary capital were forthcoming.

The results obtained by Mr. T. H. Sharp at Angels estate, in lifting water for irrigation by an American centrifugal pump show that pumping is far less costly than had been anticipated by experts in Jamaica, and that there are great possibilities for the development of our arid plains by suitable systems of pumping the underflow for purposes of irrigation.

The factory at Morelands is the most complete and efficient yet established in Jamaica. The machinery was made by the Harvey Engineering Company, and the neatness and compactness of the installation reflect great credit on the engineer.

A distillery has been erected which is a model of cleanliness and convenience. An enormous output of clean rum with a light, aromatic flavour can be relied on here with good management. The price of rum being now so favourable, it is very wise to devote great attention to the distillery, and this department should greatly strengthen the industrial position of the factory.

CACAO PRODUCTION IN BAHIA, BRAZIL.

The Brazilian State of Bahia possesses extensive areas of some of the most fertile lands in the republic, and it would appear that on those lands the Bahian planters are finding cacao cultivation a very profitable industry. The British Consul at Bahia lately furnished the following particulars :—

It is estimated that about 40,000 acres are under cacao cultivation in the State, and that some 10,000,000 trees are in bearing. In 1907-8 the total output of cacao reached 25,000 metric tons. About 250 trees are planted per acre, and the average yield per tree may be taken as about 5·5 lb. of dried beans. With the exercise of more intelligent care and attention there is little doubt that this average could be largely increased, since the product of one well known and carefully cultivated plantation averages over 13 lb. per tree per season.

During the past few years some attempts have been made to replace the older method of drying the cacao beans in the sun by a system in which artificial heat is used. These efforts have been satisfactory in that the cacao dried by artificial means is superior and more regular in colour, and also fetches a higher price on the market. The introduction of the system is, however, expensive, and so far it has been adopted only by a few wealthy planters.

Brazil, as a whole, furnishes at the present time something over one-fifth of the world's supply of cacao. Of that proportion, the State of Bahia contributes over 80 per cent. ; hence it will be seen that this State occupies a position of considerable importance in the cacao markets of the world. The output from Bahia has increased from 14,000 metric tons in 1901-2, to 25,182 tons in 1907-8, and to 27,000 tons (estimated) in 1908-9. This cacao is largely exported to the United States, Germany, and France. The United Kingdom also takes a proportion.

The advance in the Bahian output of cacao has been especially marked in the past three years, and the Consul expresses it as his opinion that the rate of increase will be maintained in the future. The area of land in the State suitable for the cultivation of cacao is practically unlimited in extent, and the conditions are highly favourable for good growth.

A great drawback to the development of the industry at present is the lack of facilities for transport. No railway exists in any part of the cacao area of Bahia, and the roads throughout the district are very poor. As a result, transport of cacao and other produce is a very costly affair. Many planters pay as much as 4s. for the carriage of every bag (132 lb.) of cacao from the plantation to the port of shipment. Moreover, the exposure and rough handling to which the cacao is subjected *en route* have the effect of depreciating the quality of the article to an extent which seriously lessens its market value.

SUGGESTED CACAO SPRAYING EXPERIMENTS AT TRINIDAD.

In order to obtain accurate results upon which to base recommendations for the use of fungicides in cacao cultivation, the Mycologist to the Trinidad Board of Agriculture (Mr. J. Birch Rorer) has drawn up a scheme of cacao spraying experiments, which was recently submitted to the Board for approval. This scheme includes experiments in which insecticides are also to be used, both alone, and in combination with the fungicides.

For the work which it is proposed to undertake, a block of 800 cacao trees in good bearing, located in a district where diseases are prevalent, will be required. The trees should be in good condition so far as pruning and culture are concerned, and should be in fertile soil, so that they will be able to mature a good crop of pods.

For purposes of experiment, the 800 cacao trees will be divided into forty plots, each containing twenty trees. Thirty-six plots will be sprayed, and the remaining four will be left unsprayed as control plots.

The thirty-six plots to be sprayed are divided into six classes (each class containing six plots), and each class is to be treated with a different spraying mixture. Thus the first six plots are to be treated with Bordeaux mixture, the second lot with Bordeaux mixture and arsenate of lead, the third with self-boiled lime and sulphur, the fourth with commercial lime and sulphur, the fifth with arsenate of lead and lime, and the sixth class with contact insecticides.

In addition to the question of the relative value of the different spraying mixtures, the experiment is also designed to investigate, in the case of all the mixtures, the influence of the frequency with which spraying is carried out. The six plots in every class are to be treated with the same mixture, but the frequency with which the six plots are sprayed will vary from two to eight weeks.

The amount of cacao gathered from each plot throughout the year will be recorded, and an accurate account of the cost of spraying will be kept. The beneficial or injurious effect of the mixtures upon pods, trees and flowers will be noted. No results of the experimental work are to be published for at least one year.

In these experiments the Board of Agriculture will furnish all spraying apparatus, mixing plant, and materials for the work, but the labour required for the spraying operations would be supplied by the owner of the estate on which the work was done.

GROWTH OF PALMS.

The rate of growth of palms forms the subject of an interesting article in the March number of the *Indian Forester.*

It is observed that in the case of all palms, whether betel, date, palmyra, etc., a fresh leaf-bud was formed every month, so that the development of twelve leaves every year appeared to be constant. Reckoned on this basis, a palmyra palm would attain a height of about 28 feet in a century, and would not reach maturity for 300 years.

Palms develop the full thickness of the stem below ground before they throw up the aerial shoot: the time required for the palmyra appears to vary from about four to twenty years.

It is suggested that increase in thickness, being caused by the expansion of the soft central tissue, continues so long as the vascular tissue of the leaf-sheaths can extend, and this varies with the nature of the soil.

AGRICULTURAL INSTRUCTION IN PRIMARY SCHOOLS AT ST. LUCIA.

Agriculture was taught as a special subject at nineteen out of the fifty-one primary schools which were in existence at St. Lucia at the close of 1908. Last year, for the first time, it was arranged that the annual examinations in this subject, together with the inspection of school gardens should be conducted by an officer of the Agricultural Department, and accordingly, Mr. T. Worm, Agricultural Instructor, carried out the work. The report on agricultural instruction in the island is included in the Annual Report (1908) of the Education Department of St. Lucia.

While good work is evidently being done at a few schools, the report suggests that one or two modifications might be made which might tend to increase the utility of the teaching given. It is pointed out that the scheme of teaching followed varied considerably in nature and scope, and that the adoption of a more uniform scheme would be advantageous.

Most of the schools at which agricultural teaching is given possess garden plots, but these are wanting in other instances. Reference is made to the useful object-lessons that can be carried out by the aid of boxes and pots, where no garden plots are available.

In a few instances the school gardens at St. Lucia are being put to good use, but the Agricultural Superintendent of the island (Mr. J. C. Moore) points out that for the plots to be of the greatest use in aiding the children to comprehend the lessons given in the school-room, it is important that they should be exclusively devoted to the production and cultivation of plants for some definite purpose in connexion with the illustration of such lessons. Merely to fill the gardens with a collection of plants, or to grow one or two edible products is not sufficient.

The schools which did best in agriculture were Forestiere (100 per cent. of total marks), Castries Anglican Juvenile (93·3 per cent. of total marks), and Laborie Boys, (80 per cent. of total marks). Then follow Dennery Boys' La Grace (Laborie), Saltibus Juvenile, and Rivière Dorée Anglican.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. VIII. SATURDAY, JUNE 12, 1909. No. 186.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial discusses the question of the proper treatment of soils under 'orchard' cultivation, i.e., the growth of limes, cacao, rubber, etc.

Some useful data for sugar planters, having reference to the relationship that exists between the percentage of fibre in canes, and the yields of juice and sugar that may be expected under different manufacturing conditions, are given on page 179.

An article giving particulars of the lemon industry of Sicily appears on page 180.

Rubber cultivation is progressing satisfactorily in British Guiana (page 181).

The Brazilian State of Bahia possesses an extensive cacao industry. It is proposed to start a useful series of cacao spraying experiments at Trinidad (pp. 182-3).

A brief, but interesting article on the subject of the fungous parasites of scale insects will be found on page 186.

Some investigations on polyembryony in the orange and mango, carried out in Florida, are reviewed on page 187.

'Hints to Cotton Growers.'

A helpful little leaflet, prepared by Mr. W. C. Fishlock, and entitled 'Hints to Cotton Growers in the Virgin Islands,' has just been issued by this Department. It is written in very simple language, being specially adapted to the peasant cultivators of Tortola, although it refers to several points of interest to cotton growers in general.

The best districts for cotton growing at Tortola are in the south of the island, and the most suitable time for planting is in the months of June and July; as a rule no cotton should be planted after the end of August. Attention is drawn to the evil results which follow the practice of planting a few cotton seeds at any time of the year when a plot of land is available. By this means the spread of insect and fungus pests is greatly encouraged.

The methods of cotton cultivation are described, and emphasis is laid upon the importance of keeping the plots clean weeded, and of maintaining a surface mulch of loose soil during dry weather. Other sections of the leaflet deal with picking, grading, and drying of cotton.

Growers are advised to apply to the Experiment Station for advice and help immediately any symptoms of attack from insects or fungus diseases show themselves.

Interesting Pasture Grass at St. Lucia.

Some time ago specimens of an unrecognized species of grass were forwarded to this Department, with a request for identification, by the Hon. E. Du Boulay, of St. Lucia. Mr. Du Boulay had obtained plants of the grass in question from Guadeloupe, where it is supposed to have been propagated by means of seeds contained in a consignment of hay from America. It proved to be an excellent fodder, and Mr. Du Boulay was anxious to ascertain the name in order that a good supply of seed might be obtained from the country or district in which it naturally occurs.

The specimens sent could not be recognized as belonging to any species of grass previously found in the West Indies. Fresh samples were therefore obtained and forwarded to Kew, where the grass was identified as *Andropogon annulatus*, L., a grass whose natural habitat ranges from northern tropical Africa to China and Australia. According to Duthie's 'Fodder Grasses of Northern India,' *Andropogon annulatus* is considered as a fairly good fodder, and is largely utilized in the north of Hindustan.

The grass would therefore appear to be worth cultivating on a fairly extensive scale, and probably it could be extensively propagated from the supply of plants already existing at St. Lucia and Guadeloupe.

It will be noted that *Andropogon annulatus* is nearly allied to the Antigua hay grass (*A. caricosus*), and Barbados 'sour grass' (*A. pertusus*). Both these are extremely useful fodder plants. The hay grass was originally introduced into these parts from the East Indies, and in Antigua has spread rapidly, displacing other grasses.

Steamed Bone Meal.

Steamed bone meal is an excellent phosphatic manure, containing a high percentage of phosphate of lime (about 60 per cent.) and a small quantity of nitrogen (about 1·6 per cent.). The phosphate is, however, all in an insoluble condition, and—like most other manures—it must be used with due consideration of the land and the crops, if its effect is to be profitable. It is hardly to be recommended on heavy land, except for such permanent crops as grass or fruit trees. All manures decay slowly—and all insoluble manures work slowly—on heavy soils, so that the gradual effect produced by bone meal on these soils is frequently not appreciable to the ordinary cultivator. On sandy soils or light loams requiring phosphates, steamed bone meal works well, but an improvement in the crop is more often seen when a dressing of potash is also applied at the same time. Phosphates do not appear to be necessary for the sugar-cane crop, but frequently give good results with fruit trees.

Steam Cultivation at Jamaica.

Steam cultivation has been introduced into Jamaica on the property of the Vere Estates Company, the plant having been supplied by Messrs. Fowler & Co., of Leeds, England. A note on this subject, together with illustration, appears in the *Bulletin* of the Jamaica Department of Agriculture, Vol. I, No. 1 (New Series).

The introduction of steam cultivation on land for the first time is a matter which always demands a good deal of previous consideration as to whether the soil is of a nature to benefit by this method of treatment. In many cases great harm has been done as the result of ploughing too deeply and burying the normal soil beneath sour, infertile subsoil, which is brought to the top. But it is believed that the fine stretches of deep alluvial land at Vere are eminently adapted for cultivation by steam power.

As was found to be the case at Antigua, where steam tillage is employed on one or two estates, some difficulty is being experienced with the trash on the surface, which it is at present found necessary to burn before the implements will work properly. This is a serious matter in connexion with the fertility of cane lands. Some progress has been made at Antigua in this connexion, and it is hoped that at Jamaica it may be possible to modify the implements in such a way as to render them capable of dealing with heavy surface dressings of trash.

Soy Bean in Manchuria.

Reports on the agriculture of Manchuria show that the two chief crops grown are millet (*Sorghum vulgare*), and the soy (or soja) bean (*Glycine hispida*). The latter is a crop that has been grown in Eastern Asia from very early times, and has of late years spread westward. Soy beans form a prominent article of diet among the Manchurians, large quantities are exported (in fact this article heads the list of exports in point of value), and the green bush is an important fodder plant. The beans contain an oil which, when expressed, is used for household purposes in China. The residual bean cake is exported to Japan, where it is employed as a fertilizer. In the year 1907, soy beans and bean cake were exported from China to the value of $9,860,790.

The soy bean is grown in the cotton belt of the United States with considerable success. It is understood that this plant is also under investigation at Antigua, in order to ascertain the suitability of the beans as an article of food, its usefulness as a green dressing crop, and for improving the soil under West Indian conditions. The bean plants are small but erect, and give a good weight of green bush when grown under suitable conditions.

Fungus Disease of Funtumia Tree.

A new 'canker' disease, affecting the rubber tree *Funtumia elastica* has been observed in Uganda, and is described in the *Kew Bulletin* (No 3, 1909). The primary cause of injury is found to be a species of *Nectria*. The trees are attacked in the trunk, at a point from 4 to 6 feet above the ground, and the diseased area may spread to a considerable extent. As the disease progresses, the bark increases very much in thickness, and becomes much cracked and rugged, presenting the appearance of large wounds caused by the disease known as 'Slime Flux.'

This disease somewhat resembles the cacao 'canker' of Ceylon, also caused by a species of *Nectria*. It causes little injury to the rubber tree, but no latex is obtained from the portions of the tree which are attacked. Spread of the disease would probably be prevented by cutting out the affected areas, and coating over the wounds with tar.

Irrigation at Barbados.

In referring to the question of irrigation on Jamaica sugar-cane estates, the *Agricultural Reporter*, published at Bridgetown, recently mentioned an instance in which an attempt in this direction at Barbados has been attended with beneficial results. This is on Sandy Lane estate, the property of Messrs. Thorne & Son, in the parish of St. James. The crop-yielding capacity of the estate has been greatly improved in the past few years by the irrigation of the fields with water pumped from a well situated about ½-mile from the shore. By means of a force-pump driven by a suction gas engine, the water is driven up to a height of about 40 feet above the pumping station, and from thence it is distributed over all the lower fields of the estate by means of pipes and gutters of various descriptions.

The vigorous condition of the crops at Sandy Lane—even in very dry weather—should be an incentive to other estate owners in certain districts of the island, to consider whether it would not be possible to organize a similar system of irrigation on their own property.

INSECT NOTES.

Scale Insects and Fungi.

Limes and other citrus fruits in the West Indies are persistently attacked by scale insects; and at times, and in certain localities, the citrus white fly also appears.

While it is true that on certain estates the trees are sprayed and other remedial measures carried out, it is also true, on many estates, that no efforts are made by the management for the control of scale insects. Yet these insects occur year after year without becoming sufficiently abundant to kill the trees. The reason for this is, that the natural enemies of the scales keep them in check. Knowing this, it remains for us to consider which are the most useful of the natural enemies of the scales, and what are the most favourable conditions for the best development of these natural enemies.

The natural enemies of scale insects are of two general kinds: parasitic insects, and parasitic fungi. While some of the insect parasites of scales in the West Indies are known, no method has yet been devised by means of which an extensive use can be made of them in a practical way. With the fungoid parasites, however, it is somewhat different. Our knowledge concerning the West Indian forms is at present somewhat scanty, but a systematic study of the question is now in progress. A useful amount of work has been done in other countries, and, thanks to the efforts of the officials of the Experiment Station in Florida, the lines are known along which experiments may be tried with a likelihood of success.

It is generally recognized that fungi as a rule require moisture for their development, and this is true of the fungi parasitic on scales. When limes are covered with Bengal beans (see *Agricultural News*, Vol. VIII, p. 154), the air contained under the canopy of bean vines is kept moist. This would be of the greatest importance in the growth of fungi in dry localities where, under the ordinary conditions, they would not be able to make rapid development, and it appears highly probable that the usefulness of the covering of Bengal beans is largely dependent on this fact.

In Florida several fungi are known as parasites of the scale and white fly, and they are being used in a practical way. In the West Indies there are probably quite as many, but they are not all known. Investigations in this direction are however in progress.

The red-headed fungus (*Spherostilbe coccophila*) which attacks the purple scale (*Mytilaspis citricola*) and the orange snow scale (*Chionaspis citri*), and a grayish fungus which was also attacking scales on limes, were reported from Dominica in 1903 (see *Agricultural News*, Vol II, p. 232). These and other similar species of fungi are known to occur in several islands, and exist perhaps in all. In addition, it is likely that there are several fungous parasites not yet recognized, which attack scale insects, and which will quickly become known so soon as the attention of the planter is directed to this kind of useful organism.

The red-headed fungus is abundant in Dominica, and it probably occurs in the other islands of the West Indies, more or less in proportion to the conditions of moisture under which the trees grow.

This fungus attacks the purple or mussel scale principally, and the orange snow scale slightly. It can often be seen growing on and among the scales on the trunk and limbs of the trees, although it is frequently present and accomplishing a considerable amount of good when it cannot be seen.

When seen, however, it appears in the form of irregular pustules, reddish in colour and ranging from very small points up to the size of a pin's head. They are not difficult to distinguish. A small reddish mite is of frequent occurrence among these scales, and may be mistaken for the fungus; but by careful observation one may quickly learn to distinguish the one from the other.

The green shield scale (*Lecanium viride*), the brown shield scale (*Lecanium hemisphericum*), and similar scales are often attacked by a whitish fungus, which may be detected by the fact that these scales often leave a whitish mark on leaf or bark when they are removed. This whitish appearance is often due to the presence of a fungus, which is parasitic on the scale.

When it is desired to locate the parasitic fungi on scale insects, one should first visit localities where the scales have been abundant for some time without having become destructive, or where serious outbreaks of scales have checked their rapid development without apparent cause, and have subsided. The probability is that the natural enemies of the scales have been at work in these places and that they can be found there. It is desirable to locate these places as sources from which these beneficial parasites can be obtained for study or experiment.

It is proposed in the next number of the *Agricultural News* to suggest ways in which the value of these natural enemies may be tried on a practical scale.

SUBSTITUTE FOR LIGNUM VITAE.

The *Kew Bulletin* (No. 3, 1909) summarizes an account which appeared in a late number of the *Indian Forester* of a substitute for the Lignum vitae (*Guaiacum officinale*) of the West Indies. The new wood is called 'Mancono' (*Xanthostemon Verdugonianus*), and is found in considerable abundance in north-eastern Mandanao, Philippine Islands.

The wood is said to be so heavy and hard that it is most difficult to cut, and the splitting of a log is almost impossible. According to Mr. Dunlap of the Bureau of Forestry for the Philippine Islands, it grows along steep slopes near beaches, where it can be shipped by water transportation, and as it is only required for use in short lengths, the work can all be done in the forests. The wood of the 'Mancono' tree, even in the tropics, is practically indestructible, and is not attacked by white ants. Many of the Filipinos of the Southern islands use the logs for posts and ground timbers

The heartwood of the tree is uniformly reddish-black, but after a number of years of seasoning it turns a black walnut colour. Like all Philippine woods, it takes a fine polish.

The wood is of such density that it sinks in water, so that the logs have to be rafted between native boats to keep them on the surface of the water when being taken to the steamer.

This wood has been used as a substitute for Lignum vitae at the United States Naval Station, Cavite, Philippine Islands, and has been pronounced a success after a year's trial. It has also been satisfactorily tested in the shipyard of the Bureau of Navigation, Manila.

SCIENCE NOTES.

On the Production of more than one Seedling from a Single Seed of the Orange or Mango.

In the Report of the Florida Experiment Station for 1908, Mr. J. Belling, B.Sc., gives an interesting account of some new work conducted by him on the phenomenon known as polyembryony in the case of certain varieties of orange and mango, more particularly of mango.

Briefly, the facts implied by this term are as follows. When the seeds of such varieties of mango and orange are planted, it is found that more than one seedling will develop from each seed, as many as nine being sometimes formed. Moreover, there is a further fact of considerable interest in connexion with the young plants so obtained. Where the seed has been produced by crossing two varieties of orange, it is often found that only one seedling shows any characters in common with the paternal parent, while all the others resemble the mother plant only. Or it may even happen that all the seedlings resemble the maternal parent only. Thus one true hybrid alone can be formed. As will be explained later, this has an important bearing on the production of plants of good varieties from seed rather than by budding.

For a complete understanding of the question, a slight knowledge of the general structure of the ovule or unfertilized seed is necessary.

The young seed before fertilization consists of a small more or less egg-shaped lump of tissue, known as the *nucellus*, which is borne on a short stalk, and by which it is attached to the ovary wall, and completely surrounded by two coats, known as the inner and outer *integuments* respectively. The integuments almost entirely cover the nucellus leaving only a small hole at the end opposite the stalk. This hole is known as the micropyle, and through it the long pollen tube, which grows out from the pollen grain, is able to enter the ovule for purposes of fertilization.

In the centre of the nucellus is a large cell or hollow known as the embryo-sac, which contains the female cell or ovum.

The whole is enclosed in a capsule of soft green tissue known as the ovary, which may contain one or many seeds. The pollen tube already referred to, grows out from the pollen grain, passes down the style of the female flower through the wall of the ovary, and into the micropyle. Finally it grows through the tissue of the nucellus and enters the embryo-sac. The male cell passes down this tube and fuses with the egg cell or ovum inside the embryo-sac.

The effects of this fusion are twofold. First, it causes the fertilized female cell to divide and grow, so that it forms the embryo, and eventually the young plant; and secondly, it gives a general stimulus to the ovary and ovule, causing them to develop into the fruit and seed. This is the course of events in the normal case.

In the abnormal case considered in this article, as presented by the orange and mango, the additional or adventitious embryos develop from certain cells of the nucellus bordering on the embryo-sac near the micropylar end. They appear to develop as a result of the stimulus of fertilization in most cases, but the male generative cell takes no part whatever in their formation. They simply arise by the growth of one cell of the mother plant and are comparable with any other method of vegetative reproduction, such as the formation of suckers or the growth of cuttings, or buds.

The male parent has absolutely no direct part in their growth. Consequently one would expect that such seedlings formed from the nucellus of the female parent would breed true to that parent and carry on its characters with the minimum of variation. In other words, such adventitious seedlings should behave exactly like buds or grafts, and, in gardening parlance, 'breed true.'

Curators of Botanic Stations and others interested in general questions of agriculture might find it of interest to investigate what West Indian varieties of mango and orange will produce adventitious embryos and which will not. This could easily be done by sowing some 50 or 100 seeds of each of several varieties, and observing if any seed gave more than one seedling; and if so, how many more. The seeds must of course be sown separately.

For those interested in more advanced work, one or two other points present themselves.

It would be of interest to determine if the adventitious embryos can always be relied upon to breed true. This might be determined by planting some twenty-five seeds of a known variety of orange or mango and taking careful notes of the number of seedlings arising from each seed and the general appearance of the young plants, and comparing them with the parent. The plants might be kept until the fruit formed, and this might also be compared with the parent. It must always be borne in mind, however, that one seedling is normal in any group arising from one seed, and consequently will not 'breed true.' If only one seedling is produced from each seed it will be the normal one, and it is useless to proceed with the experiment on such a variety.

Having determined that the seedlings of a given variety breed true, further experiments might be undertaken to determine if it is cheaper to rear such a variety from seed or by budding.

It would also be of interest to determine by emasculation, if any varieties of mango, such as No. 11, as suggested by Mr. Belling, will produce adventitious embryos, without being fertilized at all, or if the stimulus of fertilization is necessary to incite their growth. This is suggested by the fact that in certain varieties adventitious embryos alone are formed, the hybrid failing to appear altogether when the seeds germinate.

RICE IN BRITISH GUIANA.

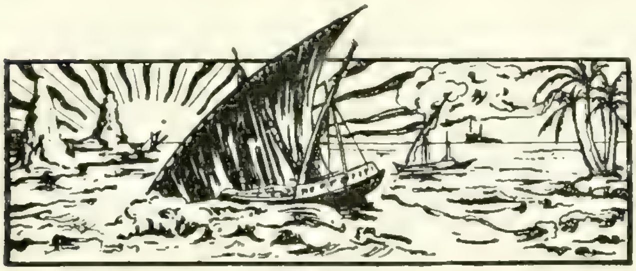
The fortnightly rice report, dated May 28 last, of Messrs. Sandbach, Parker, & Co., of Georgetown, contains the following:—

The weather during the fortnight has not been very favourable for milling, though sufficiently dry to allow of a moderate quantity of rice being cleaned and shipped to town. Several days of heavy rain were experienced during this and last week. These were needed to allow of the October to December rice crop being planted, and to establish young cultivations, and labourers are busy in all districts, getting plants into the fields that have been already ploughed.

Prices are the same as last advised, viz., \$4·30 to \$4·40 per bag of 180 lb. gross.

Stocks are not very large, and we expect to see better prices shortly, as with the wet season now on, and the consequent small deliveries to town during the next few months, there should be a better local demand.

Shipments to the West Indian islands during the fortnight amount to about 2,800 bags, principally for Barbados and Trinidad.



GLEANINGS.

During the year ended March 31 last, 14,277,300 bunches of bananas were exported from Jamaica, as compared with 13,950,767 bunches in 1907-8.

A letter from Mr. J. Maginley appeared in the *Colonizer* for May last, in which attention is drawn to the opportunity that exists at Antigua for the establishment of one or two central sugar factories.

The Governor of the Gold Coast has reported to the Colonial Office that the cacao crop of the colony for 1908 amounted to 28,545,910 lb., as compared with 21,744,000 lb. in 1907. (*Board of Trade Journal.*)

The British Cotton Growing Association recently made a donation of £15 to the Jamaica Agricultural Society in order to supplement the grant of £10 lately allotted by the Society for cotton experiments this year.

The Acting Agricultural Superintendent, Grenada, reports that four Para rubber trees (*Hevea brasiliensis*) at the Botanic Station are likely to yield a fair quantity of seed in the near future. There is a good demand for this seed at Grenada.

From the commencement of the season up to June 4, there have been shipped from Barbados 5,258 tons of sugar, and 42,242 puncheons of molasses, as against 16,492 tons of sugar, and 32,040 puncheons of molasses exported to the same date last year.

The *Leeward Islands' Gazette* of May 29 last contained a notice to the effect that up to June 30 next, a sum of 1*d.* would be paid for the dead body of each male mungoose, and 3*d.* for the body of each female mungoose, delivered at the Police Station, Antigua.

The sugar returns from Java show a considerable increase in the output. In 1908, there were produced 1,338,455 tons of sugar, as compared with 1,282,705 tons in 1907, and 1,133,525 tons in 1906. During the past year, some 176 sugar mills have been in operation. (*U. S. Consular Reports.*)

The report for 1908 on the Sugar Experiment Station at Audubon Park, Louisiana, mentions that a number of cane loaders of which public trials were made in past years at the Station have for the past two seasons been actively employed in the cane fields of the State. They have been of great assistance, and have effected considerable economy.

Messrs. Rose & Co., of Dominica, are now offering 3*s.* per barrel for limes and 5½*d.* per gallon for raw lime juice. A shipment of close upon 4,000 barrels of green limes was despatched from Roseau for New York on May 28 last, by the Quebec liner 'Korona.' (*Dominica Guardian.*)

The total sum realized at the annual sale of live stock held by the British Guiana Board of Agriculture in February last was $972·50, the expenses being $97·85. A pure-bred Shorthorn bull, two years old, was lately imported from the United States by the Board. This promises to be a very satisfactory animal. Its total cost (including importation expenses) was $303·19.

According to a paper recently read before the Society of Arts by Mr. John Ferguson, the cacao area of Ceylon has increased from 300 acres in 1878 to some 29,000 acres at the present time. The districts in which the cacao is grown are chiefly around and north of Kandy. The area under spices (chiefly cardamoms), which was 1,200 acres in 1880, was now 8,500 acres.

A new record in butter-fat production was lately created by the achievement at the Cornell University Experiment Station of a Holstein cow '2nd's Homstead.' This animal gave a yield of 28·44 lb. of butter-fat, equal to 35·55 lb. of commercial butter, in seven days. The milk of Holstein cows does not contain a large percentage of fat, so that this represents a very high milk-yielding capacity.

A writer in *Farm Life* deprecates the general use of tonics and spices for poultry. When the birds are moulting, or at other times when a tonic is needed, a little iron is the best thing to give. This should be prepared by adding ½-lb. of sulphate of iron and three drops of sulphuric acid to a quart of water. The mixture should be kept in a glass or wooden vessel, and about a tablespoonful given in each quart of drinking water.

Reports from Jamaica state that American capitalists are interesting themselves in the project of extending the cassava starch industry in the island. Investigations and enquiries have lately been made in two parishes at Jamaica with a view to establishing factories for the treatment of the cassava roots, and it is suggested that a considerable proportion of the starch required in the textile industries of the United States may ultimately be imported from Jamaica.

Attention is drawn by the United States Consul at Port-au-Prince to the great capacity of extensive areas of land in Haiti for the production of such crops as fruit, coffee, sugar, and cacao. An average Haitian coffee crop is about 50,000,000 to 60,000,000 lb., and the product is of high quality. It is stated that this yield could be greatly augmented if proper attention were given to the transplanting and care of the trees.

An article in the *Agricultural Bulletin* of the Federated Malay States (April 1909) briefly discusses the question of clean weeding *versus* the growth of weeds under permanent crops such as rubber, cacao and limes. A plant which is stated to have been found suitable for growing under rubber is *Tephrosia purpurea*. This belongs to the Leguminosae. When full-grown this plant is from 5 to 6 feet high, and of a spreading habit. Many species of *Tephrosia* occur in Jamaica and other West Indian islands.

STUDENTS' CORNER.

JUNE.

Middle Period.

Seasonal Notes.

During the manufacture of sugar, students should note carefully how much lime is needed per 100 gallons to effect the proper clarification of the juice, and in what condition—slightly acid, slightly alkaline, or neutral—the juice is concentrated.

The importance of cleanliness in boiling-house operations should be fully appreciated, since by care in this direction the risk of deterioration of sugar and molasses on storage, in consequence of bacterial or fungoid infection, is greatly minimised.

The simple methods used in chemical control of sugar houses, such as the use of the hydrometer, and the simple use of the polarimeter as a means of measuring the saccharine content of juices, sugars, and syrups may be studied with advantage.

The planting of various green dressing crops, that will be turned into the land previous to planting the next cane crop, will now be in progress. Note those that are particularly susceptible to insect attack, and those which escape such attacks.

Note how lands are being prepared for cotton, and ascertain the most suitable distances that should be allowed between the plants, and from row to row. Students should study closely the methods adopted in the selection and disinfection of cotton seed for planting purposes.

The cacao crop has come to an end, and the trees will now be getting bare of leaves. The fallen leaves should be collected, together with other waste vegetable matter, and applied as a mulch to the soil around the trees. Students should practise carefully the methods of budding and grafting cacao.

Where nutmegs are dropping, note that it is advisable to bed the land under the trees with dead leaves and other rubbish, in order to prevent the loss of nuts.

In lime plantations, this will be the season to carry out mulching operations, and to apply manures. Drainage work will sometimes be also in progress at this time of the year. Students should note the details of the work, and learn to recognize what are the conditions of the trees that indicate imperfect drainage of the soil.

Observe the overhauling that is done, and the repairs that are made in connexion with batteries, boilers, engines, and storage vats, in order that everything may be in readiness for the year's lime crop.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why does a plant, during its life, take in many times its own weight of water?

(2) What effect would the continuous absence of light have upon the growth of plants?

(3) What part of its food does a plant obtain by its roots?

INTERMEDIATE QUESTIONS.

(1) What is meant by *tillage*, and what are its chief objects?

(2) Write a brief account of the objects and methods of seed selection in Sea Island cotton cultivation.

(3) How would you deal with a field of recently cut canes with a view to starting the stools into quick growth?

SANSEVIERIA.

Many species of Sansevieria are known, of which the chief may be regarded as *Sansevieria guineensis*, the kind common in Barbados and other West Indian islands, and *S. longiflora*.

S. guineensis is native to Western and Central Africa, where some efforts have lately been made to start an industry in its cultivation, and in the preparation of its fibre.

Although the fibres of certain species of Sansevieria undoubtedly possess very considerable utility, and are fitted for certain economic uses, yet it does not appear that at present any appreciable quantity of this fibre is placed on the market. A grower bringing forward this product would probably find difficulty at first in persuading dealers to purchase, and the Sansevieria would have to displace other fibres.

The best fibres are, of course, obtained from the longest leaves, and in order to encourage a profuse growth of large Sansevieria leaves, it is necessary to provide a certain amount of shade. It will be observed that plants growing in the open yield short, small leaves, as compared with those that are provided with congenial shade. On the Zambesi in Africa, it grows abundantly, but always does best when 'keeping to the shade of woods,' and in moist situations. Hence it would appear that in an island like Barbados, ill supplied with trees and bush, the conditions are not favourable to the production of leaves of the best quality.

Owing to the fact that the produce of these plants does not occur largely in commerce, there exist little reliable data as to returns that may be expected. The first cuttings of leaves would not be obtained, however, until at the expiry of some three years from planting. In Jamaica, according to an estimate made by Sir Daniel Morris, so much as $1\frac{1}{2}$ tons of dry fibre per acre per annum might be expected under favourable conditions, after the period when cutting has begun. Since the leaves yield only about 3 per cent. of fibre, this would represent a crop of 50 tons of leaves per acre per year to be dealt with.

When once established, the Sansevieria plants are permanent.

Sansevieria fibres are soft, silky, elastic and strong, and possibly, when better known, they may come to occupy a more prominent place in the market. In his lectures on 'Fibres and Fibre Plants,' however, Sir D. Morris gives it as his opinion that 'in competition with Manila and Sisal hemps, the fibre of Sansevieria has possibly little future before it.' The fibre from *S. guineensis* somewhat resembles the valuable Manila hemp (from *Musa textilis*), and is used for cordage purposes.

The most varied figures have been quoted by dealers, and at the Imperial Institute, London, as representing the value of different samples of fibre from *Sansevieria guineensis*. These have ranged from £20 to as much as £60 per ton. Most of the valuations that have been made, however, have been of a nominal character. A good deal depends upon the length and uniformity of the staple, and the care with which the fibre has been prepared and cleaned. A good length of staple is about 3 feet 9 inches long.

The sample of fibre for which the valuation of £60 per ton was quoted, was received at the Imperial Institute about a year ago from the Gold Coast, West Africa. This was described as 'consisting of soft, clean, white, well-prepared fibre, which was fine, of good lustre, of fairly even diameter, and of good strength. The product was about 3 feet 9 inches long, and was of excellent quality, suitable for use with the finest Manila hemp.'

TROPICAL PRODUCTS ON THE HAMBURG MARKET.

In a recent report the United States Consul at Hamburg describes that town as being the most important market in the world for many classes of tropical products, such as come from Central and South America and the West Indies. The following extracts from the report, relating to cocoa-nuts, hardwoods, and tortoise shells, may be of some interest:—

All cocoa-nuts are sold by public auction in Hamburg. Such as arrive from Colombia, West Indies, and Africa are handled on consignment. Ceylon nuts are the best, and command the highest prices. Trinidad nuts stand next in rank. Colombian nuts are not much in favour, as they are poorly assorted, and the bags are of unequal weight. Colombian nuts when sold at auction are usually disposed of at the following prices: Extra large, 100 nuts weighing 175 ℔., 13 marks ($3·09); large nuts, 100 weighing 162 ℔., ($2·86; medium nuts, 100 weighing 144 ℔., $2·38; small nuts, 100 weighing 112 ℔., $1·90.

Nuts are counted after being sold, and only good nuts are accepted. It is best to ship cocoa-nuts before the fresh fruit season comes on. Thereafter the demand closes entirely.

The timber market seems at present to be depressed. The last shipments of mahogany and cedar from Colombia have been of such poor quality that buyers are discouraged. There seems to be a local over-stock of mahogany of all kinds. Lignum vitæ is but little known on this market. Ebony can be used i. a small way, but prices are low. Present approximate values per ton for hardwoods are: mahogany, $19·46 to $29·15; lignum vitæ, $7·29 to $12·16; ebony, $7·29 to $12·16.

Tortoise shells from Central America and the West Indies are all known as 'West Indies shells.' These goods are only accepted on consignment, as shippers do not assort them according to quality. One tortoise, for example, may supply two, three, or even more different grades of shell. The market is now quiet, and prices run from $3·57 to $5·95 per ½ kilogram (1·1℔.). There is a demand for light yellow, and light red-black pieces of shell, and these command good prices.

PRAEDIAL LARCENY AT JAMAICA.

Praedial larceny is a danger from which all the West Indian islands suffer in varying degree. It appears to be particularly prevalent at Jamaica, and a letter on the subject submitted to a late meeting of the Agricultural Society of the island dealt with a notable instance of the degree to which it is not infrequently carried, and indicated the effect which the practice may tend to have in preventing progress in certain directions.

A religious body from America not long since purchased an area of 507 acres of land at Riversdale, where they established a training school for youths and girls of the lower classes, not only from Jamaica, but from other West Indian islands as well. Each pupil was obliged, as a part of his or her training, to do a certain amount of field work. A large number of pupils entered the school, and in order to make the institution self-supporting, a considerable area of land was placed under provision crops.

Such a school as that at Riversdale should prove a valuable addition to the educative agencies in operation at Jamaica, and deserves every encouragement. It is unfortunate, however, that the institution has suffered considerably from the depredations of praedial thieves, and it would appear from a letter submitted by the Principal of the Riversdale School to the Secretary of the Jamaica Agricultural Society that if the practice is continued the authorities may probably be obliged to close the school, and cease their work.

The following is quoted from the letter referred to:—

'. . . In all our schools throughout the world each student is required to spend a portion of every day at labour as a portion of his education. For this labour the student is not paid, but poor students are allowed to labour more than the allotted time, in order to lessen their expenses.

'We have only been on the place about eighteen months, but we are already confronted with a very serious situation. We find in the West Indies many worthy young people who need the practical training given by our schools, but who are unable to pay for it. We have now, in addition to those, some thirty young people (about one-third women) who work their entire way. Naturally we planted largely with provisions, not to sell, but to produce food for our school family. But before we considered our yams fit to use, thieves entered the field, and took half a ton. This has continued until we have lost about a ton of yams, despite the fact that we have kept two young men watching our field at night for several weeks. Before our ground cocoes were more than half-grown, thieves took over 2 cwt. at their first visit. It is not so easy to tell what the loss of other crops has been. Fowls have also been stolen.

'I spent over five years in school work in Australia, and about ten years in America, but have never previously confronted such a condition of affairs.'

A copy of this letter was sent to the Government by the Agricultural Society.

SALE OF MILK AT TRINIDAD.

A Public Health Ordinance lately issued at Trinidad, contains a section designed with the object of ensuring the provision of a pure milk supply for the city of Port-of-Spain. Under this Ordinance the local authority is authorised to make bye-laws in connexion with the sale of milk for the following purposes:—

(1) The registration of all cow-keepers and dairymen, and all places where cows are kept.

(2) The inspection of all dairies, pastures, and other places where cows are kept; and the enforcement of such conditions as to cleanliness, drainage, etc., as may be found necessary.

(3) The prescribing of places for milking of cows, and the means for preventing contamination of the milk, or vessels used for milking; and

(4) The licensing of all cow-keepers and dairymen; and the issue of badges to be worn by all milk vendors or deliverymen.

In view of the degree to which consumers in Port-of-Spain have in the past suffered from milk adulteration, this section of Ordinance should meet with public approval.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of April:—

The condition of the drug and spice markets throughout the month of April remained much as it has done for some time past. As usual at this period of the year, two forces are at work which go far to disorganize the ordinary routine of business, namely, the Easter Holidays, and the anticipation of the Chancellor of the Exchequer's Budget proposals. The latter have been this year so long delayed, being made known only on the last day of April, that at the time of writing little or nothing can be said of their effect on colonial produce.

The following are the principal items of West Indian produce which have occupied attention in the London markets during the month:—

GINGER.

At auction little or no attention was given to ginger in the earlier part of the month. Private sales, however, were effected at increased rates of from 2*s.* to 3*s.*, medium Jamaica fetching from 60*s.* to 65*s.* per cwt. At the auction on the 21st, some 117 packages of Jamaica were sold at the following rates: Fair to good common 54*s.* to 57*s.*, small washed 58*s.* to 60*s.*; fair to good washed realized 61*s.* to 69*s.* At the same auction, as many as 896 bags of Cochin and Calicut were offered and bought in at the following prices: Fair to good washed rough 40*s.* to 45*s.*, fair brown Calicut 45*s.*, and rough and fair cuttings 40*s.* Some fair limed, slightly mouldy Japan was also bought in at 35*s.* On the 28th of the month, Jamaica was again in fair demand, 312 packages being offered and 120 sold at 67*s.* for good bright, 62*s.* to 64*s.* for fair washed, and 55*s.* for good ordinary. A small quantity of Calicut sold at 51*s.* 6*d.* for small native cut, 46*s.* 6*d.* for cut tips, and 37*s.* 6*d.* for brown tips. Unsorted native cut brought in a price of 56*s.* to 60*s.*, while 42*s.* 6*d.* was paid for washed rough Cochin.

NUTMEGS, MACE, AND PIMENTO.

No special quotations have been made during the month in the case of nutmegs. Mace has remained firm. At the auction on the 21st, 27 packages of West Indian found buyers at the following rates: Fine pale 2*s.*; good pale 1*s.* 9*d.* to 1*s.* 10*d.*; and fair 1*s.* 7*d.* to 1*s.* 8*d.* Ordinary fetched 1*s.* 6*d.*, and broken 1*s.* 3*d.* to 1*s.* 4*d.* per lb. A week later the sales amounted to 15 packages of West Indian, at prices slightly lower than in the previous week. Pimento throughout the month was in very quiet demand. At the sale on the 21st, 123 bags were offered and bought in at 2⅛*d.* per lb., and a week later 157 bags were brought forward and all bought in at the same rate. On the 6th of the month, 4 cases of West Indian distilled oil of pimento were put forward and disposed of without reserve at 2*s.* 9*d.* to 3*s.* 3*d.* per lb.

ARROWROOT.

But little attention has been given to this article during the month. On the 21st, 238 barrels of St. Vincent were offered and the whole bought in at 2*d.* to 2½*d.* for medium to good manufacturing. Bermuda was represented by 20 kegs, 12 of which found buyers at 2*s.* 1*d.* per lb.

SARSAPARILLA.

At the drug auction on the 7th, grey Jamaica was represented by 8 bales, 4 of which sold at 1*s.* 4*d.* per lb. for fair, the remaining lots of better quality being bought in at 1*s.* 5*d.* per lb. Fourteen bales of native Jamaica were disposed of, out of 18 offered, at 11½*d.* to 1*s.* per lb. for dull palish to good red. Nineteen bales of Lima-Jamaica were offered and 13 disposed of at 1*s.* 1*d.* per lb. for fair to rather roughish and chumpy, while 1*s.* 9*d.* per lb. was the reserve price at which 4 bales of Honduras were held. On the 22nd, there was no grey Jamaica offered. Lima-Jamaica was, however, represented by 4 bales, all of which were sold at 1*s.* 3*d.*, being an advance of 1*d.* per lb. over previous prices. The same advance was paid for 13 bales of native Jamaica—all that was offered—fair to good red realizing 1*s.* to 1*s.* 1*d.*, and dull pale red 10½*d.* to 11*d.*

LIME JUICE, LEMON JUICE, OIL OF LIME, ETC.

On the 6th of the month, West Indian lime juice was represented at the auction by about 40 puncheons, 1*s.* to 1*s.* 2*d.* per gallon being paid for very pulpy to pale. Good pale raw was firmly held at 1*s.* 3*d.* per gallon. On the 28th, the prices stood thus: Best pale West Indian 1*s.* 4*d.*, fair 1*s.* 3*d.*, and good 1*s.* 2*d.* per gallon. At the auction on the 21st, a single puncheon of brown Jamaica lemon juice was disposed of at 11*d.* per gallon. At the same auction 10 cases of West Indian distilled oil of lime were offered, 3 cases of which realized 1*s.* 9*d.* per lb., and 6 cases from 1*s.* 10*d.* to 1*s.* 11*d.* per lb.

MANUFACTURE OF OIL OF LEMON AT SICILY.

The United States Consul at Messina lately furnished the following report on the method of preparing essential oil of lemon which is adopted in Sicily:—

In order to prepare the essential oil, the peels are first soaked in water for some four or five minutes for the purpose of softening the envelopes of the oil vesicles, and rendering easier the expression of the oil. The peels are then carried to the expressing room, which is usually darkened, and kept as cool as possible, to guard against any changes in the character of the delicate and unstable oil.

In the expressing room each workman is seated on a low stool, and has before him a glazed earthenware bowl, across which, and resting in depressions in the rim, is a wooden rod run through a good-sized sponge. In his left hand the workman holds another sponge, often cup-shaped, against which he presses the outside of the peel, giving this a circular twisting motion. By this means the walls of the oil cells are broken, and the oil is squeezed out into the sponge to drip into the bowl. In this the oil rises to the top of the water, and can be decanted off The oil is filtered into large copper containers, in which it is stored to await sale.

Various machines have been tried for expressing the oil but so far without success. The amount of oil obtained will vary largely according to the district and the season, but will average from 0·7 lb. per 1,000 lemon peels to 1 lb., and, in rare cases, to as much as 1½ lb.

A later report of the U.S. Consul refers to the fact that the effect of the earthquake at Messina has been largely to increase the price of the essential oils of orange and lemon. He expresses the opinion, however, that the disaster has been utilized by speculators to some extent to bring about an artificial value in these products, and that prices may soon be expected to reach their normal level.

MARKET REPORTS.

London,—May 25, 1909. The West India Committee Circular; Messrs. E. A. de Pass & Co., May 14, 1909.

Arrowroot—St. Vincent, 1⅞d. to 3¾d. according to quality.
Balata—Sheet, 2/4½; block, 1/9 to 1/9½.
Bees'-wax—£7 10s. to £7 17s. 6d. for dull to good bright, and £7 for dark.
Cacao—Trinidad, 56/- to 70/- per cwt.; Grenada, 49/- to 57/- per cwt.
Coffee—Santos, 30/10½ to 32/- per cwt.; Jamaica, no quotations.
Copra—West Indian, £19 10s. to £19 15s. per ton.
Cotton—Nevis and St. Kitt's, 13d. to 13½d.; St. Vincent, 16d.; Antigua, 13½d. to 14d.; Anguilla, 14d.; Montserrat, 12½d. to 13½d., and Virgin Islands, 13d.
Fruit—
 Bananas—Jamaica, 4/6 to 9/- per bunch.
 Limes—Not wanted.
 Pine-apples—St. Michael, 1/6 to 4/-.
 Grape Fruit—5/6 to 9/- per box.
 Oranges—Jamaica, no quotations.
Fustic—£3 to £4 per ton.
Ginger—Ratoon 48/- to 50/-; low middling to fine, 51/- to 69/-.
Honey—22s. to 33s. 6d. per cwt.
Isinglass—West India lump, 2/2 to 2/6 per lb.
Lime Juice—Raw, 1/- to 1/3 per gallon; concentrated, £18 15s. per cask of 108 gallons; distilled oil, 1/10 to 1/11 per lb.; hand-pressed, 5/- to 5/6 per lb.
Logwood—£3 to £4 5s. per ton; roots, no quotations.
Mace—Steady.
Nutmegs—Quiet.
Pimento—Quiet, and easier.
Rubber—Para, fine hard, 5s. 5¾d. to 5s. 6½d. per lb.
Rum—Jamaica, 3/- to 7/-; Demerara, 1/6 to 1/6½, proof.
Sugar—Crystals, 15/- to 16/-; Muscovado, 15/3 to 16/-; Syrup, Trinidad, 11/3 to 15/9; Demerara, 15/-; Molasses, no quotations.

New York,—May 14, 1909.—Messrs. Gillespie, Bros. & Co.

Cacao—Caracas, 12c. to 13c.; Grenada, 12½c. to 13c.; Trinidad, 12c. to 12½c.; Jamaica, 10c. to 11c. per lb.
Cocoa-nuts—Jamaica, select, $22·00 to $24·00; culls, $14·00 to $15·00; Trinidad, select, $21·00 to $23·00; culls, $13·00 to $14·00 per M.
Coffee—Jamaica, ordinary, 7¾c. to 8¼c.; good ordinary, 8½c. to 9c.; and washed up to 11c.
Ginger—9½c. to 11¾c. per lb.
Goat Skins—Jamaica, no quotations; Barbados, St. Thomas, St. Croix, St. Kitt's, 45c. to 48c. per lb., dry flint.
Grape Fruit—Jamaica, $4·00 to $5·00 per barrel.
Limes—Dominica, $4·75 to $6·00 per barrel.
Mace—27½c. to 36½c. per lb.
Nutmegs—110's, 9c. per lb.
Oranges—Jamaica, $2·00 to $2·50 per box, $4·00 to $5·00 per barrel.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 3·92c.; Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Leacock & Co., June 7 1909; Messrs. T. S. Garraway & Co., June 7, 1909.

Arrowroot—St. Vincent, $3·90 to $4·00 per 100 lb.
Cacao—$11·75 to $12·00 per 100 lb.
Cocoa-nuts—$10·00 for husked nuts.
Coffee—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
Hay—$1·15 to $1·25 per 100 lb.
Manures—Nitrate of soda, $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00; Sulphate of potash, $67·00 per ton.
Molasses—Fancy, 17c.; Grocery, 18c. per gallon.
Onions—Strings, $3·00 per 100 lb.; Bermuda, $2·02.
Potatos—$2·00 to $2·60 per 160 lb.
Peas—Split, $5·75 to $6·00 per bag of 210 lb.; Canada, $3·25 to $3·40 per bag of 120 lb.
Rice—Ballam, $4·80 to $5·10 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
Sugar—Dark Crystals, 96° $2·25; Muscovado, 89° $1·85; Centrifugals, $2·10 to $2·30.

British Guiana,—Messrs. Wieting & Richter, May 29, 1909; Messrs. Sandbach, Parker & Co., May 28, 1909.

Arrowroot—St. Vincent, $9·00 to $9·25 per 200 lb., no demand.
Balata—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
Cacao—Native, 13c. to 14c. per lb.
Cassava—60c.
Cassava Starch—$5·00 per barrel of 196 lb.
Cocoa-nuts—$12·00 to $16·00 per M.
Coffee—Creole, 12c. to 13c.; Jamaica and Rio, 13½c.; Liberian, 7c. to 8c. per lb.
Dhal—$4·50 to $4·60 per bag of 168 lb., weak; Green Dhal, $5 50.
Eddos—$1·08 per barrel.
Molasses—Yellow, 23c. to 24c.
Onions—Teneriffe, 3c. to 3½c.; Bermuda, 2c. to 3c. per lb.
Plantains—12c. to 32c. per bunch.
Potatos—Nova Scotia, $2·75 per 100 lb.
Potatos—Sweet, Barbados, 72c. to 96c. per bag.
Rice—Ballam, $5·50 to $5·60; Creole, $4·40.
Split Peas—$5·90 to $6·00 per bag (210 lb.); Marseilles, $3·50 to $3·75.
Tannias—$1·44 to $1·56 per bag.
Yams—White, $2·40 per bag; Buck, $3·12 to $3·24.
Sugar—Dark crystals, $2·15 to $2·55; Yellow, $3·00 to $3·20; White, $3·60 to $3·80; Molasses, $2·00 to $2·30.
Timber—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—$3·75 to $5·75 per M.
—— Cordwood—$2·00 to $2·40 per ton.

Trinidad,—May 29, 1909.—Messrs. Gordon, Grant & Co.

Cacao—Venezuelan, $11·25 to $11·50 per fanega; Trinidad, $11·00 to $11·50.
Cocoa-nuts—$22·00 per M., f.o.b., for large peeled, in bags of 100 lb.
Cocoa-nut Oil—70c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—$3·25 per 100 lb.
Dhal—$4·40 to $4·50 per 2-bushel bag.
Onions—$2·30 to $3·00 per 100 lb. (retail); good demand.
Potatos—English, $1·25 to $1·30 per 100 lb.
Rice—Yellow, $4·75 to $4·80; White, $4·50 to $4·90 per bag.
Split Peas—$5·25 to $5·50 per bag.
Sugar—American, crushed, $5·10 to $5·20 per 100 lb.; Yellow crystals, $2·50 to $2·60; Bright Molasses, $2·25 to $2·50.

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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

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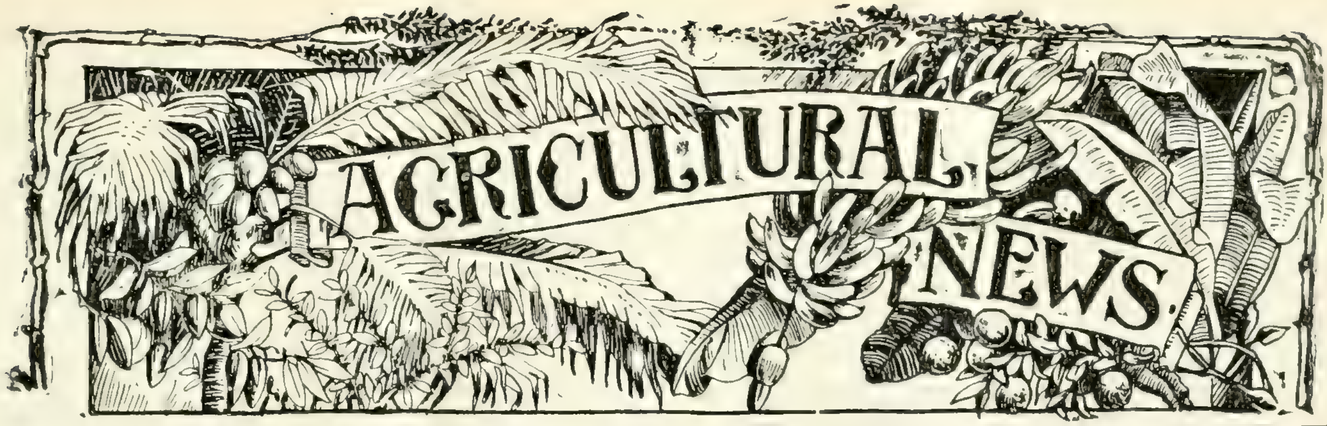


A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. VIII. No. 187. BARBADOS, JUNE 26, 1909. PRICE 1*d*.

CONTENTS.

Canadian Exhibitions, 1909.

THE efforts that have been made in the past few years to secure the representation of the West Indies and British Guiana at the annual Exhibitions held in the Dominion of Canada, and thereby effectually to bring the resources of these colonies under the notice of the people in Canada, having proved so successful, it is now generally recognized that it is very essential that the good work thus initiated should be continued, and that the interest which has been aroused in West Indian products should be stimulated as much as possible.

With this end in view, steps have been taken to secure space at the Exhibitions that will be held this year, and the Permanent Exhibition Committees in each colony have been asked to collect exhibits to be forwarded.

The date of the National Exhibition at Toronto has been fixed for August 30 to September 13; while the Exhibition at Ottawa will open on September 10. As the two Exhibitions will be in progress at about the same time, the difficulty of placing the exhibits on show at both Exhibitions is considerably increased. It has been suggested, however, that Messrs. Pickford & Black, who have again promised to convey the exhibits from the West Indies to Canada free of charge, and to undertake their arrangement at the Exhibitions, by working on Saturday night and Sunday, might be able to arrange for the transfer of the exhibits from Toronto to Ottawa in time for the opening of the Exhibition at the latter city. It is very doubtful whether this can be managed, but it is hoped that all of the colonies will agree to provide the additional funds required to make it possible to take advantage of the suggestion, in case Messrs. Pickford & Black find themselves in a position to carry it out.

The appointment of a Royal Commission to consider the question of the trade relations between the West Indies and Canada, the members of which will probably be visiting Ottawa during the summer, would appear to render the adoption of this suggestion particularly desirable this year, and there is little doubt that the additional funds required to carry it into effect will be forthcoming. But, as already stated, it will entirely depend on whether Messrs. Pickford & Black can make the necessary arrangements. The appointment of the Commission is evidence of the interest taken by Great Britain in the welfare of her West Indian colonies, and should stimulate these colonies to join in collecting and forwarding as attractive and interesting a set of exhibits as they possibly can, with the object of showing that they are endeavouring to do their share in extending trade relations with Canada.

The Permanent Exhibition Committees having now had considerable experience in getting together exhibits, it is unnecessary to repeat the advice which has been given in previous years in regard to the nature of the specimens to be obtained, and the manner in which they should be packed and forwarded. Those who may wish to refresh their memories on this point might refer to the suggestions contained in an article published in the *Agricultural News* last year (Vol. VII, pp. 129-30).

The following are approximately the dates on which the exhibits should be ready for shipment from the several colonies: Barbados, August 3; St. Vincent, August 4; St. Lucia, August 4; Dominica, August 5; Montserrat, August 6; Antigua, August 7; St. Kitt's, August 8. As the Canadian Line steamers do not call at Grenada, exhibits from that island should be sent to Barbados in time for shipment on August 3, or to Trinidad on July 31, as may be most convenient. Exhibits from the Virgin Islands should be sent to St. Kitt's some time before August 8. The usual supply of decorative material such as bamboo stems, dried leaves of the cocoa-nut palm, bunches of cocoa-nuts (strongly wired together), fresh sugar-canes, etc. should be shipped at the same time as the exhibits, and would arrive at St. John's or Halifax on August 15.

Fresh fruit and other perishable commodities might be forwarded by the following steamer, which would arrive at St. John's or Halifax about August 27, three days before the opening of the Toronto Exhibition. A second shipment of fresh fruit, etc. might be made by the steamer due at Halifax on September 7. This would be available for use at the Ottawa Exhibition opening on September 10, in the event of its being found possible to transfer the exhibits to Ottawa in time.

Glass jars and bottles should be carefully inspected after being filled, to detect any leakage before shipment. Owing to the amount of knocking about which they are likely to receive in transit, great care should be taken to pack each bottle separately in straw, shavings, or sawdust.

Attention is also drawn to the desirability of placing fresh fruit, etc., to be displayed in glass bottles, in a 4-per cent. solution of formaldehyde.

In 1907 a small illustrated Handbook entitled 'The West Indies in Canada' was issued by the Imperial Department of Agriculture, and copies of it were distributed at the Exhibitions. As this Handbook contained a considerable amount of interesting and useful information in regard to the West Indies, it is proposed to revise and amplify it, and to distribute copies at the forthcoming Exhibitions. In order to make it more attractive, a set of illustrations will again be inserted, which will, it is hoped, enable people in Canada to form a clearer idea of the conditions and circumstances that exist in the West Indies.

Such a Handbook will, it is thought, be more likely to be retained by persons visiting the Exhibitions than the detached leaflets which are usually issued by each colony; but in the event of its being considered desirable, leaflets might also be printed by individual colonies for distribution.

A collection of photographs from each colony would be likely to prove an interesting addition to the exhibits.

All correspondence in connexion with these Exhibitions should be addressed to Messrs. Pickford & Black, Halifax, Nova Scotia.

Protection of Seed Corn. The Kansas State Experiment Station in a recent circular have discussed the treatment of seed corn to protect it from burrowing animals. Mice are the pests most concerned and several treatments have been found useful. The use of poisoned baits three or four days before planting, the use of poisoned seed, and coating the seed with offensive smelling substances have all been tried with success.

The loss of seed from mice in the field in the West Indies would seem to be small, but the loss due to black birds is often considerable. It would not be a wise practice to poison the blackbirds because they are very useful insect eaters, but the use of coal tar, as suggested, would be likely to prove of value. For each peck (one-fourth bushel) of corn use a teaspoonful of tar. The corn should be slightly wet with warm water before stirring in the tar. Stir thoroughly till each grain of corn is covered with tar, and dry before planting. This might be tried in the West Indies for Guinea corn and imphee.

SUGAR INDUSTRY.

Varieties of Sugar-cane in British Guiana.

At a meeting of the Board of Agriculture of British Guiana held in May last, Professor Harrison brought forward particulars of the acreages under cultivation with different crops in the colony. The total area planted with economic crops for the season 1908-9 was 69,619 acres, as against 56,327 acres in 1907-8. Sugar-cane occupied 38,972 acres on January 1 of the present year. The following table shows the number of estates on which the chief kinds of cane were planted, and the acreage occupied in every case :—

Variety.	*No. of estates.*	*Acreage.*
D. 625 ...	39	13,540
B. 208 ...	28	7,738
D. 109 ...	37	6,896
D. 145 ...	30	3,710
B. 147 ...	20	1,108
White Transparent ...	12	572

In addition to the above, which form the chief kinds of cane grown in British Guiana, there were in 1908-9 about fifty-six other varieties planted over areas of from 400 acres downwards.

A second return brought forward showed the average crop yield given in the past season on a number of estates by the canes mentioned above, together with some others also planted fairly extensively. This return is as follows :—

Variety.	*No. of estates.*	*Yield of sugar per acre.*
B. 376 ...	4	2·37 tons.
D. 625 ...	32	2·02 ,,
D. 145 ...	22	1·90 ,,
B. 208 ...	16	1·88 ,,
B. 147 ...	17	1·84 ,,
Bourbon ...	32	1·76 ,,
Sealy Seedling ...	5	1·66 ,,
D. 116 ...	4	1·60 ,,
D. 109 ...	28	1·56 ,,
D. 95 ...	4	1·47 ,,
White Transparent ...	12	1·37 ,,
B. 109 ...	4	1·21 ,,

In connexion with this table, Professor Harrison pointed out that when the yields given by the Bourbon cane were considered for a number of years back, it was found that these yields were almost always about $1\frac{3}{4}$ tons per acre, although they might vary somewhat more or less.

A third return laid before the meeting showed the average yields given by a number of canes cultivated on estates over areas of not less than 40 acres. In making an estimate on this basis, the very high or very low results often obtained with small plot experiments are not taken into consideration. The following are the yields in question :—

Variety.	*No. of estates.*	*Yield per acre.*
D. 625 ...	24	2·04 tons.
D. 145 ..	10	2·04 ,,
B. 208 ...	6	2·08 ,,
B. 147 ..	6	1·83 ,,
Bourbon ...	26	1·79 ,,
D. 109 ...	24	1·55 ,,
White Transparent ...	4	1·41 ,,

Sugar Industry in the Hawaiian Islands.

Some statistical particulars relating to the condition and progress of the Hawaiian sugar industry are included in the report of the Commissioners of Agriculture and Forestry for the Territory, for the year ended December 31, 1908.

From the data given it is seen that the output of sugar from the four islands increased from 282,807 short tons in 1899, to 521,123 short tons in 1908. At present, therefore, the Hawaiian sugar crop is rather more than twice as great as that of the British West Indies and British Guiana. There has been a continuous advance throughout the period mentioned, but the record increase made in any one year was that which took place in the year 1907-8. In 1907 the crop return was 440,017 short tons, so that the 1908 output showed an advance of over 80,000 tons upon this.

The total area of the Hawaiian Islands is 4,127,360 acres. Of this amount, 200,000 acres are under cultivation in sugar, of which about 105,000 acres are irrigated, and 95,000 acres unirrigated.

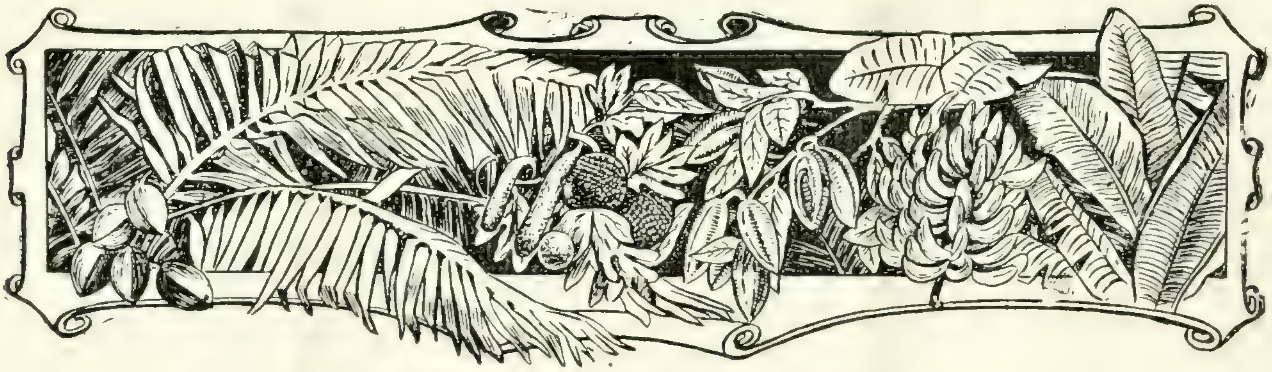
The average yield of sugar for all the plantations in 1906 was as high as 8,945 ℔. per acre, or about $4\frac{1}{2}$ short tons. The average return from the irrigated plantations was 11,526 ℔., or $5\frac{3}{4}$ short tons, and the average of the unirrigated plantations was 6,140 ℔., or a trifle over 3 short tons per acre.

It must be borne in mind that in the Hawaiian Islands a period of from eighteen to thirty months elapses between planting the sugar-canes and reaping the crop. As a result of this, it will be noted that the number of acres cultivated for the crop of any particular year does not represent the total area planted. In 1906, for instance, 96,228 acres were cultivated and produced 430,368 tons.

A little over $2,000,000 is expended every year for manures for the cane crop. This represents an average of about $4·65 for each ton of sugar produced, and $22·20 per acre for the crop.

On the irrigated plantations about 10,000 gallons of water are applied per day to every acre of land. A vast amount of money has been spent on irrigation works in the Hawaiian Islands, the cost of the irrigation systems of the several plantations having reached $14,069,804 up to December 1906.

A Recent Number of the *Louisiana Planter and Sugar Manufacturer* contains a note to the effect that a large sugar factory is about to be erected in Florida. The canes for this factory will be grown on land brought in cultivation for this purpose—a further extension of the cane-growing area in the United States.



WEST INDIAN FRUIT.

HINTS ON COCOA-NUT CULTIVATION.

In a paper entitled 'Cocoa-nut Culture,' included in the *Queensland Agricultural Journal*, Mr. A. H. Benson, Instructor in Fruit Culture to the Department of Agriculture of Queensland, brings forward some useful suggestions.

As the result of personal observation and enquiry made in many cocoa-nut-growing countries, Mr. Benson mentions that he has been struck with the general want of care shown in the selection of seed nuts for planting. No attempts whatever seem to be made to improve the strain of cocoa-nuts in the East, and probably much could be done in that direction throughout the whole of the cocoa-nut-growing region of the world. It seems probable that in time varieties could be produced possessing all the characters most desired, viz., a large nut with little coir, containing a thick flesh, which will yield a good percentage of copra.

As is well known, cocoa-nut trees prefer a light sandy soil, and can stand the presence of a large amount of saline constituents in the soil. Consequently they grow best along the coast-line just above high-tide-mark, where also they are exposed to all the sea-breezes another factor favouring their development. While the access of freely moving water, either salt or fresh, has been found of great use to the trees it is necessary that the soil on which they are growing should be well drained, since stagnant water is very injurious.

The general cultivation of the soil in a cocoa-nut plantation is a simple matter. The chief object is to keep the surface of the land in a state of good tilth, and free from weeds. This method of treatment is such as will enable the soil to retain as much moisture as possible—an important point when dealing with light sandy soils.

Cocoa-nut palms require fairly large supplies of nitrogen and potash. Phosphates are demanded to a smaller extent, but lime is also essential. In the case of sandy beaches, however, a sufficient supply of this will be naturally present, in the form of ground-up shells. Nitrogen may often be cheaply applied by growing some leguminous crop beneath the trees, and ploughing the green vegetation into the soil. By this means the land is kept in a state of good tilth, and the supply of humus is maintained—a point which is of great importance in connexion with the water-holding capacity of the soil. It does not appear to be necessary to give an application of potash until the trees come into bearing, but after this time its use will probably be found to have a very distinct influence on the yield of nuts produced.

Animal manure is also highly valuable, but is frequently difficult to obtain in districts where cocoa-nut cultivation is carried on. Speaking generally, it would appear that the judicious manuring of cocoa-nut groves is a matter which receives insufficient attention in most countries where the crop is grown.

Seed nuts to be used in raising a crop are usually first planted in a nursery. A practice generally adopted is to keep the nuts in heaps, to moisten them in dry weather, and to set them out as soon as they show signs of sprouting. The nursery should be partially shaded.

When about 18 inches to 2 feet high, the young seedlings may be planted out where they are to grow permanently. Holes are dug at distances of 30 by 20 feet apart, and should be 2 to 3 feet square and 2 feet deep. At the bottom of the holes are placed a few spadefuls of a mixture of top soil and cow manure. The young plant is put in and the roots are covered by a small quantity of fine earth, the hole remaining open, as it will eventually be filled by the trunk of the tree.

While the young trees are growing, subsidiary crops may be planted between the rows. Such crops should not make too heavy a demand on the soil. Pine-apples, peanuts, cotton or sweet potatos are useful for this purpose. The subsidiary crops should alternate with leguminous green dressings so that the supply of nitrogen in the soil may be maintained.

The cocoa-nuts should be gathered when fully ripe, and not allowed to fall to the ground, more especially when they are to be used for seed purposes.

When the nuts are utilized for the manufacture of copra, the husk is first removed, and the husked nut is then split in half to allow of the removal of the flesh. Drying in the sun for a short time facilitates this removal, which is effected by means of a short curved knife.

The most up-to-date method of drying the copra is by means of a fruit evaporator. In many countries, however, the practice still exists of drying it in the sun, or over a somewhat primitive kiln. The former method requires some three days, whereas kiln drying only takes about twenty-four hours.

While suggesting that fairly extensive cocao-nut planting could probably be made remunerative in Northern Queensland, Mr. Benson is of opinion, that in order to make the industry a success, it would be necessary for the individual planter, or a combination of planters, to erect up-to-date machinery for the preparation and drying of the copra, and also, probably, for extracting the oil from the same.

MANGOS IN JAMAICA.

An article that is accompanied by a number of interesting illustrations, and deals with the different varieties of mango cultivated in Jamaica, the methods of propagating this fruit tree by budding, and the possibilities of developing an export trade in the fruit is included in the *Bulletin* of the Jamaica Department of Agriculture (Vol. I, No. 1).

In September last, a stock of 105 grafted mangos of the choicest Indian varieties was obtained from the Calcutta Botanic Gardens, and planted out in Jamaica. These kinds included the 'Alphonse,' 'Bombay,' 'Singapur,' and many other fine mangos.

The first experiments carried out at Jamaica in budding mangos were undertaken by Mr. T. J. Harris in 1904. A fairly large 'yam' mango of good age formed the stock, and the buds used were from the 'Bombay' and 'Alphonse' varieties. The operation was followed by rapid growth, and fruit was borne for the first time when the buds were three years of age; and at the end of four years from budding, the tree had made quite respectable growth.

As a result of this success, and with a view to testing the practical aspect of the case, the idea of purchasing 1,000 seedling trees growing on Hope estate on which further budding operations might be carried out is under consideration. In this way, a good trial would be obtained of the possibilities of growing high-class Indian mangos on ordinary wild trees.

The possibilities that may exist in connexion with the development of an export mango trade are exemplified by the success lately achieved by Mr. A. W. Gardner, of Kingston. Mr. Gardner, during the past year, shipped a supply of mangos, the produce of some grafted trees of choice kinds possessed by him, to London, and as a result he has received no less than £70 for the produce of one tree. The prices varied from 1s. 6*d*. to 2*s*. 6*d*. per fruit.

At present the variety 'Peter's Bombay' is recommended as the most suitable kind to propagate, and the most promising variety for cultivation for the export trade. The 'Alphonse' mango is also very highly esteemed in India.

MAIZE GROWING IN SOUTHERN NIGERIA

A remarkable increase in the exports of West African maize is reported from Southern Nigeria, the returns for the twelve months ended December 31, 1908, being 15,528 tons, of a value of £51,696, as against 9,891 tons, valued at £28,521, for 1907. It has been the same in the case of Dahomey (French), and Togo (German), the former having exported 14,111 tons, and the latter 29,773—an increase of 10,000 tons over the shipments for 1907. Thus maize to the value of £200,000 was exported from West Africa last year.

The whole of the maize shipped, was grown by the native cultivators on their holdings, and it is only within the past few years that these growers have been able to find a market for their product.

It is believed that the maize-growing industry of Southern Nigeria is capable of very considerable development and extension, provided the natives are given market facilities, and technical advice in the selection of seed, and the preparation and harvesting of the product.

The future of the Nigerian maize industry is regarded by the authorities as being so very important that the Commercial Intelligence Officer was recently sent on a special mission to Togo to report upon the methods adopted by the German officials to encourage its development in that colony.

THE SAGO PALM.

In the course of an article on the subject of some East Indian economic plants, and their uses, which appears in the *Journal* of the New York Botanical Garden, the following particulars concerning the sago palm (*Metroxylon Sagu*), and the method adopted in the Malay States of producing starch from it, are given:—

Sago, a kind of starch, is a product of several species of palms and palm-like plants, the bulk of which is probably derived from the trunk of *Metroxylon Sagu*, the true sago palm, native of many of the islands of the Malay Archipelago and vicinity. This species of palm, which prefers damp places, sometimes attains a height of 40 feet, and has a large comparatively smooth trunk, bearing at the summit a crown of pinnate leaves. In the preparation of sago a full-grown plant is selected, the palm is felled close to the ground, cut into sections 3 or 4 feet in length, and soaked in water for several days, after which the outer fibrous portion is removed. Each section is then ground into sawdust by a coarse grater.

The sawdust is then thrown into a large receptacle made of coarse sacking, and propped up on poles several feet from the ground. Into this receptacle a native enters, and tramps up and down, while an abundance of water is being added. As a result of this treatment, the starch sinks and flows out through a small bamboo trough into a vessel below, leaving the woody portion floating behind. After several days the water is drained off, and the sago meal dried, when it is put into bags and shipped away for refinement.

PRIZE-HOLDINGS COMPETITIONS AT GRENADA.

At a meeting of the Grenada Agricultural Society held on March 26 last, it was decided to recommend:—

(1) That £150 be granted for Prize-holdings competitions in each parish this year.

(2) That £25 be granted for the payment of an honorarium of £2 2*s*. each to the judges of each competition, as it is important—for the purposes of comparison—that the same persons should do the judging in every parish.

(3) That a sum of £12 10*s*. be granted for the payment of prizes for the best vegetables, etc. offered for sale in the market, every alternate month.

(4) That the Government be asked to authorize the expenditure of £150 for the Prize-holdings competitions, so that early notice may be given, with a view to ensuring that the judging shall be done in the month of September next, as recommended by the judges of past competitions.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from St. Lucia on June 15, and left by the R.M.S. 'Eden' on June 22 for an official visit to St. Vincent. Dr. Watts is expected to return to Barbados on June 29.

Mr. W. Biffen, B.Sc., Scientific Assistant on the staff of the Imperial Department of Agriculture accompanied the Commissioner to St. Vincent and will return on June 29.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland of Liverpool, writing under date of June 7 last, report as follows on the sales of West Indian Sea Island cotton:—

Holidays in the spinning districts have rather interfered with business in all classes of cotton during the last fortnight. The sales of West Indian Sea Island during that period amount to about 260 bales, of which about half were stains at 5½*d.* to 8*d.* The balance consists of St. Kitt's 12½*d.* to 14½*d.*, Nevis 14*d.*, Barbados 14½*d.* to 15*d.*, Antigua 13*d.*, Montserrat 13*d.* to 13½*d.*, St. Martin 13½*d.* to 14*d*, and St. Vincent 17*d.* to 20*d.* Prrices still remain firm.

COTTON CULTIVATION IN THE SEA ISLANDS.

The Director of Agriculture of the Nyasaland Protectorate (Mr. J. Stewart McCall) sometime ago paid a visit to the United States, in order to study the methods of cotton cultivation practised in that country, and the information gathered as the result of his visit is published in a small bulletin (No. 1 of 1909) recently issued by the Nyasaland Agricultural Department. The following notes are an abstract of the section of the pamphlet which deals with the cultivation of fine staple cotton in the Sea Islands:—

The amount of Sea Island cotton grown in the United States forms less than 1 per cent. of the whole American cotton crop, but it is of great importance owing to its high quality. It is grown to the highest perfection on James and Edistow Islands, which lie to the west and south-west of Charleston, in the State of South Carolina.

Sea Island cotton is most sensitive in regard to changes of soil and climate. It does best on light sand and gravel alluvia, not too rich in humus, with free drainage, and a fairly humid atmosphere.

On the best plantations in the Sea Islands, about 75 per cent. of the whole area is known as 'cotton land,' and the other 25 per cent. is devoted to the growth of truck crops.

Cotton is not grown continuously on the same land, however, but only in alternate years. Land which has borne cotton in one year is either planted with some leguminous crop, such as cowpeas or velvet beans, in the following season, or simply left unploughed. When green crops are grown they are fed to animals on the land.

The cotton is planted in March and April, at distances of 22 inches from plant to plant, and 5 feet from row to row. About the end of August the first pickings begin, and the harvest continues until December.

Much of the finest cotton grown in the Sea Islands never enters the open market at all, being sold privately to French lace manufacturers at a high price.

The cotton grown on the Islands is much superior to the Sea Island cotton produced on the mainland. The inferiority of the latter, which consists in shorter staple and lack of lustre, is partly due to the large amount of hybridization which takes place with the Upland cotton grown in the neighbourhood, and partly to the lack of humidity in the atmosphere. On the mainland the best cotton is said to be produced by a crop raised from island-grown seed.

Cotton growers in the Sea Islands are firm believers in seed selection, which they practise regularly. Mr. McCall reports that each of the island plantations visited by him had its own breeding and selection plot, and there can be little doubt that the high quality of the cotton produced is to a large extent the result of prolonged selection. Great intelligence is exercised by the island planters in growing and harvesting their cotton. Manuring of the land is frequently commenced as early as November, when if pen manure is available, it is applied at the rate of 20 tons per acre on the surface between the old ridges. Otherwise, a dressing of cotton seed, at the rate of about ½-ton per acre is given early in February, when the first ploughings are made. This seed is covered by splitting the old ridges with the plough, and the great bulk of it undergoes decay. Any seeds which germinate are destroyed by subsequent ploughings. It is found that late applications, on a large scale, of slow-acting organic manures interfere with germination of the cotton seed, and retard the ripening of the crop.

The tillage operations practised frequently include two or three ploughings, of which the first is deep (12 inches when possible). Subsequent ploughings are more shallow. The first ploughing provides conditions suitable for deep rooting, and enables the plants to be drought resistant. The shallow cultivations which follow, result in the production of a fine surface tilth, which is so necessary for germination and rapid early growth during the weak stages before the plant puts on the rough leaf.

When the land is ready to be ridged up for planting, a manure such as 600 lb. of Peruvian guano, and 50 lb. of potassium sulphate is applied per acre, and after germination 50 lb. of nitrate of soda is added.

Cotton grown in the Sea Islands is marketed in bags, 7½ feet long by 2½ feet in diameter, containing approximately 350 lb. of lint. This cotton is not compressed in bales, since many of the planters consider the practice detrimental to the fibre. Practically all the Islands' crop is sold at Charleston, and forms 35 per cent. of the cotton marketed at that port. Sea Island cotton from the mainland is principally marketed and shipped from Savannah.

THE SOILS OF NEVIS.

The study of the soils of the Leeward Islands group has been carried on from the Government Laboratory, Antigua, as time and opportunity have permitted. A *Report on the Soils of Dominica* was published in 1902, and the soils of Montserrat formed the subject of a paper which appeared in the *West Indian Bulletin* some two years ago (Vol. VI, p. 263). A paper on the soils of Nevis, by Dr. Watts and Mr. Tempany, appeared in the latest number of the *West Indian Bulletin* (Vol. X, p. 60). The following are among the chief points brought out as the result of the investigations:—

The uniformly high percentage of available potash, and the very low percentage of available phosphate are remarkable, and would appear to be characteristic of Nevis soils.

It is probable that under some conditions, applications of phosphatic manures to the majority of soils in the island would prove markedly beneficial. Nevertheless, the demands of certain tropical crops in this respect, notably cotton and sugar-cane, are, in our experience, so peculiar that caution in the use of manures of this class should be observed. Phosphatic manures would appear likely to be of marked benefit in the case of permanent crops such as cacao and limes, and may probably be useful in the case of cotton and sugar; this latter is, however, a matter for local experiment.

In common with all the volcanic soils in these islands, the soils of Nevis are invariably markedly deficient in carbonate of lime. It is likely that, in all cases, moderate dressings of lime, when combined with the liberal use of organic manures would prove of marked benefit, and we recommend its use at the rate of 2 to 8 cwt. per acre. It must, however, be borne in mind that lime by itself is not a manure, and unless accompanied by an ample supply of manurial constituents, particularly organic matter, is liable to result in ultimate impoverishment of soils.

The majority of Nevis soils are remarkable for the considerable number of large stones and boulders that are distributed over their surfaces, and this general distribution constitutes an important determining factor in the agricultural manipulation of these soils. It is probably not too much to say, that in many instances their presence is sufficient to remove from the possibility of cultivation 30 per cent. of the arable land of the fields in which they occur. From their large size it is impossible to give expression to the effect they exert in the results of analysis quoted. Nevertheless, in reviewing the Nevis soils, it is impossible to give an adequate description of their characters without taking full account of this characteristic and peculiar feature.

Finally, attention must again be directed to the need for the free use of organic manures, such as pen manures and compost, and the growth of green dressings as an essential feature in the maintenance of tilth in these, in common with other tropical soils. In tropical agriculture all the world over, the main problem to be contended with is the rapid decay of humus which takes place, and the corresponding rapid decay of tilth that is likely to ensue in consequence. The combating of this tendency, combined with the conservation of soil moisture, must, we are convinced, always be the chief end and object of cultivation in the tropics.

To sum up, the soils of Nevis are fertile, and well adapted to the growth of all ordinary tropical crops, such as sugar-cane, cotton, and tobacco.

DISINFECTION OF COTTON SEED.

Now that the time is at hand for planting cotton for the coming crop, it might be well to consider again the advantages to be derived from the disinfection of cotton seed, and the methods to be employed.

Corrosive sublimate is a poisonous substance and a germicide. If eaten by insects, animals or persons, it is a poison in the ordinary sense, and a very powerful poison at that. As a germicide it kills bacteria, fungus spores, and similar organisms by coming in contact with them. It is used in a water solution, at a strength of 1 part of corrosive sublimate to 1,000 parts of water. To make this strength, use 1 oz. of corrosive sublimate and 7 gallons of water or 1 ℔. to 100 gallons. The poison may be dissolved in a small amount of hot water, and then poured slowly into the full amount of water. It is essential that the poison should be thoroughly dissolved in the water before the solution is used.

There are two points that must be borne in mind—one is, that the wooden tub or cask in which the cotton seed is usually soaked will probably absorb a certain amount of the corrosive sublimate, thus weakening the solution; and the other is that the seed must be thoroughly wetted, but must not stay in the solution too long. In dealing with the first of these points, the tub or cask may be prepared some time before it is proposed to disinfect the seed After it has been thoroughly washed, the tub should be filled with a solution of corrosive sublimate, 1-1,000, and left to stand a few hours. By this time the reaction between the wood and the solution will have been completed. The solution may then be thrown away, and the tub is ready for use in disinfecting cotton seed.

In order that the seed may be thoroughly wetted it is only necessary to stir it in the solution for a few minutes, when it is first put in, so that the solution may come in contact with all parts of the surface. Ten to twenty minutes should be quite long enough for thorough disinfection.

It is estimated that the cost of disinfection amounts to about one cent for 12 ℔. of seed, 1 gallon of the solution being sufficient satisfactorily to disinfect 12 ℔., and the planter should always bear this in mind. The solution is weakened by the loss of corrosive sublimate, which is absorbed by the testa or hard outer covering of the seed.

When the seed has become thoroughly wetted it should be taken out and, if it is desired, may be planted at once, without drying; but if it is not to be planted at once it should be thoroughly dried before being put in bags for storing.

There are no disadvantages to the disinfection of seed except the cost and the labour required, each of which is only a small item. The advantages to be expected are several. Seed often germinates better as a result of disinfection: it is reported that fields of cotton planted with disinfected seed suffered less from leaf-blister mite than the adjoining fields, the seed for which was not disinfected: the spores of fungus diseases are often transported with the cotton seed, and disinfection is the best means known of killing such spores and thus warding off subsequent attacks.

One of the most troublesome of the fungus diseases liable to be transported with the seed is anthracnose. This fungus causes the damping off which often kills the young cotton seedlings when only a few days above ground.

When this attack is serious, a large proportion of the seedlings may be killed. Later in the life of the cotton this fungus causes the well-known anthracnose of the boll. If the process of disinfection is carefully carried out, and the directions given herewith are observed, there ought to be no ill effects from it, but rather well marked benefits ought to be realized.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals with the Canadian Exhibitions, giving the dates at which exhibits should be forwarded, and directions are also given for packing, shipping, etc.

The notes on the Sugar Industry refer to the growing of varieties of sugar-cane in British Guiana.

Hints on Cocoa-nut Cultivation, and a short account of Mangos in Jamaica are to be found on pp. 196-7.

The disinfection of cotton seed forms the subject of an article on p. 198. This is especially appropriate just now, when the planting season for cotton is about to begin.

The Insect Notes on p. 202 give directions for distributing beneficial fungi on lime and other cultivations, and an article also appears dealing with insects and disease.

The Lemon Industry in the United States is the subject of an interesting article on p. 203.

An interesting account of the trials of ground nuts in the West Indies is given on p. 206.

Two articles relating to forests and forest products are to be found on p. 207.

The Leeward Islands Report on Sugar-cane Experiments.

The second part of this report is now issued, dealing with the experiments on the manuring of ratoon canes during the season 1907-8. It has previously been shown that under the prevailing conditions in the Leeward Islands it is sound policy to use pen manure for plant canes, and that when this is done they do not require artificial manures.

The recent experiments have had to do with ratoons following plant canes. The results continue to show that nitrogenous manures such as sulphate of ammonia and nitrate of soda are necessary and remunerative, and that phosphate and potash do not appear to be necessary. The results in this report were presented in brief and popular form in Pamphlet No. 57, published by this Department.

Fruit Inspection at Jamaica.

In connexion with the citrus fruit industry of Jamaica, it is satisfactory to note that steps are being taken in the direction of establishing a proper system of inspection for all fruit exported from the island. A special Committee of the Board of Agriculture, appointed to investigate the matter, lately made its report, in which the members recommended : (*a*) That it is desirable to prohibit the export of immature, juiceless, and improperly packed fruit : (*b*) that inspection is the only feasible way of checking, if not entirely preventing this : (*c*) that inspection should be made either at (1) the packing house, (2) in transit, or (3) at the shipping port, wherever an inspector could carry it through with least delay and most effect, the principle being to establish a wholesome uncertainty as to where an inspector might appear ; and (*d*) that as the preservation of the orange industry is for the public weal, the expenses of inspection should be met by general revenue.

Coca Leaves.

A report furnished by the Imperial Institute, London, on a sample of coca leaves (from *Erythroxylon Coca*) forwarded from Perak, Malay States, affords the occasion for a brief article on the coca plant, and the prospects connected with its cultivation for economic purposes, in a late number of the *Agricultural Bulletin* of the Federated Malay States. The coca plant is a small, bushy shrub, native to Peru and other parts of South America. It is easily propagated and cultivated, and has an economic value since the leaves furnish the drug cocaine.

The leaves sent from the Malay States to the Imperial Institute contained 0·64 per cent. of alkaloids, and were valued at from 7½*d.* to 8*d.* per lb. on the London market. At this price the culture of coca would be fairly remunerative. The production at present, however, is in the hands of but few growers, chiefly in South America, who produce just enough to meet the limited demand. If further planting were undertaken, there would be a risk of overstocking the market, and prices would fall at once.

West Indian Bulletin.

Part 1 of Volume X of the *West Indian Bulletin* has lately been issued. The first paper by Mr. H. A. Ballou, M.Sc., deals with the flower-bud maggot of cotton that has been the cause of so much trouble to cotton growers at Antigua in the past two seasons. An account is given of the investigation work that has been carried out with this insect.

The 'Composition of Antigua and St. Kitt's Molasses' is discussed by Dr. Francis Watts, C.M.G., and Mr. H. A. Tempany, B.Sc. Antigua molasses is in greater demand than that produced at St. Kitt's. This is attributed to the difference in the composition of the two products. The molasses from St. Kitt's contains less sucrose than that produced at Antigua.

In the paper 'The Passing of the Bourbon Cane at Antigua,' Mr. Tempany, gives an account of this cane, and shows the causes that have led to its abandonment.. Mr. J. R. Bovell, I.S.O., contributes an article in which a comparison is made of the Bourbon sugar-cane with the White Transparent and other varieties at Barbados.

Two other useful papers by Dr. Watts and Mr. Tempany are also contained in this number. The first is on the soils of Nevis, while the second contains a detailed account of the work in cotton selection that was done in the Leeward Islands during 1907-8.

The final article is by Mr. Walter Biffen, B.Sc., on the subject of soil inoculation in connexion with the growth of leguminous crops. In this the chief work that has been done in the past is described, and the conclusions arrived at are indicated.

Prize-holdings Competitions at Jamaica.

The reports on the prize-holdings competitions held last year in the parishes of St. Elizabeth and Clarendon, Jamaica, are published in the *Journal* of the Jamaica Agricultural Society for April, and indicate that the competitions aroused very considerable interest among the peasant cultivators. Forty-three entries were received in St. Elizabeth and fifty-seven in Clarendon—a fairly good number, although not equal to what was expected. In both parishes, it is stated that the influence of the competition was apparent on all hands in the improvements that were being carried out on the holdings. On many holdings that were entered, much useful work had been done, contributing to the permanent good of the property. It was satisfactory to note the efforts made in many cases to provide storage for water. In Clarendon numbers of small holders had erected fences around their holdings. For this purpose the judges recommended in general the use of walls, boards, barbed wire, etc., in preference to live hedges, which often provide too much shade. In Clarendon the cultivations were clean and neat, but all the competitors need to give more attention to drainage, trenching, and deep cultivation.

Disc Ploughs and Mould-board Ploughs.

The relative advantages of disc and mould-board ploughs is attracting the attention of many farmers and planters. The mould-board plough may be considered most suitable on moist or irrigated land, while the disc plough is to be preferred when the soil is dry and hard. Indeed, a special advantage connected with the disc implement, is that it may frequently be used for ploughing land that has become too dry and hard for the mould-board. This is often of much value, as it is not so necessary to wait for rain, and the seed can be planted at the proper time. On the other hand, where the land is in a fit condition for ploughing, and is not too dry, the mould-board plough pulverizes and turns the soil more satisfactorily. The disc plough is lighter in draught, does not require sharpening so often, cuts through trash better, and does not clog so easily. A 24-inch disc is best for general purposes.

Rice Production and Consumption in British Guiana.

In a report lately issued, Messrs. Wieting & Richter mention that the area that has been planted for reaping from October to December next is believed to be somewhat larger than that of last season, but that it is too early as yet to calculate on any material increase in the yield.

It is interesting to note that with the extensive increase in the cultivation of rice that has taken place of late years, there has been a large advance in the quantity consumed locally. The local consumption now reaches 360,000 bags per annum. In the West Indian islands the high quality of British Guiana rice, as compared with that imported from Calcutta, is now generally recognized, and the exports to those islands since the beginning of the year now amounted to 15,000 bags. In 1907, 29,715 acres yielded 27,150 tons of rice ; in 1908 the area increased to 37,851 acres, with a yield of 30,770 tons.

Cacao Production in San Domingo.

Cacao production forms the premier agricultural industry of San Domingo, and in 1907 the quantity shipped was 9,983 tons. During 1908 there was a considerable increase in the output, no less than 7,409 tons having been exported from Puerto Plata, alone. San Domingo possesses extensive areas admirably adapted in every way for cacao cultivation, and according to the latest British Consular report, continuous efforts are being made by both native and foreign planters to develop the industry, and it is anticipated that these efforts will soon place the republic in the second or third rank of the cacao-producing countries of the world.

The average yield of cacao per tree in San Domingo is placed at somewhat over 3 lb., and on some plantations the average reaches 4 lb. These returns compare favourably with those obtained in many other countries where more advanced methods of culture are practised.

INSECT NOTES.

Parasitic Fungi.

In the last number of the *Agricultural News*, a short account was given of the valuable assistance rendered to planters by the natural enemies of the scale insects which occur as blights on limes, oranges, and many other economic plants.

In Florida, more extensive trials have been made perhaps than anywhere else, in the use of fungi for the control of scale insects, and the whole subject has been given careful study, with the result that several species of fungi are now recognized as being parasitic on scale insects.

Methods have been devised for distributing these fungi throughout scale-infested orchards. One of these is known as the spore-spraying method. The parasitized scale insects are collected on leaves, twigs, or bark, and are carefully scraped off into clean, fresh water. The water mixture should be thoroughly stirred to separate as far as possible the fungus from the coarser part of the scale insects, and then poured through coarse muslin to remove any particles that might clog the spray nozzle

This water mixture would contain the spores and broken particles of the fungus, which under favourable conditions would grow. It should be immediately applied to scale-infested trees from a new sprayer, or syringe ; or even sprinkled on by means of a brush or wisp of bush. No sprayer should ever be chosen for this purpose which has been used for applying Bordeaux or similar mixtures, and it would be better not to use the sprayers with which the ordinary scale insect spraying mixtures have been applied.

The spraying should be very light, the greatest care being taken that the leaves and branches are thoroughly damped ; but there should be no dripping from the leaves.

Another method is the leaf-tying method. Leaves, twigs, or strips of bark covered with scales that are known to be parasitized, or that have been taken from trees where the parasitic fungi are known to be abundant, are distributed throughout trees infested with the same kinds of scales, in such a way that the spores of the fungi may easily find scale insects on which to grow. The parasitized scales should be placed fairly high in the trees, and in contact as far as possible with the healthy scales. This may be done by tying or pinning the collected material on to a leaf or branch of the trees.

These trials are, of course, best made at the beginning of the rainy season, so that the fungi may have the benefit of the moist conditions which are favourable to their growth. If a dry spell should follow immediately after the application of the fungi, it would be useful to spray with clean water, in order that they might not be dried up.

It is also likely that in those orchards where the fungi are known to be present, but where scale insects are not being held well in check, a few sprayings with clean fresh water during the dry season would prove very useful. It is in the dry season that scale insects make their most rapid development, and at that time the fungi grow slowly—if at all—so that the provision of a small amount of moisture might prove of great benefit.

This method of control is worthy of careful trial on the part of lime growers and others. Trees that are very badly attacked by scale insects might perhaps be sprayed with contact insecticides during the dry season to reduce the numbers somewhat, and then at the beginning of the rainy season the systematic distribution of parasitic fungi would probably result in keeping the scales in check through the year.

All who are interested in the subject of scale insects would do well to become familiar with their parasitic fungi.

The local agricultural officers will give all information in their power, and will forward specimens to the Head Office, where they will be examined and reported upon.

The Loss Occasioned by Insects that Carry Disease.

The United States Department of Agriculture has recently issued Bulletin No. 78 of the Bureau of Entomology, entitled *Economic Loss to the People of the United States through Insects that Carry Disease.* This bulletin is written by Dr. L. O. Howard, Chief of the Bureau of Entomology.

The introduction to Bulletin No. 78 is given herewith :—

It has been definitely proven, and is now generally accepted, that malaria in its different forms is disseminated among the individuals of the human species by the mosquitos of the genus Anopheles, and that the malarial organism gains entrance to the human system, so far as is known, only by the bite of mosquitos of this genus. It has been proven with equal definiteness, and has also become generally accepted, that yellow fever is disseminated by the bite of a mosquito known as *Stegomyia calopus* (possibly by the bites of other mosquitos of the same genus), and, so far as has been discovered, this disease is disseminated only in this way. Further, it has been scientifically demonstrated that the common house-fly is an active agent in the dissemination of typhoid fever, Asiatic cholera, and other intestinal diseases, by carrying the causative organisms of these diseases from the excreta of patients to the food supply of healthy individuals ; and that certain species of fleas are the active agents in the conveyance of bubonic plague. Moreover, the tropical disease known as filariasis is transmitted by a species of mosquito. Furthermore, it is known that the so-called 'spotted fever' of the northern Rocky Mountain region is carried by a species of tick, and it has been demonstrated that certain blood diseases may be carried by several species of biting insects. The purulent opthalmia of the Nile basin is carried by the house-fly. A similar disease on the Fiji Islands is conveyed by the same insect. Pink eye in the southern United States is carried by minute flies of the genus Hippelates. The house-fly has been shown to be a minor factor in the spread of tuberculosis. The bed bug has been connected with the dissemination of several diseases. Certain biting flies carry the sleeping sickness in Africa. A number of dangerous diseases of domestic animals are conveyed by insects. The literature of the whole subject has grown enormously during the past few years, and the economic loss to the human species through these insects is tremendous. At the same time, this loss is entirely unnecessary ; the diseases in question can be controlled, and the suppression of the conveying insects, so absolutely vital with certain of these diseases, and so important in the others, can be brought about.

LEMON INDUSTRY IN THE UNITED STATES.

Mr. G. Harold Powell, Pomologist in charge of Fruit Transportation and Storage Investigations, of the Bureau of Plant Industry of the United States, has published an interesting article on this subject in the *Yearbook* of the Department of Agriculture, under the title 'The Status of the American Lemon Industry,' from which the following remarks are taken :—

The industry commenced from a commercial point of view about twenty-five years ago, but owing to difficulties in preserving the fruit, and want of knowledge in general agricultural methods it became so depressed that ten years ago many of the groves were grafted to oranges. Now, however, owing to increased knowledge in manuring and pruning, to the extreme care practised in handling and packing, and to co-operative methods in shipping and selling, the industry has greatly revived and supplies from one-third to two-fifths of the total number of lemons consumed in the United States.

The remainder are supplied mainly from Sicily, with some from Cuba, and the West Indies. The demand for lemons is steadily increasing all over America, and at present the nurserymen in California are unable to supply young lemon trees fast enough to meet the increased demand.

The following figures show the position of the import trade in lemons compared with that of the home supply. The numbers are expressed in terms of the standard California box of 84 lb., 312 boxes making a car load :—

Year.	Foreign Imported.		Home Supply.	
	Carloads.	Pounds.	Carloads.	Pounds.
1899-1900	6,112	160,198,056	1,447	37,922,976
1902-3	5,799	152,004,312	2,649	69,424,992
1904-5	5,306	139,084,321	4,274	112,012,992
1906-7	6,023	157,859,906	3,507	91,911,456

The fruit ripens in America during the late autumn, winter, and spring, though fruit ready for picking is to be found on the trees all the year round.

The greatest demand occurs from May to September, so that the fruit must be kept in good condition and slowly ripened to meet the demand, and further it is the aim of all growers to have as heavy a harvest as possible in the summer.

The fruit is usually forwarded to the markets under ventilation from November to March, and under ice during the rest of the year. By this means, and by using great care in the ventilation of the curing sheds, the loss by 'blue mould' is almost entirely avoided, if the fruit has been carefully handled in picking.

The groves occur mostly in Southern California in the foot hills of the Sierra Madre mountains. They vary considerably in size, the average being from 20 to 30 acres. The growers prefer a deep, loamy, well drained, high piece of land protected from high winds, and with the soil free from hard pan. The groves are irrigated once a month from April to October, sometimes less frequently. The tillage is intensive from spring to late summer, when a leguminous cover crop is drilled or sown in between the trees to supply nitrogen. The land is then furrowed out in case irrigation is neccesary in the autumn or winter. The cover plot is ploughed in not later than March 1.

Fertilizers are applied to the tree at the rate of 1 lb. per tree for each year it has been planted. Two applications are generally made, one in the autumn and one in the spring. Young trees are supplied with considerable quantities of nitrogen, but as they grow older the potash and phosphorus are increased. Large quantities of stable manure are also used.

The trees are pruned in such a manner that a short bushy growth is formed. The bottom branches are kept clear of the ground, as this prevents infection by the deadly 'brown rot' fungus, which is further prevented by the use of the cover crop, as described above, since the fungus grows in the soil.

In case of frost in the winter, the growers are supplied with lines of brazers between the trees in which crude oil, briquets of shavings and asphaltum are burned, and in this way the temperatnre of the grove may be raised from 3° to 5°. When trees have been frozen, subsequent damage by rapid thawing is often prevented by making a thick smoke over the grove.

Careful spraying and fumigating to prevent insect and fungus troubles are also employed regularly. And 'brown rot' is further guarded against by using copper sulphate or potassium permanganate in the water in which the fruit is washed.

In picking the fruit a ring $2\frac{5}{16}$ inches is used. All fruit which will just pass through the ring is cut from the tree with shears and put into a canvas bag with which each picker is supplied. Smaller fruit which has ripened is also picked, together with the larger fruits which will not pass through the ring.

The fruit is then cleaned from dust and 'black mould' by passing it between two cylindrical brushes in a tank full of water. It then comes on to a canvas or moving belt table where it is sorted by hand into three grades, dark-green or unripe, silver, green or partially mature, and yellow or tree, ripened. Great care is exercised in handling the fruit. The tree-ripened lemons are shipped at once, but the others are packed carefully in standard boxes and stored in special curing-houses. Here the degree of moisture and temperature is most carefully regulated by covering the boxes with tents that can be lowered and raised in such a way that there is as little change as possible. Great care and judgement are necessary here to prevent the fruit from withering, and to enable it to ripen well.

The storage or curing-houses are generally owned by a co-operation of growers, or an association of such co-operations.

When in the curing house the fruit is carefully looked over and all fruit showing any sign of 'brown rot' or 'blue mould' are removed.

When ready for market, the fruit is carefully packed in cars, either under ventilation or under ice as mentioned above.

In conclusion, the following figures of expenditure and returns may be quoted. They are taken from a grove where very special care is exercised. The grove contains 20 acres and the total working expenses amounted to \$7,417·47 or \$370·87 per acre. The average returns for the last four years have been \$900 per car load, and this estate gave about 21 car loads ; that, is the return was about \$18,900 or a net profit of \$11,482·53.

GLEANINGS.

The West African ram sheep 'White Chief,' the property of the Imperial Department of Agriculture, has lately been transferred from Barbados to Montserrat, and his services will be available in the latter island for a very small fee.

There are about 75,000 acres under coffee in Costa Rica, and this area remains stationary from year to year. The average production of dry coffee per acre is from 5 to 6 cwt. During 1907, the total export was 17,325 tons, of a value of about $3,300,000.

In connexion with the introduction of exotic cottons into new countries, the experience of the Bureau of Plant Industry, U.S. Department of Agriculture indicates that a newly introduced exotic seldom attains its normal cropping capacity until it is acclimatized, and on an average, five years are necessary for acclimatization.

The *Bulletin of Agricultural Information*, Trinidad, reports that about 1,200 seedling canes of different varieties have been obtained from British Guiana by the Department of Agriculture. These have been planted in the best part of the St. Clair Station, and after testing, the most suitable will be distributed to planters in the island.

The damage to the cocoa-nut crop in Portuguese East Africa last year (1908) from the ravages of locusts amounted to $360,000. On a big sugar plantation along the Zambesi River more than 14 tons of locust eggs have been dug from the soil of the cane fields on an area of 2,000 hectares (about 4,900 acres). (Letter from Govt. Entomologist, P. E. A., in *Entomological News*, Vol. XX, p. 287.)

With the object of extending the amount of knowledge now generally available in connexion with the matter of cacao fermentation, *Tropical Life* has arranged to offer a prize of £50 for the best essay on the subject. The essay in question should take the form of a popular scientific treatise. Preliminary particulars of this competition are given in the May number of *Tropical Life*, but full details will be given in the June or July number.

The Queensland Acclimatization Society has for some years past been engaged in the work of raising new varieties of sugar-cane from seed. About 450 seedlings are reported as the result of last year's work. These will naturally undergo a process of examination and selection. One particular cane, Q. 116, raised some few seasons ago, seems to be the most promising. No experiments in artificial cross-fertilization have yet been attempted in Queensland.

A note in the *Journal* of the Jamaica Agricultural Society for May refers to the possibility of orange wine manufacture in Jamaica. The preparation of orange wine has often been tried in the past, but without success. It is suggested that if attention were given to the matter at the Government Laboratory, some progress might be made in the direction of turning out a refreshing drink made from fermented orange juice.

According to a recent number of the *Cuba Review*, The Cuba Mill and Furniture Co. has been organized for the purpose of manufacturing, in Cuba, building material, including shingles and doors, and also crate and cigar box material, axe and pick handles, waggons, bull carts, and a very high grade of furniture. The company has valuable timber contracts including many of the valuable hardwoods to be found in that island.

Praedial larceny is very prevalent at St. Vincent, and cotton growers have suffered considerable loss from this cause. The following remedies for checking the theft of, and illicit dealing in, cotton have been proposed to the Executive: To prohibit the selling of, and dealing in cotton locally, to appoint cotton inspectors on the same lines as at Barbados, to compel all cotton growers to furnish accurate returns of cotton planted, and to ask the Government to make arrangements for the purchase of cotton belonging to small growers, at the Central Cotton Factory, at current rates.

It will be seen from the Agricultural Notes—'St. Kitt's-Nevis'—on p. 205, that black blight is conspicuous on limes in certain districts in that Presidency. Although the same citrus crops are grown to a greater or less extent in all the West Indian islands, the prevalence of scale insects and black blight varies greatly. This variation is probably due in large part at least to the natural enemies of the scales.

The *Trinidad Bulletin of Agricultural Information* for January and April 1909 mentions that the frog hopper of the sugar-cane ha been identified by specialists at Washington as *Tomaspis Postica*. Green moulds found growing on these insects were determined to be *Oospora destructor*, and *Penicillium Anisotliae*, commonly known as the green muscardine disease.

Copies of the prospectus of Macdonald College, Quebec, which is incorporated with McGill University, have lately been received. This College contains a well-equipped Agricultural Department, at which courses of instruction ranging from two weeks to four years can be taken. The fee for instruction for students whose home is outside of Canada is $50 per session. Board and lodging costs approximately $3·50 per week.

At the regular meeting of the Antigua Agricultural and Commercial Society, June 4, Mr. Tempany the Acting Superintendent of Agriculture brought up the matter of pedigree cotton seed, and read a paper on Antigua molasses. Experiments carried out since 1906 in the selection of cotton have resulted in the production of a strain of Sea Island cotton which seems to be well adapted to the local conditions, and a quantity of this seed was offered for sale at Rooms estate. Mr. Tempany advised the planters to procure this seed for planting. Mr. Tempany also read a paper on the manufacture and treatment of molasses, and pointed out the need of the great care and greater cleanliness in handling the molasses, if the standard of Antigua molasses is to be kept up.

STUDENTS' CORNER.

JUNE.

LAST PERIOD.

Seasonal Notes.

Now that the plant canes are mostly reaped, attention turns to the fields to be kept for ratoons, and the questions of the cultivation and manuring of these fields come up for consideration. What tillage should such fields have and what manures, in what form, and when and how applied? A careful comparison of the condition of the soil under trash, and that exposed to the sun and entirely undisturbed will suggest to the mind the course to be followed. Is the soil moist and friable, or dry and hard? If in addition, a small area, say about four rows wide and ten holes long, is taken for an experiment as follows, new ideas may arise: Thoroughly pulverize the surface soil on this plot to a depth of 3 inches, not more, and work as close to the old stumps as you can conveniently. Repeat this tillage twice at intervals of a week each time, and then compare the *lower depths* of soil with the conditions found under the trash and in the open field where the soil had not been tilled since the canes were cut.

Consider carefully and try to explain the reasons for these conditions, and from your conclusions decide how ratoons should be tilled. How do these methods compare with the practice of deep forking, and deep plowing?

With the advent of favourable rains cotton planting will shortly be in progress. The process of the disinfection of seed should be well understood, as well as the reasons why this should be done even when the seed is to be planted on the same estate where it was grown.

Students should learn what is the action of corrosive sublimate, and why it is used for this purpose. What strength solution is used, and what amounts of material are used to make the required strength. It should also be noted that in general, the most successful cotton growers destroy all old cotton plants in the fields and wild cotton near the fields, before beginning to plant the new crop. Why is this done?

In lime cultivations, careful observations should be made on scale insects, and their natural enemies, especially the beneficial fungi, accounts of which have appeared in recent numbers of the *Agricultural News*, and in this present one (p. 202).

Careful consideration should be given to the soil conditions favourable to cacao and nutmegs. Do these crops both make their best developments under similar soil conditions? If not, what differences are there in the adaptability of these plants to the soil in which they are grown?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why is the æration of the soil neccesary to good plant growth? State how drainage aids æration.

(2) What is meant by cross-fertilization, and what is the object of the operation?

(3) What are the benefits to be derived from burning or burying the old cotton plants when the crop is over, and what are the risks if this is not done

INTERMEDIATE QUESTIONS.

(1) Are any parasites known to attack the moth borer of the sugar-cane in the West Indies? If so, what are they, and how do they act?

(2) How does farmyard manure benefit the soil?

(3) Are stones of any value to a soil? If so, in what way are they valuable?

It is proposed to hold an examination about October next, in connexion with the Reading courses for overseers. Candidates are advised to bear this in mind. Notice as to the exact date will appear later.

AGRICULTURAL NOTES.

St. Kitt's-Nevis.

In connexion with his visits to St. Kitt's and Nevis, Mr. Tempany, Acting Superintendent of Agriculture for the Leeward Islands, in a letter to the Imperial Commissioner of Agriculture, makes some observations of general interest on agricultural conditions in the islands, from which the following notes are taken:—

The Indian ram goat Rajah, which belongs to the Department, was then at the experiment station. Its condition and general health were excellent.

The past cotton crop in Nevis was a poor one, as was the case in other West Indian islands, though the position was better than was at first anticipated. The yield all round was expected to be about 100 lb. of lint to the acre. According to Mr. Maloney's estimate, the total area in Nevis under cotton for the coming crop will be about 1,000 acres.

The cacao on all the estates visited seemed to be in a healthy and satisfactory condition, and at Maddens in Nevis many of the older trees were blossoming well.

The vanilla, both at Maddens estate, Nevis, and Molineux estate, St. Kitt's, was doing well. It was planted along the sides of the cacao areas, the young vines being trained on posts wrapped in banana trash.

The lime cultivation in Nevis was very satisfactory, especially on the lower grounds, where the trees were doing well with but moderate attention. In St. Kitt's, however, one estate in particular showed trees of an unhealthy appearance; they were attacked by scale insects and black blight. Black blight was also conspicuous on mangos and other trees in Nevis. The cocoa-nut cultivation at Pinneys estate was making satisfactory progress, and the older trees presented a promising appearance.

A small area of sugar-canes at Molineux estate had been cultivated with implements according to the Louisiana system, as it is called. A field of B. 208 cultivated in this way presented a very healthy appearance, in contrast to the surrounding fields planted according to the method usually employed in St. Kitt's. The plants, although put in some weeks later than the neighbouring estate canes, had made far better growth, were considerably higher, showed a better stand, and withstood the dry weather better. The effect was most striking, and was visible from a considerable distance.

The broom corn machine was in Nevis, but had not been worked, as apparently its method for working was not quite clear. Mr. Tempany explained the working of the machine, and it was expected that no further difficulties would arise.

At Maddens a considerable area on the mountains side was planted in Guinea grass, which was making good growth despite the dry weather, and was expected to give satisfactory returns in a comparatively short time.

GROUND NUT TRIALS IN THE WEST INDIES.

Recognizing that ground nuts might possibly become a valuable source of profit to small holders, and others in the West Indies, the Imperial Department of Agriculture has made several efforts to encourage their cultivation on a more extended scale in many of the islands. These efforts have included the introduction and trial of a number of new varieties of nuts from the United States.

In 1907-8, seed nuts of two new varieties, 'Dixie Giant' (a nut remarkable for its large size), and 'Tennessee Red,' both of which appeared to be promising for West Indian conditions, were imported, and trial plantings were made at the Botanic or Experiment Stations in St. Vincent, St. Lucia, Dominica, Montserrat, Antigua, and St. Kitt's-Nevis. Unfortunately, however, the results—speaking generally—were not so good as were hoped for.

In the trials made at St. Vincent in 1907, 'Dixie Giant' gave a return at the rate of no more than 5 cwt. per acre, although sown in rich well-manured land. The plants were slightly attacked by a rust fungus. The few seeds of 'Tennessee Red' that were available germinated badly and died out.

At St. Lucia, in the same year, a trial was made with the 'Dixie Giant' ground nut, and 40 pints of nuts were obtained from 3¾ pints of seed. The nuts were harvested in December, but many of them germinated before they were ripe. This indicates that planting should be done at a time to throw the ripening period into the dry season—between February and May.

At Dominica, where large areas of soil suitable for the cultivation of this crop exist, the two varieties under trial in 1907 gave somewhat better results than in some of the other islands. The 'Dixie Giant' nuts, which were planted early in September, took seventeen weeks to mature, and 6½ ℔. of cured nuts were obtained from 2½ ℔. of seed. In the case of 'Tennessee Red,' 3 oz. of seed yielded 1 ℔. 3 oz. of nuts. Neither variety was attacked by any pest or disease.

At Montserrat, in the case of 'Dixie Giant,' only 4 ℔. of nuts were obtained from 2½ ℔. of seed. Moreover, many of the nuts contained shrivelled kernels. 'Tennessee Red' did somewhat better.

Fair results were obtained at Antigua with both the imported kinds in 1907. It is believed, however, that the land was unsuitable, being too heavy for the crop. The foliage of the plants was much attacked by caterpillars.

At St. Kitt's, the ground nut plants grew well, and developed a large amount of foliage. Unsatisfactory weather, however, interfered with the proper maturing of the produce.

The experiments with ground nuts were continued in 1908 at the same centres. In addition to the 'Dixie Giant' and 'Tennessee Red,' two other kinds, viz., 'Spanish' and 'Carolina Running,' both imported from the United States, were included in the trials. The 'Spanish' is a very small nut, but one that in the United States is very popular, both among growers, and on the market. It grows well on poor soil, and takes but a comparatively short time to mature its produce. The plants are of an erect habit. 'Carolina Running' is reported to be a prolific bearer in the States, and yields nuts of a fairly large size.

At St. Lucia the four kinds of nuts were planted in October 1908, but the results proved disappointing. 'Carolina Running' was the only variety which germinated well and produced a crop which was harvested on February 11, 1909. The yield was at the rate of 504 ℔. per acre.

The report on the trials made at Dominica states that the soil on which the ground nuts were grown, was carefully prepared beforehand. With the exception of the plot on which the 'Dixie Giant' nuts were planted, the soil was very light and fine in texture, which offers the most favourable conditions for this crop. The land planted with 'Dixie Giant' nuts was of a comparatively heavy nature, and this, no doubt, had a detrimental effect upon the yield of nuts obtained.

All the four kinds of nuts were sown in July. The 'Spanish,' 'Carolina Running,' and 'Tennessee Red' varieties were reaped towards the end of November, while the 'Dixie Giant' nuts did not mature till about a fortnight later. The 'Spanish' variety did best, showing a yield at the rate of 1,940 ℔. per acre. This was followed, in the order named, by 'Carolina Running' (1,137 ℔. per acre), 'Tennessee Red' (459 ℔. per acre), and 'Dixie Grant' (335 ℔.). It is mentioned that the small nuts of the Spanish variety sell in Dominica much more readily than those of larger kinds.

At Montserrat the four kinds of nuts were planted on June 26 and reaped in the last week of October, so that only four months were occupied in coming to maturity. This was probably owing to the dry weather that was experienced during the season. The yields were poor, 'Carolina Running' giving the highest return, which was at the rate of 889 ℔. per acre. 'Tennessee Red' yielded at the rate of 400 ℔., and 'Spanish' at the rate of 364 ℔. per acre. 'Dixie Giant' failed to germinate at all.

At Antigua, plots were planted with each of the four varieties. 'Dixie Giant' gave the best return—at the rate of 960 ℔. per acre. 'Carolina Running' yielded at the rate of 640 ℔., 'Spanish' 440 ℔., and 'Tennessee Red' 400 ℔. per acre. It is mentioned that in these experiments, the plants of the 'Carolina Running' variety covered the ground much better than any of the others.

Mr. Shepherd has sent in a report on the ground nut trials made at St. Kitt's in 1908. The same four kinds of nuts were planted as in the other islands to which reference has already been made. It is unfortunate, however, that the varieties, 'Spanish,' and 'Tennessee Red' were severely attacked by a fungus, and as a result only a poor crop of nuts was harvested, the yield being at the rate of about 300 ℔. per acre. In the case of 'Dixie Giant,' the nuts planted showed very poor germination, and rotted in the ground as if attacked by a fungous disease, although they appeared to be sound at the time of planting. Much better results were obtained with the 'Carolina Running' variety. The seed nuts showed good germinating power, and the ground was soon well covered by the vines. The nuts took from five to six months to mature, and gave a yield of nearly 1,500 ℔. per acre. A local variety of ground nut planted for purposes of comparison, showed a crop return at the rate of about 2,000 ℔. per acre.

Mr. Shepherd points out that in the experiments made at St. Kitt's, none of the imported varieties have yielded a return superior to that given by the local nut, but adds that some of the new kinds evidently possess certain very desirable characteristics not found in the local variety. It is apparent that there is room for selection work in this connexion, with the object of bringing about increased resistance to disease. Further experiments are to be carried out at St. Kitt's this year.

The four kinds of ground nuts in question were also tried at Nevis last year. 'Carolina Running' and 'Spanish' did best, giving yields respectively, of 1,400 lb. and 810 lb. per acre. Both these varieties matured in slightly less than four months. 'Tennessee Red' germinated fairly well, matured early, and yielded a crop at the rate of 360 lb. per acre. The 'Dixie Giant' variety failed to do well, many of the nuts rotting before coming to maturity. The total return obtained was at the rate of no more than 120 lb. per acre. A local variety, grown under similar conditions, gave a yield at the rate of 570 lb. per acre.

DEPREDATIONS BY FOREST INSECTS.

In the *Year-book* of the U. S. Department of Agriculture for 1907, an interesting and instructive article appears, entitled 'Notable Depredations by Forest Insects,' by Dr. A. D. Hopkins, of the Bureau of Entomology, who is in charge of forest insect investigations.

The bulk of the paper is made up of accounts of different species of insects in Europe and North America, and the extent of their depredations on the forests of those continents.

The introductory and the concluding remarks of the article are likely to be of interest to the readers of the *Agricultural News*, and they are given herewith.

In a review of the principal recorded depredations by forest insects in Europe and North America during the past 400 years, one is forcibly impressed with the idea that insects have exerted a most important influence on the history and modification of the forests, and thus indirectly on that of the countries themselves.

Among the natural destructive influences which have brought about changed conditions, storms, insects, and diseases have doubtless been primarily concerned in causing radical changes in local conditions, such as the successive disappearance of generations of matured trees, the disappearance of one or more tree species to be replaced by other species, or the total destruction of the forest cover.

The insects primarily concerned in depredations on living trees, and in the killing of the timber over large areas fall, according to their food and breeding habits, into two groups. One includes those species of bark-beetles and bark-boring grubs which bore in the living bark and excavate burrows and galleries through the vital cambium on the main stem or trunk, thus serving to girdle and kill the tree. The other includes those species which feed on the leaves and occur in such numbers as completely to defoliate the trees during two or more successive seasons, thus preventing the performance of the necessary vital functions of the foliage to such an extent as to cause the death of the trees.

. . . . . .

A striking feature of nearly all of the great invasions by forest insects in Europe and this country [America] has been their more or less periodical nature, and the more or less sudden check of the outbreak after a large percentage of the timber had been killed, and within two or three years after the insect had become so abundant as to threaten the total destruction of the kind of trees attacked by them. This is to be explained by various natural causes, which, however, operate only after the greatest damage has been done, and often the invasion is far beyond human control. Therefore the object in future management of forests should be to utilize the authentic technical information relating to the species involved, and the vital features in their seasonal history and habits, with a view to preventing destructive outbreaks, or promptly adopting the proper measures for their control as soon as the first evidence of the insects' presence in destructive numbers is noted. In fact, the first evidence of an outbreak of a destructive insect should receive the same prompt attention as that required in preventing the spread of an incipient forest fire. Fortunately, most of the bark-beetles can be kept under complete control, with little or no expense, by proper adjustments in forest management and lumbering operations.

The history of efforts toward the control of forest insect depredations in Europe, as well as in this country [America] shows that one of the greatest obstacles has been the failure to realize the importance of expert entomological information. This has resulted in the waste of time, energy, and large sums of money in absolutely worthless and often detrimental efforts before proper measures have been adopted and applied.

CONSUMPTION OF FOREST PRODUCTS IN AMERICA.

The accompanying article which appeared in *Science* for May 28, 1909, is likely to be of interest to readers of the *Agricultural News*, and should be considered in connexion with the editorial which appeared in a recent number (see Vol. VIII, No. 185, May 29 last) and the note on 'Depredations by Forest Insects' on this page.

It has been estimated that the amount of wood annually consumed in the United States at the present time is twenty-three billion cubic feet, while the growth of the forest is only seven billion feet. In other words, Americans all over the country are using more than three times as much wood as the forests are producing. The figures are based upon a large number of state and local reports collected by the government, and upon actual measurements. The State Forester of Connecticut, in a recent report, has supplied figures on growth and use for New Haven County, which give more details than are generally to be obtained, and illustrate how the forest is being reduced by over-cutting. In this county a very careful study was made on each township of the amount of forest, the rate of growth, and the amount of timber used. For the year 1907 the timber used was 120,000 cords, in the form of cordwood, lumber, ties, poles, and piles. The annual growth on all types of forest land, including the trees standing on abandoned fields, for the year, reached a total of 70,000 cords. Thus the amount cut yearly exceeds the growth by 50,000 cords. The amount of standing timber considered as merchantable and available for cutting within the next few years was found to be 1,200,000 cords. Each year the annual growth increases the supply on hand by 70,000 cords, while the use decreases it by 120,000. The net reduction is therefore 50,000 cords a year. If the cut and the growth remain at the present figures, the supply of merchantable timber will be exhausted in about twenty years. At the end of that time there will be a large amount of forest standing in the country, but it will be in tracts under forty years of age, containing wood below the most profitable size for cutting. Cordwood could still be cut, but supplies of the most profitable products, like ties and lumber, would be practically exhausted.

MARKET REPORTS.

London,—The West India Committee Circular, June 8, 1909; Messrs. E. A. de Pass & Co., May 28, 1909.

Arrowroot—St. Vincent, $1\frac{7}{8}d.$ to $3\frac{3}{4}d.$, according to quality.
Balata—Sheet, 2/5; block, 1/10.
Bees'-wax—£7 10s. to £7 15s. for fair to darkish.
Cacao—Trinidad, 57/6 to 68/- per cwt.; Grenada, 49/- to 57/- per cwt; Jamaica, 49/- to 56/.
Coffee—Santos, 30/9 to 32/- per cwt.; Jamaica, 38/6 to 49/-.
Copra—West Indian, £20 per ton.
Cotton—Nevis, 14d.; St. Kitt's, $12\frac{1}{2}d.$ to $14\frac{1}{2}d.$; St. Vincent, 17d. to 20d.; Antigua, 13d.; Montserrat, 13d. to $13\frac{1}{2}d.$; Barbados, $14\frac{1}{2}d.$ to 15d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 50/- to 53/-; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 69/-.
Honey—23s. to 32s. per cwt.
Isinglass—No quotations.
Lime Juice—Raw, 1/- to 1/3 per gallon; concentrated, £18 15s. per cask of 108 gallons; distilled oil, 1/10 to 1/11 per lb.
Logwood—No quotations.
Mace—Steady.
Nutmegs—Firmer.
Pimento—Quiet.
Rubber—Para, fine hard, 5s. 10d. to 5s. 11d. per lb.
Rum—Jamaica, 3/- to 3/3; Demerara, $1/6\frac{1}{2}$, proof.
Sugar—Crystals, 14/6 to 17/-; Muscovado, 15/9 to 16/-; Syrup, San Salvador, 16/-; Molasses, no quotations.

New York,—Messrs. Gillespie, Bros. & Co., May 14, 1909.

Cacao—Caracas, 12c. to 13c.; Grenada, $12\frac{1}{2}$c. to 13c.; Trinidad, 12c. to $12\frac{1}{2}$c.; Jamaica, 10c. to 11c. per lb.
Cocoa-nuts—Jamaica, select, \$22·00 to \$24·00; culls, \$14·00 to \$15·00; Trinidad, select, \$21·00 to \$23·00; culls, \$13·00 to \$14·00 per M.
Coffee—Jamaica, ordinary, $7\frac{3}{4}$c. to $8\frac{1}{4}$c.; good ordinary, $8\frac{1}{2}$c. to 9c.; and washed up to 11c.
Ginger—$9\frac{1}{2}$c. to $11\frac{3}{4}$c. per lb.
Goat Skins—Jamaica, no quotations; Barbados, St. Thomas, St. Croix, St. Kitt's, 45c. to 48c. per lb., dry flint.
Grape Fruit—Jamaica, \$4·00 to \$5·00 per barrel.
Limes—Dominica, \$4·75 to \$6·00 per barrel.
Mace—$27\frac{1}{2}$c. to $36\frac{1}{2}$c. per lb.
Nutmegs—110's, 9c. per lb.
Oranges—Jamaica, \$2·00 to \$2·50 per box, \$4·00 to \$5·00 per barrel.
Pimento—$4\frac{1}{4}$c. per lb.
Sugar—Centrifugals, 96°, 3·92c.; Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Leacock & Co., June 21, 1909; Messrs. T. S. Garraway & Co., June 21, 1909.

Arrowroot—St. Vincent, \$4·00 per 100 lb., good quality.
Cacao—\$12·00 per 100 lb.
Cocoa-nuts—\$10·00 for husked nuts.
Coffee—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., scarce.
Hay—\$1·25 per 100 lb.
Manures—Nitrate of soda, \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00; Sulphate of potash, \$67·00 per ton.
Molasses—Fancy, 17c.; Grocery, 18c. per gallon.
Onions—Strings, \$3·00 per 100 lb.; Bermuda, \$1·75.
Peas—Split, \$6·00 per bag of 210 lb.; Canada, \$3·40 per bag of 120 lb.
Potatos—\$2·60 per 160 lb.
Rice—Ballam, \$5·60 (188 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—Dark Crystals, 96° \$2·25; Muscovado, 89° \$1·85; Centrifugals, \$2·10 to \$2·30.

British Guiana,—Messrs. Wieting & Richter, June 12, 1909; Messrs. Sandbach, Parker & Co., June 11, 1909.

Arrowroot—St. Vincent, \$9·00 per 200 lb., no demand.
Balata—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
Cacao—Native, 13c. to 14c. per lb.
Cassava—60c.
Cassava Starch—\$5·00 per barrel of 196 lb.
Cocoa-nuts—\$12·00 to \$16·00 per M.
Coffee—Creole, 12c. to 13c.; Jamaica and Rio, $13\frac{1}{2}$c.; Liberian, 7c. to 8c. per lb.
Dhal—\$4·30 to \$4·50 per bag of 168 lb., weak; Green Dhal, \$5·50.
Eddos—\$1·20 to \$1·44 per barrel.
Molasses—Yellow, 23c. to 24c.
Onions—Teneriffe, 3c.; Bermuda, $2\frac{1}{2}$c. to 3c. per lb.
Plantains—16c. to 40c. per bunch.
Potatos—Nova Scotia, \$2·75 per 100 lb.
Peas—Split \$5·90 to \$6·00 per bag (210 lb.); Marseilles, \$3·00, over stock.
Potatos—Sweet, Barbados, \$1·44 per bag.
Rice—Ballam, \$5·50 to \$5·60; Creole, \$4·40.
Tannias—\$1·90 per bag.
Yams—White, \$1·40 to \$1·92 per bag; Buck, \$3·50 to \$4·00.
Sugar—Dark crystals, \$2·20 to \$2·27; Yellow, \$3·00 to \$3·20; White, \$3·60 to \$3·80; Molasses, \$2·00 to \$2·30.
Timber—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—\$3·75 to \$5·75 per M.
——Cordwood—\$2·00 to \$2·40 per ton.

Trinidad,—Messrs. Gordon, Grant & Co. June 12, 1909.

Cacao—Venezuelan, \$11·10 to \$11·30 per fanega; Trinidad, \$11·00 to \$11·50.
Cocoa-nuts—No quotations.
Cocoa-nut Oil—75c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—\$3·25 per 100 lb.
Dhal—\$4·40 to \$4·50 per 2-bushel bag.
Onions—\$1·50 to \$2·00 per 100 lb., fair demand.
Peas—Split \$5·25 to \$5·50 per bag.
Potatos—English, \$1·25 to \$1·40 per 100 lb.
Rice—Yellow, \$4·60 to \$4·75; White, \$5·00 to \$5·25 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.; Yellow crystals, \$2·50 to \$2·60; Bright molasses, \$2·25 to \$2·50.

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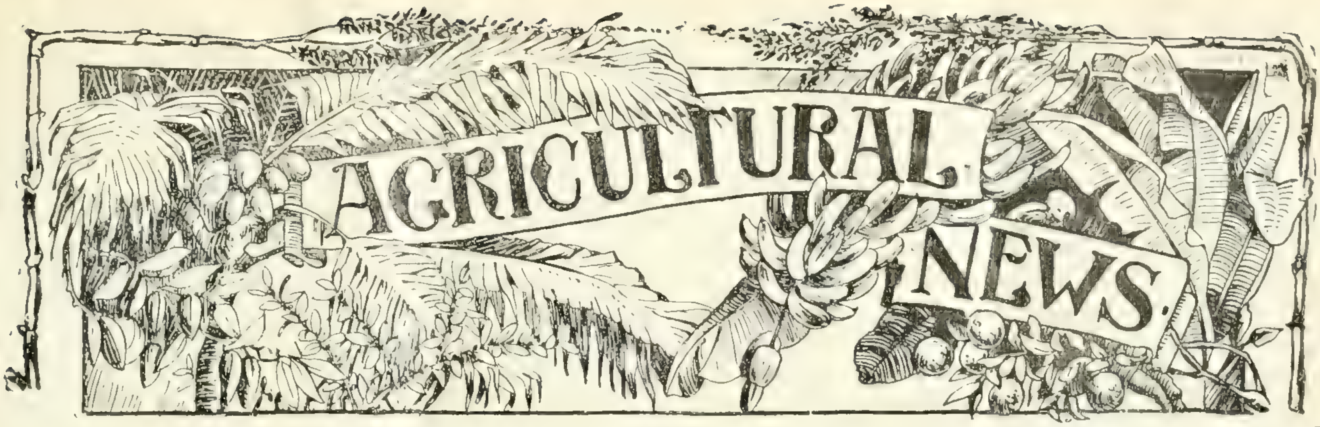


A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. VIII. No. 188. BARBADOS, JULY 10, 1909. PRICE 1*d*.

CONTENTS.

Hurricanes.

AS the hurricane season is approaching, a few notes with regard to the nature of these peculiar storms may be of interest to the readers of the *Agricultural News*.

A hurricane is a storm in which there is a great rush of air towards and around the centre, the whole mass moving slowly along. These storms originate near the equator and generally travel in a westerly or north-westerly direction, in the lower latitudes; recurve at about the latitude of the Bahamas, and take a north-easterly direction across the Atlantic. During the so-called hurricane season, storms originate at from 10 to 11 degrees north of the equator, in mid-ocean.

It will be seen from what has been said, that Trinidad and Grenada, and even some of the islands of the Grenadines, are not at all likely to encounter one of these storms. St. Vincent and Barbados, however, and all the islands to the north lie in the storm track. The origin of these storms may be explained in the following manner.

If a mass of air, practically at rest, becomes very highly heated, a strong upward current is induced, and this creates a rush of air from all directions towards the point at which this upward current leaves the earth's surface. It was discovered by Ferrel on purely mathematical grounds, that on account of the rotation of the earth on its axis, all moving bodies to the north of the equator swerve slightly to the right. This, it will be seen, would cause the rotating movement of the cyclonic storm. The rotation is thus from right to left, or in a direction opposite to the movements of the hands of a watch. South of the equator, moving bodies swerve to the left, and the rotation of the hurricane is from left to right.

In considering hurricanes it is necessary to distinguish clearly between the two distinct movements of the storm, which are known as rotation and translation. The rotation of the storm is the movement of the currents of air around the centre, and the translation is the forward progression of the whole storm along the storm track.

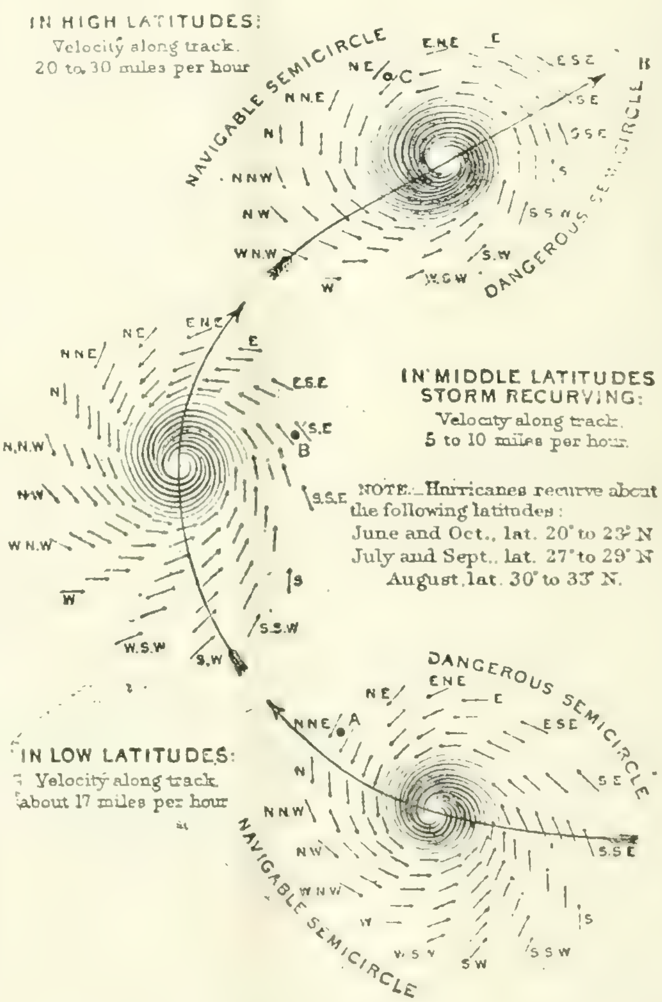
The rate at which the storm travels along the storm track (the translation) is not very great, ranging from about 10 to 17 miles an hour in these lower latitudes, but the velocity of the wind (in rotation) often becomes very great. It is not known what the limit of this velocity may be; but it has been recorded up to 120 miles an hour, with an air pressure of over 70 lb. per square inch. At the centre of the storm there is an upward rush of air, which produces the effect of a calm in the midst of the storm.

Reference to the accompanying diagram will help to make clear what has already been said about the rotating movement of the wind and the forward progression of the storm, the larger arrows indicating the latter. The small letters accompanying the small arrows indicate the direction from which the wind is blowing with reference to the storm centre.

The following premonitory indications are largely taken from the United States' Pilot Chart. Before a hurricane the barometer is somewhat higher than usual, with cool, very clear, pleasant weather; there is a long low swell from the direction of the distant storm; the sky is covered with a quantity of light feathery cirrus clouds (mare's tails) radiating from a point on the horizon, where a whitish arc indicates the bearing of the centre. If the cirrus plumes are faint and opalescent in tint, fading gradually behind a slowly thickening haze or veil, the approaching storm is an old one, of large area. If of snowy whiteness, projected against a clear blue sky, it is a young cyclone of small area, but great intensity. Great activity of movement of the upper clouds while the storm is still distant indicates that the hurricane is of great violence.

As the storm approaches, the following unmistakable signs display themselves: the barometer falls rapidly: halos are seen around the sun and moon: the ocean swell increases: the weather becomes hot, moist and oppressive, with light variable winds: deep-red and violet tints appear at dawn and sunset, tints which assume a coppery glare of ominous aspect: a heavy mountainous cloudbank on the distant horizon indicates the position of the approaching storm: the barometer falls more rapidly, and, finally, if the observations are made on or near the storm track in the West Indies, the wind begins to blow in a direction between the north-east and north-west, soon rising to hurricane force, increasing till the central calm passes, then breaking out with violence from the south to south-east.

In the diagram, the northern portion of the storm is marked the dangerous semi-circle, because in this semi-circle the wind all the time is from an easterly direction, and all such winds blow to the front of the storm. The southern half of the storm is considered the navigable semi-circle, because the wind in this portion of the storm is always from a westerly quarter, and blows toward the rear of the storm. It may be added that, owing to the usual track of these storms in these latitudes being about south-east to north-west, it follows that as soon as the word south can be used in describing the direction of the wind, the centre of the storm may be known to have passed, and the worst may be considered to be over.



It is useful for an observer on land to have a clear understanding of the manner of ascertaining the progress of the storm along its track from observations on the direction in which the wind blows, and the changes which the direction undergoes.

It is clear from what has been said, that if the observer faces the direction from which the wind is blowing, the centre of the storm lies on his right hand. If he is directly on the storm track, the wind will remain constant in direction, with increasing violence and rapidly falling barometer until the centre arrives; then there will be a short period of calm, after which the wind will suddenly begin to blow from the direction opposite to that previously experienced, and the violence will slowly abate as the centre passes away. It is essential to be on the look-out for this recurrence of wind of great violence after the passing of the central calm.

If the centre of the storm passes on the north side of the observer, the wind will steadily shift from north to north-west to west, and die away somewhere in the neighbourhood of south-west.

If, on the other hand, the centre passes on the south, the wind will steadily shift from north-north-east to east, and die away some where in the south-east.

SUGAR INDUSTRY.

Sugar Crop of British India.

An official estimate of the sugar-cane crop of British India, for the year 1908-9, has lately been issued, which contains a few points worthy of notice.

The total area under sugar-cane in the seven provinces of British India is reported to be 2,184,000 acres, which represents a net decrease of 455,200 acres, or 17 per cent., as compared with last year.

The total yield from this large area was no more than 1,841,800 tons of unrefined sugar, or considerably less than 1 ton per acre. This yield, however, shows a decrease of 10 per cent. on the total return given in 1907-8—a decline which is chiefly attributed to drought.

It is in the United Provinces that the chief sugar-growing districts of British India are situated, and here over 50 per cent. of the total sugar crop of the country is produced. In the past season, however, there was a decline of 24 per cent. in the acreage planted with cane in these provinces, the area falling from 1,481,700 acres in 1907-8, to 1,119,400 acres in 1908-9. Similarly, the total yield of raw sugar decreased from 916,700 tons to 843,700 tons. The crop suffered very considerable damage both from drought and insects in the past year.

In Bengal, which usually produces about 19 per cent. of the total sugar crop of the country, the area planted in 1908-9 is estimated at 375,000 acres, as compared with 436,200 acres in the previous year. The yield obtained shows a very large decline, having fallen from 407,800 tons in 1907-8, to 255,800 tons in 1908-9. Drought was the cause of this decrease.

About 12 per cent. of the Indian sugar crop is produced in the Punjab, and in 1908 this province was fortunate in having favourable rains. As a result, the output showed an increase of about 11 per cent. on the crop of 1907-8.

Eastern Bengal, Assam, and Madras also suffered from drought, and showed diminished crops of sugar in the past season.

Amount of Water Needed for the Maximum Development of the Sugar-cane Plant.

Bulletin No. 17, of the *Estacion Central Agronomica de Cuba*, on Irrigation, by J. T. Crawley, Director, is reviewed in the June number of the *American Sugar Industry and Beet Sugar Gazette*, from which the following notes are taken:—

The Hawaiian sugar planters have probably done more and better work in irrigating sugar-canes than any other people, and therefore the experience acquired in Hawaii as to the amount of water required for the maximum development of the cane will be of interest in all sugar-growing countries.

In Hawaii, it is not known just what amount of water is used per acre, but a good approximate estimate may be arrived at from the known capacity of the pump, and of the streams supplying water for irrigation.

Where the annual rainfall is 50 inches or less, it is estimated that 5,000,000 gallons are sufficient and this is equal to 184 inches of rainfall per annum. The 50 inches of actual rainfall and the 184 inches supplied by irrigation give a total of 234 inches.

The greater part of the rainfall in Hawaii comes during the winter, when the rate of growth of the cane is not rapid, and the evaporation from the soil is comparatively slow.

In Cuba, on the other hand, the larger part of the rain falls in the summer, a season of great heat and rapid growth and rapid evaporation, and consequently at a season when it does the greatest amount of good to the cultivations, with the result that 50 inches of rainfall in Cuba is generally of greater value to the crops than the same amount would be in Hawaii, and consequently the need of irrigation will not be as great in the former as in the latter place.

Cane is a crop that needs for its best development a large amount of water. It is given as the opinion of the writer of the bulletin that 100 inches of water, if applied at regular intervals and in quantities proportional to the needs of the cane, would probably be sufficient, but that with the loss experienced in the surface run-off and seepage, at least 125 inches are necessary for the full development.

Some modifications of these figures would however result if the nature of the soil were taken into consideration, since the power of absorption, retention of the water by the soil, and the nature of the subsoil are factors that would somewhat alter the local conditions.

The Bourbon Cane.

In the last number of the *Agricultural News*, see page 201, mention was made of the papers by Mr. Tempany and Mr. Bovell on the Bourbon cane, which appeared in the *West Indian Bulletin*, Vol. X, No. I.

It must be remembered that these papers deal with actual experience, and the statements made with regard to recent trials do not demonstrate that the Bourbon cane has entirely 'passed,' but they show that on account of the abundance of fungoid diseases, and the susceptibility of the Bourbon cane to them, this variety cannot be grown profitably in Barbados, Antigua, or St. Kitt's.

Perhaps the Bourbon may still be a profitable cane to grow in other places where the conditions are less favourable to the fungus.

The articles referred to also show that the chief superiority of the Bourbon was in the softness, low fibre content and consequent easy milling qualities, not in larger yields of cane nor of sugar, nor yet in higher sucrose content of the juice.

WEST INDIAN FRUIT.

FRUIT PRODUCTION IN THE BAHAMAS.

Fruit production is a valuable industry in the Bahamas, but it is capable of considerable further development. Some interesting notes in this connexion are contained in the report, for 1908, of the Curator of the Botanic Station, Nassau.

Pine-apples form the chief fruit shipped abroad, the value of the shipments in 1908 being £17,181. This, however, shows a great decline as compared with 1907, when exports of this fruit were made to the value of £30,614. The falling off is chiefly due to drought experienced in 1906 and 1907. Reports as to the prospects of the crop for 1909 seem to be more encouraging.

With the help of increased grants from the Legislature, the Board of Agriculture last year imported and distributed 180,000 slips of the Red Spanish variety of pine-apple. These were in most cases given to growers, on the condition that half the increase of stock for three years be handed over to the Board for further distribution. The J. S. Johnson Pine-apple Canning Company also imported 20,000 slips of Red Spanish pine-apples, which were distributed free to local growers. It is satisfactory to note that the prices obtained by growers of pine-apples in the Bahamas in 1908 were appreciably higher than in the preceding year, both at the factories, and in the United States.

Manurial experiments with pine-apples have been in progress for the past two years, the Legislature having made a special grant of £100 for this purpose. Various combinations of fertilizers are being tried, and though the experiments are not yet concluded, some satisfactory and profitable results have already been obtained in certain cases. It would appear that when nitrogen is to be applied to the crop, better results are obtained when it is given in the organic form, e.g., as dried blood, than as sulphate of ammonia, or nitrate. A good supply of potash is essential for the proper development and fruiting of the pine-apple crop, and for this purpose sulphate of potash is preferable to kainit. On the red lands, where pine-apples are largely grown in the Bahamas, the following is recommended as a good mixed manure: dried blood, 744 lb.; raw ground bone, 432 lb.; and low grade sulphate of potash, 904 lb. per acre. The experiments have already demonstrated that if the best results are to be obtained, a manure for pine-apples must be a complete fertilizer, i.e., it must contain nitrogen, potash, and phosphates.

Grape-fruit and oranges were exported from the Bahamas in 1908 to the value of £6,177, this being an increase of £3,557 on the exports of 1907. Oranges show a greater increase than grape-fruit. Both these kinds of fruit are produced in excellent quality in the Bahamas. The importance of supervision to ensure that only mature fruit is shipped, and that grading and packing are properly carried out, is referred to in the report.

There is a citrus nursery at the Agricultural Experiment Station for the purpose of supplying the best marketable varieties of grape-fruit and oranges to growers at a low price. Stocks of sour orange and rough lemon to the number of 800 were planted in 1906, and budded early in 1908 with buds of 'Marsh Seedless', Jaffa, Washington Navel, 'King', and other varieties of orange. Strong and healthy trees are now being sold at 1*d*. each.

Another point to which reference is made is the fact that enormous quantities of various fruits, such as mangos, guavas, cocoa-plum, hog plum, sorrel, etc., are annually wasted in the colony, whereas if these products were properly treated, a continuous supply of preserves would be available not only for local consumption, but also for export. These considerations apply not only to the Bahamas, but to several of the West Indian islands, and to British Guiana as well.

The establishment of a small factory in certain of the colonies would be all that is required, and this might be the means of starting a useful and remunerative industry.

Rubber-tapping Method.

The *Tropical Agriculturist* for May 15, 1909, contains a review of a report by Professor Fitting after a visit to the tropical garden at Beitenzorg to study the physiology of the bark of the rubber trees in its relation to the various methods of tapping.

His conclusions were based on the fact that sap ascends the tree through the sap wood and the elaborated food supply descends through the bast or minor wood.

If the bark is cut through to the wood, and horizontally around the tree, the supply of elaborated food may be cut off entirely from the root, with the result that the tree may be killed outright in a few years.

Professor Fitting concludes that the best results will be obtained, in the long run, by those methods which leave the widest possible area of free bark unblocked in a vertical direction, and therefore advocates such a system as the herring-bone or the half herring-bone, in which only a quarter of the circumference of a tree is tapped at a time.

THE HISTORY OF THE COWPEA.

An interesting account of the Cowpea with its history from earliest times, and an account of its introduction into the New World was published by the Bureau of Plant Industry of the United States Department of Agriculture in Bulletin No. 102, part VI, from which the following notes are taken.

It is very difficult to discover the origin of the cowpea (*Vigna unguiculata*), owing to its great similarity to other leguminous plants, and the inadequate way in which these plants were described by the ancient authors. It is, however, certain that bean-like plants were cultivated in southern Europe before the discovery of America, and it would seem that at least one of these plants resembled closely the common or kidney bean (*Phaseolus vulgaris*). Authors writing during the century after the discovery of America tried to identify the beans grown at that time with those described by Theophrastus and Dioscorides. De Candolle, in the *Origin of Cultivated Plants* doubts any such identity. It is known, however, from early accounts of discovery in America, that the natives of the New World used leguminous plants extensively.

Hariot, 1558, mentions two kinds of beans : (1) Okindguer (which was either a large form of kidney bean, or the Lima bean), (2) Wickonzour. John Smith, 1612, mentions 'pease' called 'Assentamene,' which were the same known in Italy as Fagioli. This is probably a species of *Lathyrus* or *Vicia*, and this bean, he mentions as being the same the Turks called Garnanseo, and which was probably a vetch resembling the chick-pea. Josselyn, 1675, describes four kinds of beans or peas : French beans, or rather American beans ; Bonavis, Calavances, and the kidney bean that is proper to ' Roanoke, which may be the Lima bean. Bonavis is derived from the Italian Buono vista, and was first used in America [New World] by Richard Ligon, 1657. (*A true and exact History of the Island of Barbados*: 'Maies and Bonavists planted between the boughs, the trees lying along upon the ground ; so far short was the ground then of being cleared.'

Romens, in his natural history of East and West Florida, 1775, gives the first unmistakable reference to *Vigna unguiculata* as having appeared on the mainland of America. His discussion indicates that although grown for several years in the southern colonies, in Virginia they were not cultivated, or only to a small extent, at so early a date.

Washington was accustomed to grow seeds of new plants from England and other countries that might prove of agricultural value. There is reference in M. D. Conways 'George Washington and Mount Vernon' to his planting Indian corn and potatos in intermediate rows, but no reference anywhere to the cultivation of peas or beans with corn. His first reference to cow peas is in a letter dated February 27, 1797.

Dr. James Greenway, in an article on *Cassia chamaecrista*, 1793, as a soil renovator, refers to the common corn-field pea as being preferable to anything tried for this purpose. The pea vines left on the ground quickly moulder and fall to pieces, forming a covering for the ground, which mingles readily with it.

Phaseolus vulgaris appears to have reached central Europe about 1536. Certainly a plant resembling the dwarf form of *Phaseolus vulgaris* was cultivated in Southern Europe, in the Mediterranean region, before the discovery of America.

The *Vigna unguiculata* first became known to central and northern European botanists by its being grown at Prague. These seeds were probably brought overland direct from Persia or India, and not from Italy, as it was known at Prague before Vienna.

The figure in the Vienna Dioscorides Codex, supposed to be the *phasiolus* of Dioscorides corresponds closely with the description of *Dolichos lubia*. Koernicke believes this species to have originated in central Africa, as it grows wild there. This, however, so frequently happens with plants imported into the tropics, that it cannot be taken as conclusive evidence.

Indian works refer to the ancient cultivation of *lubiya* in India, and Reede describes nine different preparations of the seed of the *Vigna catjang* which were used in medicine.

The cultivation of *V. unguiculata* extended to China at a very early date ; and at the beginning of the Christian era to Arabia, Asia Minor, and some of the European Mediterranean countries ; but did not become known in central Europe until the middle of the sixteenth century.

COLONIAL EXHIBITION.

The next Fruit and Vegetable show under the auspices of the Royal Horticultural Society will be held at the Society's Hall, Vincent Square, Westminster, December 1 to 4, 1909. The attention of the permanent Exhibition Committees, and of fruit growers generally, is called to this opportunity of exhibiting West Indian grown fruit and vegetables, both fresh and preserved, in competition with similar products from all other parts of the empire.

All entries must be in, not later than November 17, but the Secretary hopes that as many as possible will be in previous to that date.

It should be borne in mind that the exhibits are carried freight free, there is no entrance fee, no charge for space, and tabling is provided free. If desired by the exhibitor the Committee is prepared to unpack and stage the exhibits but cannot undertake to repack and return any exhibits. The Society will receive any exhibits and store in their cellars which are cool, but not cold. Mr. A. E. Aspinall, Secretary of the West India Committee, in a letter to the Imperial Commissioner of Agriculture, forwards the printed circulars of the Royal Horticultural Society, which have been issued by the Secretary. These circulars give all necessary information in regard to the conditions under which the exhibition is to be conducted and an entry form to be filled in by the exhibitor. Mr. Aspinall states that his Committee will be pleased to receive and stage any exhibits if so requested.

This would seem to be an excellent opportunity for West Indian fruit to be exhibited under the most favourable conditions, at a very low cost.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from St. Vincent on June 29 by the R.M.S. 'Esk.' Mr. Biffen also returned to Barbados by the same boat.

With the approval of the Secretary of State for the Colonies, the Imperial Commissioner of Agriculture will proceed to England on duty leave by the R.M.S. 'Magdalena' on July 13. During the absence of Dr. Watt's, Mr. J. R. Bovell, I.S.O., F.I.C., F.C.S. will sign for the Commissioner.

Mr. J. Chisnall Moore, Agricultural Superintendent of St. Lucia, has been granted six months' leave of absence, and has sailed for England.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland of Liverpool, write as follows, under date June 21, with reference to the sales of West Indian Sea Island cotton :—

Since our last report about 150 bales of West Indian Sea Island cotton have been sold, chiefly Barbados at 13½*d.* to 14*d.*, with a few St. Vincent at 16¾*d.* to 17¾*d.*, the remainder being 'Stains' at 5*d.* to 9*d.* The spinning trade is still unprofitable, and consumers are not prepared to add to their stocks at anything over present quotations.

Messrs. Henry W. Frost & Co., in their report on Sea Island cotton in the Southern States for the week ending June 19, discuss the situation as follows :—

The unsold stock of Islands now consists of planters' crop lots held here (Charleston, S.C.), or on plantations, aggregating 457 bales. The factors are still refusing to sell any of them under 30 c. and the larger proportion are held, under instructions from planters, at 35 c.

COTTON SELECTION.

As a result of careful selection of the best seed from the best plants in Antigua, Dr. Watts and Mr. Tempany came to the conclusion that external conditions of soil and climate had, in the experiments reported on, more effect on the general quality of cotton lint than selection.

As a result it is evident that in order to improve the stock in any given locality, the best plants grown in that locality should be selected for seed ; and further, the fact that a certain strain of cotton is known to give very good results in any given neighbourhood, is no guarantee that it will continue to do so in another, where the conditions of moisture and the nature of the soil may be very different.

It has been found in America that imported cottons may take three or four years to become completely acclimatized, and will not give their best results until this period has elapsed. Consequently it is better to work steadily to improve a strain that is already partially acclimatized, than to import continually new strains because they are known to have given better results in a different locality.

The authors also found in selecting seed, that the seed with lint of about 1¾ to 1⅝ inches gave the best results, as the plants produced from seed with longer lint often gave a lint that was so weak as to be practically useless. Extreme length of lint combined with evenness and strength, appears to be greatly affected by external conditions even when the best seed alone is used for planting. It seems possible, however, that a natural improvement in these qualities would be likely to take place, as a strain becomes more and more thoroughly acclimatized, provided a careful selection is practised in choosing plants for seed.

PROSPECTIVE COTTON CULTIVATION IN CEYLON.

The question of the extension of cotton cultivation in Ceylon is discussed in a *Circular* (Vol. IV, No. 19) recently issued by the Royal Botanic Gardens of that colony.

Cotton was one of the crops grown in Ceylon as early as 1838, although it was never cultivated on an extensive scale. Several leading authorities state, however, that the plant is indigenous to the island.

In 1903, an Experiment Station was opened at Maha-iluppalama, for the purpose of carrying out cotton experiments. One object of these trials was to determine whether cotton of long staple, such as is required for the Lancashire market can be grown, with or without irrigation, in the dry regions of Ceylon.

It has already been demonstrated that Egyptian, Sea Island, and Upland cottons will grow in the North Central Province of the island, but that the Egyptian variety is the most profitable. The writer of the *Circular* recommends, therefore, the advisability of fostering the cultivation of this class of cotton. Upland cotton does not command a sufficiently high price to be profitable, while the smaller yield given by the Sea Island variety, and the limited demand which exists for the finest qualities of lint, are points which lead to the conclusion that this kind would not be profitable to grow in Ceylon.

It would appear that the cultivation of Egyptian cotton under suitable conditions should be distinctly remunerative, since there is an increasing demand for this class of staple, and the variety cannot be grown in the Southern States of America, as the summer is too short to mature the crop.

As a result of the experiments which have already been conducted at Maha-iluppalama, a supply of Egyptian cotton seed, of a strain which has been grown in the colony for three years is now available. Another result lies in the demonstration which has been made that cotton of good quality and staple, worth about 9*d.* per lb., can be produced in certain districts. It is believed that with careful cultivation, at least 300 lb. of lint per acre should be obtained.

It is recognized that in order to develop and establish the industry, a good deal of selection work will have to be done. Egyptian cotton has a special quality, viz., colour—an even brown cotton always bringing the highest price. This quality is difficult to maintain out of Egypt, but most of the difficulties connected with the establishment of a fixed type can be overcome by selection.

SUPPRESSED AND INTENSIFIED CHARACTERS IN COTTON HYBRIDS.

The following are some of the conclusions arrived at by Mr. O. F. Cook, Bionomist of the Bureau of Plant Industry, United States Department of Agriculture, in a pamphlet with the above title:—

When the different characters of cotton hybrids are compared with those of the parent plants, some of them are observed to be intensified, while others are suppressed. The character may be weakened or even suppressed in one series of hybrids, and intensified in another series, as is shown by the reduction of the bractlets and lint when the Kekchi is crossed with Upland cotton, and the intensification of these characters when Kekchi is crossed with the Egyptian plant.

In the first generation of Egyptian and Kekchi hybrids the intensification of the characters which give superiority to the lint is so regular that it may be possible to utilize it in the commercial production of high-grade fibre.

Unfortunately this intensification, as also in the case of other characters, tends to disappear in later generations, so that hybrids with permanently intensified characters have not been obtained. But if hybrid seed can be obtained in sufficient quantities, this fact should not stand in the way of the commercial production of cotton from first generation hybrids.

It is also possible that the superior value of the lint and the increased crop to be obtained from these hybrids would justify the expense of special methods of breeding and cultivation.

BIRDS AND AGRICULTURE.

In an article entitled 'Does it Pay the Farmer to Protect Birds,' in the *Yearbook* of the United States Department of Agriculture, a considerable amount of information as to the usefulness of birds of different kinds is given, and mention is made of the many ways in which they may be encouraged and protected.

The following brief notes are abstracted :—

Birds as a general rule are insect eaters, and they are so persistent in pursuit of insects that they are important insect enemies, and as such should receive all consideration and protection from farmers. Insects are so numerous that the amount of green vegetation necessary for their subsistence is very great. If it were not for the birds, agriculturists would suffer much more than they do at present from these pests. Birds are particularly useful during an insect invasion, as, the more numerous the insects, the more do the birds seem capable of eating, and they devour not only the adult insects, but the larvae also. At the same time, birds are not wholly beneficial ; their good qualities however, generally outweigh their bad, and, on the whole, they must be considered as the friend rather than the enemy of the farmer. Blackbirds, for instance, destroy grain ; but, on the other hand, they consume insects in such a wholesale way that the balance is strongly in their favour.

Sparrows, unlike most birds, are not insect feeders. Their chief qualification lies in the fact that they are diligent seekers for, and devourers of seeds of weeds, and their utility depends largely on the amount of weeds and wild land in the vicinity. Unfortunately they do not confine their attention to seeds of weeds only, but often do much damage to grain crops.

There are many ways of attracting birds to the farm and about the farm house, one of the most efficient being a convenient drinking and bathing place near the house. Cats are responsible for a large number of deaths among the birds, and the farmer who rightly counts birds among his friends should see to the destruction of stray cats, and the adequate feeding of his house pets, and a reasonable restraint on their raids on nests.

For protecting crops from birds, the old methods of a scarecrow, a dead bird hung on a pole, a white cord stretched around a field, the drilling-in of seed, and the tarring of seed corn may be adopted. None of these should be employed exclusively or for too long a time in the same locality, or they become ineffective. Fruit trees may be protected by netting, or wild trees grown for the protection of orchards. The gun should be the last method employed. Hawks, crows, and even robins are often serious pests, the hawks attacking poultry. Crows and robins, in addition to their fruit and seed-eating habits, attack the nests and young of other birds. After all other means have been tried without success, it sometimes happens that one particular aggressor in a locality can be identified, and its destruction, or that of the principal offenders, may be enough to protect the poultry yard or crop. It undoubtedly benefits the farmer to protect birds, as it gives him an increased profit on his crops, and increased pleasure of living.

The Barbados blackbird is so useful that attempts have been made to introduce it into various places. The Martinique blackbird, or Tick bird, is also very useful.

MANURING WITH SUPERPHOSPHATE, AND THE PRESENCE OF LIME IN THE SOIL.

The presence of a sufficient quantity of lime in a soil to which superphosphate is applied is an important factor, since upon this depends, to a large extent, the manner in which the superphosphate is held in the soil, and the degree to which it is available for the growing crop. In his book 'The Soil' (2nd edition, page 220), Mr. A. D. Hall, F.R.S., Director of the Rothamsted Experiment Station, thus refers to this matter :—

In an ordinary soil containing a sufficiency of calcium carbonate, the application of soluble phosphoric acid, like superphosphate, will chiefly result in the precipitation of di-calcium or 'reverted' phosphate, wherever the solution meets with a particle of calcium carbonate. This di-calcium phosphate is a compound easily soluble in weak organic acids, or in water containing carbonic acid : hence the great value of applications of superphosphate on soils rich in lime, for thus a readily available phosphate is very quickly disseminated throughout the ground in a state of fine division.

On soils poor in calcium carbonate, the precipitation will be chiefly effected by the hydrated iron and aluminium compounds, and the resulting phosphates are practically insoluble in water containing carbonic acid, and but little in saline solutions, or in weak organic acids. Hence applications of superphosphate to such soils become much less available to the crop, and should be preceded by a thorough liming of the land. Even a subsequent liming on soils containing phosphates of iron or alumina will help to bring them into a more available form, because a double decomposition will take place, resulting in the production of calcium phosphate and hydrate of iron. This reaction will proceed to an extent dependent on the proportion of lime present in the medium.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in the present issue is a timely article on hurricanes, explaining how these storms are made up and how their progress and position may be determined. The accompanying diagram is very useful in this connexion.

An interesting note on the amount of water needed for the maximum development of the sugar-cane appears on page 210.

The history of the cowpea on page 213, and the article dealing with the development of new varieties on page 219, together make an interesting account of this valuable plant.

The soy bean, which is another plant useful in certain localities for green dressing, is the subject of an article on page 222.

Attention is drawn to the article on page 222 dealing with the possible poisonous effect of the wild ipecacuanha on cattle. This plant is very wide-spread in its distribution, and it would be useful to know the experience of planters.

The insect notes in this issue include short articles on the house-fly and the larger moth borer of the sugar cane (page 218).

On page 219 will be found a report by a Committee of the Jamaica Board of Agriculture, on the agricultural conditions at South Manchester, Jamaica.

Colour in Soils.

The colour of soils may vary from the almost pure white of the chalk or limestone, to the black of peat lands. The chief agents upon which this colouration depends, are humus and hydrated ferric oxide. Humus accounts for the black colouration of soils, while all the red, yellow, and brown shades are caused by the iron oxide. The blue or green colour of deep-seated clays is due to the presence of various ferrous silicates, or other salts of iron, which on being brought to the surface oxidize to brown ferric oxide.

Volcanic sands, and soils of volcanic origin are often very dark-coloured though they contain but little humus. Other things being equal, a fine soil requires more of the colouring constituents to produce a certain shade than a coarser one. Dark-coloured soils absorb more heat than light ones.

Forestry in Hawaii.

The importance of the establishment of wooded areas is generally recognized in Hawaii, and has led to a strong public sentiment in favour of forestry. This finds expression in a Territorial Forest Service, charged with the creation and administration of forest reserves, and with the prosecution of other forest work. During the past five years a definite policy has been followed in this connexion, and sixteen forest reserves have been set apart, with an aggregate total area of 444,116 acres. Of this, 273,912 acres, or 61 per cent., is land belonging to the Territorial Government. The other 39 per cent. is in private ownership, but for the most part the owners of the lands, fully aware of the benefits of forest protection, co-operate actively with the Territorial Government in the management of the forest reserves.

Paper Manufacture from Wood Products.

The following note may be of interest in connexion with the brief articles which have appeared in recent numbers of the *Agricultural News* dealing with the consumption of forest products:—

It is stated that a large New York daily newspaper uses for each day's issue 150 tons of paper. To make one ton of paper 1½ cords of wood are required or 225 cords per day for that newspaper. If the average yield of spruce, suitable for the purpose, is taken as 5 cords per acre, it will be seen that one day's issue of one paper consumes the product of 45 acres. The forest cut for this purpose may be taken as representing from twenty to thirty years' growth.

This emphasizes in a striking manner the rapid rate of consumption of forest products for paper manufacturing alone, and ought to encourage to further effort those who are experimenting in the production of paper from other material.

In the tropics bamboo, banana, cotton, and other plants have been experimented with, and the results have given a certain amount of encouragement that paper may be made on a commercial scale from these materials, provided they can be obtained in sufficient quantity in any locality where a factory might be established.

Rum Manufacture at Barbados.

From the particulars set out in the report on the Excise branch of the Customs Department at Barbados, it is seen that four rum stills were worked in the island during 1908, viz., the West India Rum Refinery, Ltd. the Premier, Carrington in St. Philip, and Mount Gay in St. Lucy.

Altogether, 228,513 gallons of rum were manufactured during the year, as compared with an output of 210,612 gallons in 1907. Of this quantity, by far the greater proportion was made by the West India Rum Refinery, Ltd., which turned out 164,923 gallons, or 78 per cent. of the whole; 28,149 gallons were made at the Premier, 19,301 gallons at Mount Gay, and 16,140 gallons at Carrington. With the exception of 4,414 gallons sent out of the island, or issued as 'ships' stores,' all the rum manufactured was consumed locally.

Tobacco Culture in South Africa.

Considerable attention has during recent years been given to tobacco cultivation in the South African colonies, since it has been demonstrated that leaf of good quality, suitable for local consumption and for export can be produced in several districts. In the Orange River colony a small tobacco experiment station was established in 1907 on the Vaal river, in the centre of the largest tobacco-growing district of the colony, and about twenty imported varieties of the plant are being tested. A small curing and fermenting shed has also been erected for treating the produce in an up-to-date manner. The seeds of the varieties of tobacco that have given the best results are being distributed to farmers in the locality.

In 1906, the value of the tobacco imported into South Africa reached £246,229, but as the result of increasing local production, the imports fell to a value of £160,238 in 1907. The exports of tobacco in the corresponding period increased from £2,403 to £4,574.

Construction of Buildings in 'Earthquake' Countries.

The question of the most suitable method of constructing buildings in countries liable to earthquake is one that is periodically discussed in technical journals. Buildings of masonry or brickwork are distinctly out of place, and it would appear that only the lightest woodwork should be used, as in parts of Japan; or, where a more permanent type of erection is needed, some method of monolithic construction should be adopted. This was recently discussed in an article in *Concrete and Constructional Engineering*, where the claims of reinforced concrete as a suitable material for building purposes in countries known to be subject to earthquake were strongly advocated. The writer states it as his opinion, that the use of reinforced concrete in its simplest forms possesses advantages superior to those which result from the employment of steel frames covered by concrete—a method largely adopted at San Francisco.

The points brought forward should be of interest to those who are rebuilding at Kingston, Jamaica, at the present time.

The late Dr. Christian Branch, of St. Vincent.

The community of St. Vincent have suffered a severe loss through the recent death of Dr. Christian W. Branch, M.B., C.M. (Edin.), Medical Officer of Health for the Kingstown district of the island. Dr. Branch, who was but thirty-nine years of age at the time of his death, had held official medical appointments in a number of the West Indian islands, including the Virgin Islands, St. Kitt's-Nevis, St. Lucia, St. Vincent, and the Bahamas. At St. Vincent, in addition to the official post already mentioned, he acted as surgeon to the hospital, and Medical Officer to the gaol. Only last year he took the course of work relating to tropical diseases given at the London School of Tropical Medicine.

Dr. Branch was a devoted worker, and took a keen interest in the many branches of scientific study bearing upon his profession. He was especially interested in bacteriology and parasitology in general. In 1902, when he first went to St. Vincent, he drew attention to the existence and spread of anthrax in the colony, and in the same year was employed by the Government to draw up a report on the disease, which included recommendations as to the most approved methods for stamping it out. Dr. Branch also prepared a paper 'Anthrax at St. Vincent,' for the Agricultural Conference held at Trinidad in 1905, which was reprinted in the *West Indian Bulletin*, Vol. VI, p. 161.

Phases of Agricultural Production.

The editor of the Experiment Station Record in reviewing the report of the United States Secretary of Agriculture mentions in one place the phases which agricultural production passes through. He says that the United States 'is passing through historical phases of agricultural production. First comes the exploitation of virgin land by the soil robber, a proceeding that is justified by the poverty of the settler or his lack of capital; next is the diminished production per acre, which surprises the farmer, and for which he is unable to account; next is the receipt of information from the scientist as to the means of improving the productivity of the land, with slow response; in the course of time, especially when the next or perhaps the third generation takes the farm, important advances are made, at first irregularly and mostly on the farms of the leading farmers, and subsequently with increasing diffusion and accelerated speed.'

This is of interest to the agriculturist in the West Indies, where the various phases mentioned above can all be seen. There are the islands where the virgin land is being exploited, there are the islands or the localities where the diminished returns are being obtained, and there are the planters who, listening to the advice of the scientific agriculturist, are experiencing the slow betterment of estate conditions.

INSECT NOTES.

The House-fly, or Typhoid Fly.

The following note on the house fly or typhoid fly, as it is being more commonly called, is from the editorial page of the June number of the *Journal of Economic Entomology*, and will serve to show how seriously the situation is being taken by the sanitary authorities in cities and localities where typhoid fever is likely to appear in epidemic form :—

An extraordinary campaign against the typhoid or house-fly is now in progress. Magazines, weeklies, and dailies are cheerfully giving much space to exposing the true character of the insect. Satire, denouncement, and exhortation are all being employed. Municipalities here and there are adopting much-needed sanitary regulations designed to reduce the numbers of this nefarious fly. The Merchants' Association of New York City, and some other associations, as well as numerous individuals, are giving much time and effort to this most commendable work. The control of this insect is an entomological problem, since efficient repressive work must be based upon adequate knowledge of the habits of the fly, and the way these may be taken advantage of to reduce the numbers of the pest in the most economical manner. The sanitarian and the medical man are both in position to give cogent reasons for the suppression of this long tolerated menace and nuisance. Special pains should be taken to encourage every good feature of the movement, and at the same time care exercised to avoid everything which may appear like an over-statement of facts. This campaign, if it is to be successful, must be conducted along common-sense lines, and the necessity of attending closely to details emphasized most strongly. Otherwise there may be a disappointing reaction, which may result in a serious set-back to home sanitation, not to mention the continuance of needless suffering and loss of health and life.

The Larger Moth Borer, or Cane Sucker.

In October 1904, Mr. G. N. Bethune, manager of Plantation Enmore, British Guiana, sent to the Imperial Department of Agriculture, specimens of a larger Lepidopterous insect, which has since been identified as *Castnia licus*. Mr. Bethune stated that, at that time, this insect was a severe pest, since on account of its enormous numbers and its great size, it was doing great damage to the sugar-cane on that plantation.

The larvae attain a size of about 2½ inches in length and about ½ inch in diameter. The tunnels which they excavate in the canes and in the underground parts of the stool are of great injury, not only resulting in the loss of much sugar, but also causing the death of the stools and preventing a ratoon growth. Reference is made to the notes published in the *Agricultural News* (see Vol. 3, p. 426, and Vol. 4, p. 26), and to the paper read by the Entomologist on the staff of the Imperial Department of Agriculture at the Agricultural Conference at Trinidad in January 1905, which was published in the *West Indian Bulletin*, Vol. 6, p. 41. The Hon. B. Howell Jones sent specimens to the Bureau of Entomology of the United States Department of Agriculture, from which notes and drawings were made, which appeared in Bulletin 54, p. 72 of the Bureau of Entomology. *Castnia licus* has received the common names of the larger moth borer, in the publications of the Imperial Department of Agriculture, and the giant sugar-cane borer by the United States Department of Agriculture.

The Bulletin of Agricultural Information for January to April 1909, issued by the Department of Agriculture, Trinidad, contains notes and drawings of this pest, to which the common name cane sucker is given. It is stated that although long known to occur in that island, it is now recorded as a pest for the first time. It is known to attack sugar-cane and banana, and it is believed to feed also on the soft internal portion of several palms. *Castnia licus* was originally reported as having been bred from Ochidearum, and it is of common occurrence throughout the northern parts of South America and in Central America.

The remedies are the catching of the adults, and plugging the holes in the cane stumps immediately the canes are cut, with mould or clay to prevent the emergence of the adult. It is stated that in one district in Trinidad 25,000 moths were caught from November 1908 to February 1909.

The cutting and grinding of attacked canes will cause the death of a large proportion of the larvae. Carbon bisulphide is found useful injected into the burrow.

CATALASE OF SOILS.

Messrs. D. W. May and P. L. Gile, of the Porto Rico Agricultural Experiment Station, have been conducting experiments on the power possessed by soils of giving off oxygen from hydrogen peroxide solutions. This power is due to an enzyme of vegetable origin known as catalase. They found that the amount of catalase depended on the amount of humus and of bacteria and mould fungi present in the soil. Consequently a measure of the amount of catalase in any given soil is also a measure of the dead and living organic material it contains.

The amount of the catalase present is determined by measuring the time taken by 5 grammes of the soil in evolving 100 cubic centimetres of oxygen from 60 c. c. of neutral 92 per cent. peroxide at a constant temperature, and with constant shaking of the flask in which the reaction is progressing. This was found to be the only method of obtaining reliable results, as the time required was found to be affected by the temperature, the volume and concentration of the hydrogen peroxide and the amount of shaking the flask received, as well as by the alkalinity or acidity of the hydrogen peroxide solution. The usual method of estimating catalase by measuring the amount of oxygen evolved by a given weight of soil from a definite amount of hydrogen peroxide is valueless, as a small amount of catalase will decompose as much peroxide as a larger amount within certain limits, though the rate is slower. The method of comparison based on measuring the volume of oxygen evolved in a given time was also found unreliable.

Artificial manures are without effect on the catalase content of the soil. But carbon bisulphide and high temperatures can destroy part of the catalase.

The power of evolving oxygen is also possessed by certain forms of iron and aluminum found in some soils, but this has very little effect on catalase determinations.

AGRICULTURE IN SOUTH MANCHESTER, JAMAICA.

As a result of the liability to drought from which the district of South Manchester, Jamaica, suffers, agricultural conditions in that region are in an unsatisfactory state, and this was lately made the object of enquiry by a Committee of the Jamaica Board of Agriculture, in the hope that some means might be found of improving existing conditions. The report of this Committee was submitted to the Board of Agriculture at a recent meeting.

It is suggested in the report that the small settlers of South Manchester might make greater efforts to obviate the effects of drought in certain seasons by increased attention to quick-growing and drought-resisting grain crops, like varieties of peas, beans, and corn—especially Guinea corn—all of which can be stored for a considerable time, as is done in the dry districts of Trelawny. Cassava would also be a useful crop to grow, since it could be stored as farine.

The Committee consider that every endeavour should be made to encourage the people to make the most of the crops now growing there (*a*) by improving their methods of cultivation, and ways of harvesting and marketing their crops; (*b*) by keeping live stock suitable to their means and conditions, i.e., cows, goats, sheep, or rabbits; and (*c*) by the careful use of manure saved from such stock by penning and feeding.

Coffee is the staple crop of South Manchester, and the Committee recommend that this cultivation should be encouraged, and every effort made by the Agricultural Instructors to introduce improved methods of cultivation, pruning, mulching, and manuring, and also to bring about co-operation for the sale of the produce.

The drought-resisting character of cassava, its usefulness as an article of food, and the fact that it can be exported in a manufactured form, make it a desirable crop to be encouraged in South Manchester, and if its cultivation could be established on a large scale, it would, in a great measure, provide a solution of the difficulty of finding a good ready-money crop for the dry districts.

Since a good water supply is of the greatest importance on holdings—both for agricultural and household purposes it is recommended that more and larger tanks should be advocated and encouraged.

It was also recommended that demonstrations or experiments be carried out on cultivators' own holdings under the Agricultural Instructor for the district, and that a sum of money for this purpose might be asked from the Government, to provide necessary expenses. A sum of £25 might enable ten such plots to be taken up in different parts of the district for one year. Longer experiments and more plots—involving the expenditure of a larger sum of money—would be still more effective.

While the Committee recognized that it does not always pay to take oranges to distant markets from South Manchester after the middle of October, it points out, in the report, that since orange trees are already established all over the district, experiments might, with advantage be directed towards inducing the trees to fruit at an earlier period, when there is a good demand and a larger price, on the same lines as are successfully carried through on several private groves. No expense would be involved in such experiments, but only a small outlay of time and effort on the part of the owners of the orange trees.

COWPEAS.

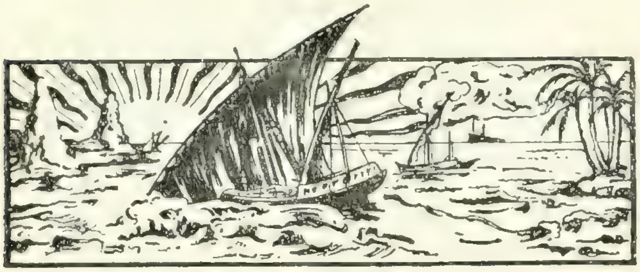
In the *Yearbook* of the United States Department of Agriculture for 1907, there is an article entitled 'Some New Work of the Bureau of Plant Industry,' from which the following notes on the production of new varieties of cowpeas are copied:—

The cowpea is one of our most important crops, especially for the Southern States, and is coming to be looked upon as the clover of the South. Although there are numerous varieties of this important crop, nearly all of them fail in some important particular to give satisfactory results. Either the vines produced are too long and they are consequently difficult to harvest, or the leaves drop off early, or else they fail to set seed properly. Again, it is found that many of the varieties are subject to diseases of various kinds, both the parts above and the parts underground being affected. It seems very desirable, therefore, to secure two or three new types of cowpeas which may be planted generally throughout the Southern States and which under varied conditions of soil and climate will mature a good crop of seed in such a way that it may be readily harvested by machinery, if necessary, and also will have characteristics of growth that will enable the farmer readily to harvest a crop of hay if hay is desired; types, furthermore, that shall be resistant to the various root diseases, will hold their leaves well, and will produce seeds which are able to maintain their vitality for a considerable time.

The ideal cowpea is one which is disease-resistant, early fruiting, has an abundance of seed, and is strictly upright, or bush in habit. To obtain the desired characteristics many of the most promising varieties have been flowered, crossed, and fruited, in the greenhouse during the late winter and spring months. In this way it is possible to get two crops annually, thus reducing by one-half the time when the work will approach completion. The second, and especially the third generation plants in the open field in several instances have shown very satisfactory progress toward ideal forms. Some of the crosses between the Indian variety and the Iron cowpea and between the former and the Unknown variety show some surprising results. The last-named cross made vines much larger than either parent, and larger than any of the numerous established varieties in the same field. The major portion of the plants was too late in coming into fruit. About 10 per cent. of these seedlings came into bearing early, however. This habit of early bearing of the plants is accompanied by an upright habit of growth, with scarcely any long trailing shoots. The fourth generation of these hybrids will be tested the coming season.

A peculiar feature in our cowpea hybrids is that many of them do not change the colour of the seeds in the first, second, and third generations. Others again, such as the Whippoorwill-Iron and Red Ripper-Iron crosses, split up during the third generation into as many as twelve very dissimilar sets of peas. The Whippoorwill and Iron crosses are in every way satisfactory, in so far as earliness and abundance of pods are concerned. Only a very small proportion of the third generation plants come near our ideal of a bush plant, however.

In conclusion, it may be said that while this work is progressing satisfactorily, and while results of interest have been secured, the Department is not ready to distribute seeds or plants that have been developed. It is believed that some of these things may be safely sent out at an early day, however, and when they are ready, special descriptive circulars will be prepared, and the plan of distribution properly announced.



GLEANINGS.

A sum of $7,000 has been appropriated in Cuba, by the Government, for expenses in connexion with the campaign against bud-rot disease in the cocoa-nut groves of the island.

The Dominica Agricultural and Commercial Society has made a grant of £5 to the trustees of the Public Library at Roseau to assist in defraying the cost of purchasing standard works on general and tropical agriculture.

Mr. H. H. Cousins, M.A., Director of Agriculture for Jamaica, has proceeded to England on leave, and during his absence Mr. W. Harris, F.L.S., Superintendent of Public Gardens, will act as Director of Agriculture.

It is mentioned in the latest annual report of the Dominica Agricultural and Commercial Society that an additional eleven members were elected during 1908, and that at the end of the year the membership stood at 117, as compared with 106 in 1907.

As a result of the unfavourable conditions which have prevailed in connexion with the Antigua cotton industry in the last two seasons, the Agricultural Society of the island recently passed a resolution praying the Governor to reduce the tax on land under cotton cultivation to 1*s.* per acre.

There have been 186 sugar factories in operation in Cuba during the past season. Of these, seventy-two are of Cuban ownership, thirty-six of American, seventy-six English, French, and Spanish ownership. The average area of canes associated with each factory is about 4,500 acres, and the average output of sugar about 8,100 tons. The sugar acreage of Cuba has doubled within the past ten years.

In reference to the prize of £50 to be offered by *Tropical Life* for the best essay on the subject of the changes undergone by cacao during fermentation (see last issue of *Agricultural News*, page 204) the editor of that journal has written to the Imperial Commissioner of Agriculture, stating that this sum of £50 has been raised by subscription, and that the whole amount has now been guaranteed.

Soy beans were tried last year in some experiments carried out by the Department of Agriculture of the Orange River Colony. The plants are reported to stand drought well, and they grew to a height of about 2 feet. Over 480 lb. of seed per acre was gathered, and it is stated that this plant gives promise of value both as a forage crop, and for green manuring.

The weekly shipments of bananas from Dutch Guiana amount at present to from 12,000 to 13,000 bunches. During the first five months of 1909, there were shipped altogether 229,526 bunches, as against 219,663 bunches during the corresponding period of the previous year. (*Demerara Argosy.*)

Cassava is grown on a considerable scale in the Philippine Islands, and the roots are utilized in the manufacture of starch. About 11 tons of roots constitute an average return per acre, and from these a yield of about 34 per cent. of starch is obtained, i.e., about 8,000 to 10,000 lb. of starch per acre.

Sellers of fertilizers and feeding stuffs in Trinidad are required by an Ordinance recently enacted to take out an annual licence. This licence is granted only to residents in the colony, but is issued without charge. It may be cancelled if the holder has been twice convicted of adulterating the produce in which he deals.

A Berkshire boar which was imported from the Royal Farms, Windsor, England, in 1904, by the Imperial Department of Agriculture, and which is now to be seen at the Botanic Station, Grenada, is offered for sale. Applications to be made to Mr. George F. Branch, Acting Agricultural Superintendent, Grenada.

Mr. A. Davenport, a Dominica planter, advertises that he is offering for sale 5,000 budded orange plants, of the 'Washington Navel' variety, and 500 budded grape-fruit plants of the 'Triumph' variety, all well matured. These plants are offered at 6*d.* each, delivered in Roseau, and 1*s.* each, f.o.b., for deliveries abroad.

Of the total sugar area of the Hawaiian Islands, 105,000 acres (about 50 per cent.) have been reclaimed from practically arid land, entirely through private enterprise, and by means of irrigation, magnificent crops are now produced. The cost of reclamation, with the provision of irrigation plant, was about $140 per acre.

Experiments in rice cultivation have been carried out in parts of Queensland, and these are reported to have shown that grain of excellent quality can be produced under the conditions which prevail there. Labour is more expensive in Queensland than in most other rice-producing countries notably China and India, but it is stated that this difficulty has been largely overcome by the introduction of special self-binding rice harvesters.

At the meeting of the Committee of Management of the Grenada Agricultural and Commercial Society held on April 23 last, the report was received of the Judges on the Prize Holdings Competitions in the parish of St. John's. There were 20 entries, divided between the classes as follows: 4 in Class I, 2 in Class II, and 14 in Class III, all in the Grand Roy-Concord District. The Judges state: 'We have much pleasure in being able to testify to the really excellent work that is being done on the small holdings that were entered in this competition. Sixteen out of nineteen competitors obtained 40 marks and over; 45 being full marks.'

STUDENTS' CORNER.

JULY.

First Period.

Seasonal Notes.

All fields on which cotton is to be grown and which are not planted by the end of June should be planted as soon as possible, and students would do well to note the difference in yield, on the average, of fields of cotton planted at an early date and those planted late in the season. A sharp look-out should be kept for the attacks of the cotton caterpillar, and students should try and learn something of its life-history, and the time it takes to mature after the egg is hatched, and not accept the statement made by some of those who have failed to be on the look-out for the first attack of this pest, that 'they came during the night,' or that 'they were brought by the lightning.' As soon as the caterpillar is observed on the cotton plants, they should be dusted with a mixture of Paris green and lime at the rate of 1 lb. of Paris green to 6 lb. of lime. Students should carefully observe the growth of the cotton plants in the fields, and healthy and vigorous plants which are free from either fungoid or insect pests, growing among cotton that is attacked, should be marked, and if when the bolls are mature the lint is of good quality, the seed from these plants should be kept for planting.

In Antigua, keep a specially careful watch for the flower-bud maggot. Note if the picking of the flaring bracts and the application of manurial fertilizers keep this pest in check. Land is being prepared for onions; note the methods of cultivation. When first planted, ants will carry away the seed; see whether a wineglassful of kerosene to 3 gallons of water sprinkled on the seed-bed during the first two or three days after planting will keep these pests away.

Young lime plants will be planted. These are not always planted the same distance apart; why should this be? Why should land that is being prepared for eddos be cross-holed. Note the quantity of manure given to this crop, the subsequent growth and yield.

At the beginning of the quarter, Indian corn will in some instances be planted, and students should observe the ease with which blackbirds pull up the young corn when the soil has not been well pressed down at the time of planting, and their ineffectual attempts to pull up corn on which sufficient pressure was put at that time. Students should also be on the look-out for individual plants of Indian corn bearing more than one, long, well-filled ear, and when the corn is ripe the ears from these should be kept for seed. This is a matter of some importance, as it has been found in the United States of America that the selection of seed has added considerably to the yield. Note should also be taken of any individual plants that have not been attacked by the caterpillar, which does so much injury to Indian corn at that time of the year, when the remainder of the field has to a great extent been denuded of its leaves, and the seed from these saved.

Students should also note the difference in yield between sweet potatos grown from cuttings obtained from potatos planted for the purpose, and those grown from cuttings that had been taken from other potatos grown from cuttings for some time. They should note whether in fields attacked by the scarabee there are any varieties immune, and in that case, they should be careful when replanting to take cuttings from the varieties found to be free from the insect attacks.

Questions for Candidates.

Preliminary Questions.

(1) Why is there less risk of loss by drainage with sulphate of ammonia than with nitrate of soda?

(2) What is meant by propagation by 'circumposition?' Which class of plant cannot be propagated by this method?

(3) What are the functions of leaves, and the action of light upon them?

Intermediate Questions.

(1) To what is the plasticity of clay due? Does this resume its plastic character if moistened after burning?

(2) Why is pasture land frequently burnt? What effect has this on the grasses growing thereon?

(3) Name the principal insect pests of the sugar-cane, and their treatment.

READING COURSES EXAMINATIONS.

It is proposed to hold examinations in connexion with the Reading Courses for Overseers in October and November as follows:—

Preliminary Examinations will be held on October 11, and on November 2.

All students who have been taking the reading courses and have registered according to the regulations issued last year, are cautioned that if they wish to sit in either of the coming examinations they must notify the Agricultural Officer in the island in which they reside, stating clearly which examination they wish to take, or if it is desired to take both, this fact should be stated.

It must be remembered that no candidate will be allowed to sit in the Intermediate examination who has not passed the Preliminary.

The Diploma of Harrison College, Barbados, in Agricultural Science, or a certificate showing that the candidate has successfully passed the Cambridge Local Examinations in Agriculture, will be accepted as the equivalent of the Preliminary examination.

Candidates who may pass the Preliminary examintion on October 11, will be allowed to sit for the Intermediate on November 2, provided that they have previously notified the examiners of their intention to do so. It must be borne in mind that candidates for the Intermediate examination must take two crop subjects, and these must be notified when they signify their intention to sit for the examination.

WEST AFRICAN OIL PALM.

The *Kew Bulletin* (No. 4, 1909) contains an article on the economic aspects of the oil palm cultivation industry in West Africa, the information having been supplied by officers in Nigeria, Sierra Leone, Gambia, and the Gold Coast. It is mentioned that the chief factors affecting the habitat of the palm are a rainfall of more than 70 inches, and a soil rich in humus, but well drained. Regular plantations of the palms are only occasionally met with, as among the Krobos of the Gold Coast, but there is no difficulty in raising young plants. The method of tapping the palms for 'wine,' which tends to the destruction of numbers of plants, is described. At the present time, and until transport facilities are improved, the sources of supply are stated to be more than adequate.

THE SOY BEAN.

The Acting Government Chemist and Superintendent of Agriculture for the Leeward Islands, has sent in the accompanying article on the soy bean, its characteristics, and methods of cultivation, which has been prepared by Mr. G. A. Jones, Acting Science Master at the Antigua Grammar School.

The soy bean, which is probably a native of China, is the most important legume of China and Japan, and its cultivation is rapidly spreading to other tropical and subtropical countries.

Its remarkable high percentage of protein and fat, its heavy yield both of bush and seed, and its capacity for resisting drought, while it is not easily injured by excess of moisture, are some of its outstanding features.

This bean has been cultivated in China and Japan from the earliest times. Later, it was introduced to India and Europe where for a time at least it excited considerable interest. It has been cultivated in the United States for many years, and during the last sixteen years has been grown extensively for experimental purposes, and its great value as a crop clearly brought out.

The soy bean, which is often, but incorrectly called the 'sojah bean,' is described as being an erect annual plant with hairy stems; trifoliate, hairy leaves; inconspicuous flowers, pale lilac or violet in colour; self pollinated (an advantage when a new plant is introduced into a district, since the yield is thus made independent of insects). The pods are broad and hairy, containing two to five seeds, the colour of which varies from white and yellowish to green and black. Under favourable conditions the plant may grow to a height of 4 feet.

There are a number of varieties of this bean, differing mainly in the time of ripening and the colour of the seed.

The soy bean grows best on medium soils well supplied with phosphoric acid, potash, and lime. Poor soils in several cases have, however, produced quite fair crops. Experiments in both America and Europe show it to possess excellent drought-resisting powers, enduring dry weather much better than other beans and peas. Further experiments show that the soy bean is also able to survive a period of excess of moisture better than other leguminous crops grown on adjacent land.

The soil must be well cultivated, and the surface soil worked into a fine tilth before sowing. The seed may be sown in drills, or broadcast.

The yield from the soy bean, both in seed and bush, varies according to conditions, and between 9 and 12 tons of bush seems to be the average. It is a prolific seed producer, from 25 to 30 bushels of seed per acre being about the average.

The chemical analysis of the soy bean shows it to contain 30 per cent. of proteid, and 17 per cent. of fat. This compares most favourably with other leguminous seeds, e.g., cowpeas, which contain 21 per cent. of proteid and 1·4 per cent. of fat. The quantity of proteid is not greatly less than that found in cotton seed meal, and the quantity of fat is very considerably higher. These figures show its great value as a fodder. The seed is best fed when ground to a meal and mixed with some other feeding stuff rich in starch.

When used as a green fodder it gives excellent results. For this purpose it should be cut between the period of early bloom and early seed. It is most suitable for milk production, considerably increasing the quantity of the milk.

As a soil renewer, the soy bean, like all other leguminous crops, has the power of being able to assimilate for its own use, a supply of nitrogen from the air, through the agency of the tubercle-forming bacteria that dwell in the roots of the plants. The manurial value of a crop of soy beans compares very favourably with that of other leguminous crops grown as green dressings.

When the soy bean, or any other bean or pea, is introduced for the first time into a locality, it does not always form root tubercules owing to the absence of the tubercule organism from the soil. The beans should be grown several times on the same land until these tubercules appear. After this there should be no difficulty in establishing the crop wherever desired, for the infected soil could be used for inoculating fresh land. No doubt this will account for the small growth of bush which this crop is recorded to have produced at the Botanic Station and several estates in Antigua and other West Indian islands.

It is hoped that every effort will be made to ensure that this plant, which has proved such a valuable crop in many other countries, may be established in the West Indies.

The Possible Poisonous Effect of Wild Ipecacuanha on Cattle.

A question has lately been raised as to the poisonous effect on cattle of the wild Ipecacuanha (*Asclepias curassavica*), or as it is variously known, bloodflower, wild ipecac, Johanna, and redhead. Several cattle in St. Kitt's have died after grazing on land where the plant was known to be growing, and individual plants showed signs of having been eaten by the cattle.

In an article entitled 'Poisonous weeds in the Springsure District,' by Mr. J. F. Bailey, Assistant Government Botanist, published in the *Queensland Agricultural Journal* for 1900, mention is made of the possible poisonous effect of this plant on cattle. The plant, among others, is reported as having been grazed on during the passage of some 300,000 head of cattle through the district, and several of the cattle subsequently died. The evidence, however, is incomplete, as most of the effect is attributed to a local cycad (*Macrozamia Moorii*), whose leaves are very hard and sharp.

The question is of considerable importance, in view of the wide-spread occurrence of this plant in the West Indies. Up to the present, no other instance is on record of its causing harm to cattle, and any information on the subject would be of interest.

The plant has been carefully removed from the land in St. Kitt's, and it is stated that the number of deaths among the cattle shows a corresponding decrease. Taken in connexion with the fact that the juice of the Asclepiadaceae is generally considered to be poisonous, this seems to be fairly strong evidence in support of the idea that the Ipecacuanha is responsible for the death of the stock.

It would be useful if planters and others would bring forward any suggestions or observations which they may have to make on this subject by communicating with the Imperial Department of Agriculture, with the object of arriving at some more definite conclusion.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of May:—

Business in spices and drugs has shown some general improvement during the month of May, in spite of the fact that the effects of the long anticipated and delayed budget began to be felt in many directions, notably in the drug trade, affecting as it does such articles as chloroform, ether, fluid extracts, tinctures, fruit juices, etc., by the extra duty of 3*s.* 9*d.* imposed on proof spirit. Directly, however, no interference has been made with any raw product of the West Indies coming under recognition in these notes.

GINGER.

A good supply of Jamaican, amounting to 815 packages, was brought forward at the first spice sale on the 5th of the month, 104 packages of which were sold at prices ranging from 2*s.* to 3*s.* below those obtained at previous auctions. The quotations were as follows: 58*s.* to 59*s.* for fair washed, and 50*s.* for small dull. Cochin and Calicut were represented by 300 packages, all of which were bought in at the following prices: 50*s.* for unsorted native cut, and small medium; 42*s.* 6*d.* for brown rough Calicut, and 40*s.* for washed roughed Cochin. Some limed Japan was also offered and bought in at 23*s.* per cwt.

At an auction on the 12th, only 250 bags of good washed rough Cochin were offered, all of which were bought in at 42*s.* per cwt. West Indian green ginger, of which 4 barrels were brought forward, realized 25*s.* per cwt. In the following week as many as 1,098 barrels and 235 bags of Jamaica were brought forward, but only 180 packages were sold. Good bold fetched from 65*s.* to 68*s.*, fair washed 59*s.* 6*d.* to 64*s.*, bold 61*s.*, and dull washed from 55*s.* to 58*s.* The rest was bought in at the following prices: Small cut Calicut 55*s.*, unsorted native cut from 55*s.* to 57*s.*, medium cut 60*s.*, rough washed Cochin 40*s.*, limed Japan 32*s.*, and Bengal 30*s.*

At the last auction on the 26th, Jamaica was represented by 112 barrels and 75 bags; the sales, however, were limited. Middling to good bright was sold at 61*s.* to 67*s.*, and ordinary to good ordinary at 51*s.* to 52*s.* 6*d.* Common ratoon realized 47*s.* to 49*s.*, while Calicut was bought in as follows: fair washed at 42*s.*, and brown rough at 41*s.* Washed Cochin was also offered and bought in at 42*s.* per cwt.

NUTMEGS, MACE, AND PIMENTO.

The dealings in nutmegs have been quiet throughout the month, calling for no special remarks. The same may be said with regard to mace, as far as the early part of the month is concerned; but at the spice auction held on the 26th, some 50 packages of West Indian were disposed of at the following prices: good, 1*s.* 9*d.*; pale and reddish, 1*s.* 7*d.* to 1*s.* 8*d.*; and fair red 1*s.* 6*d.* to 1*s.* 7*d.* per lb.

The demand for pimento was quiet throughout the month. At the auction on the 19th, out of 130 bags offered, 10 bags were sold at 2*s.* per lb. for fair. A week later 5 bags only were offered, and all sold at the same price.

ARROWROOT.

One hundred and twenty barrels of St. Vincent were brought forward at the auction on the 19th, and disposed of at 2*d.* per lb. A week later some 50 barrels were offered, 10 of which were sold at $1\frac{7}{8}$*d.* for ordinary manufacturing.

SARSAPARILLA.

At the first drug sale on the 6th, sarsaparilla from all sources was put forward in great bulk, as many as 152 packages being offered. Thirty-two bales of genuine grey Jamaica were all sold at the following rates: Fair, good, slightly rough, 1*s.* 4*d.* to 1*s.* 5*d.*; very ordinary rough, and common rough dark, 1*s.* 1*d.* per lb.; while 71 bales of Lima-Jamaica found purchasers at 1*s.* to 1*s.* 1*d.* for ordinary part rough to fair, and at 11*d.* to $11\frac{1}{2}$*d.* for dark rough. Twelve bales of native Jamaica were offered, and 11 sold at 1*s.* 1*d.* to 1*s.* 2*d.* for good red, and 11*d.* for yellow.

The prices realized were considered very good, especially in view of the fact that some of the grey and Lima-Jamaica showed signs of having been packed while in a damp condition.

Twenty-one bales of Guatemala and 16 of Honduras were also offered at this auction, and were bought in.

On the 19th, again there was a good supply of grey Jamaica, native Jamaica, and Lima. Out of 41 bales of the first named, 38 were sold at 1*s.* 4*d.* to 1*s.* 5*d.* for fair to good; part slightly rough, and coarse rough realized 1*s.* 2*d.* to 1*s.* 3*d.* Only 14 out of the 31 bales of native Jamaica were sold, fair red fetching 1*s.* 2*d.*, and dull red and yellow mixed 10*d.* to 1*s.* Six bales of Lima-Jamaica were offered and bought in at 1*s.* 2*d.* per lb., and 5 bales of Mexican were disposed of at $4\frac{1}{2}$*d.* per lb.

CASSIA FISTULA, KOLA, AND OIL OF LIME.

At the first sale in the month, 11 bags of Dominican Cassia Fistula were offered and disposed of at 17*s.* 6*d.* per cwt., part of which were good bold pods, and part dark and mouldy. On the 20th, 21 bags of Dominican of a similar character were again offered, and sold at a lower rate, viz., 16*s.* 6*d.* per cwt.

At the first sale some 20 packages of small dried Jamaica kola were offered and held at 2*s.* per lb., and at the same sale 5 cases of distilled Dominican oil of lime were offered, and 3 sold at 1*s.* 8*d.* to 1*s.* 11*d.*

Thirty packages of West Indian tamarinds were brought forward on the 19th, 12 of which, of good pale juicy Barbados, were held at 12*s.* 6*d.*, while 18 packages of rather dark Antigua were disposed of at 8*s.* in bond.

RICE IN BRITISH GUIANA.

The latest report issued by Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated June 25 last, contains the following notes:—

The weather during the past fortnight has been very wet and unfavourable for milling, and no cleaned rice has been received from the small mills in the country.

The area that has been planted with rice in the colony is somewhat greater than last year, but we fear that the heavy and continuous rains that are being experienced are injuring the young plants, and there are already complaints from a few districts that several acres have been lost through flooding.

Shipments to the West Indian islands during the fortnight amount to about 3,000 bags, principally for Trinidad and Barbados.

We quote to-day, f.o.b. Demerara, for good export quality: 17*s.* $10\frac{1}{2}$*d.* to 18*s.* $10\frac{1}{2}$*d.* per bag of 180 lb. gross, and 16*s.* $4\frac{1}{2}$*d.* to 17*s.* $4\frac{1}{2}$*d.* per bag of 164 lb. gross.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, June 22, 1909; Messrs. E. A. DE PASS & Co., June 11, 1909.

ARROWROOT—St. Vincent, $1\frac{7}{8}d.$ to $3\frac{3}{4}d.$, according to quality.
BALATA—Sheet, 2/4½; block, 1/9½.
BEES'-WAX—No quotations.
CACAO—Trinidad, 54/- to 65/- per cwt.; Grenada, 50/- to 56/- per cwt; Jamaica, 49/- to 56/.
COFFEE—Santos 30/10½ to 32/- per cwt.; Jamaica, 41/- to 94/6.
COPRA—West Indian, £20 per ton.
COTTON—St. Vincent, $16\frac{3}{4}d.$ to $17\frac{1}{4}d.$; Barbados, $13\frac{1}{2}d.$ to $14d.$
FRUIT—No quotations.
FUSTIC—No quotations
GINGER—Common to good common, 48/- to 51/-; low middling to middling, 52/- to 58/-; good bright to fine, 60/- to 67/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/- to 1/3 per gallon; concentrated, £18 15s. per cask of 108 gallons; distilled oil, 1/11 per lb., nominal.
LOGWOOD—No quotations.
MACE—Firm, and in good demand.
NUTMEGS—Steady.
PIMENTO—Firm.
RUBBER—Para, fine hard, 6/1½-; fine soft, 6/- per lb.
RUM—Jamaica, 3/- to 3/5; Demerara, 1/6½, proof.
SUGAR—Crystals, 14/9 to 16/9-; Muscovado, 12/- to 16/-; Syrup, Trinidad, 10/6; St. Lucia, 12/3 to 12/6; Surinam, 12/6 to 12/9; Molasses, no quotations.

New York,—Messrs. GILLESPIE, BROS. & Co., June 11, 1909.

CACAO—Caracas, 12c. to 13¾c.; Grenada, 12½c. to 13c.; Trinidad, 12c. to 12½c.; Jamaica, 10c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, \$24·00 to \$25·00; culls, \$15·00; Trinidad, select, \$22·00 to \$23·00; culls, \$15·00 per M.
COFFEE—Jamaica, ordinary, 7¾c. to 8¼c.; good ordinary, 8½c. to 9c.; and washed up to 11c.
GINGER—9½c. to 12c. per lb.
GOAT SKINS—Jamaica, no quotations; Barbados, 55c.; St. Thomas, St. Croix, St. Kitt's, 45c. to 48c. per lb., dry flint; Antigua, 50c. to 52c.
GRAPE FRUIT—Jamaica, \$5·00 to \$6·00 per barrel.
LIMES—Dominica, \$4·00 to \$5·00 per barrel.
MACE—28c. to 35c. per lb.
NUTMEGS—110's, 8¾c. per lb.
ORANGES—Jamaica, \$1·50 to \$1·75 per box.
PIMENTO—4⅝c. per lb.
SUGAR—Centrifugals, 96°, 3·92c., Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., July 3, 1909; Messrs. T. S. GARRAWAY & Co., July 5, 1909.

ARROWROOT—St. Vincent, \$3·80 to \$4·00 per 100 lb.
CACAO—\$11·21 to \$12·00 per 100 lb.
COCOA-NUTS—\$10·00 for husked nuts.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., according to quality—scarce.
HAY—\$1·15 to \$1·25 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00; Sulphate of potash, \$67·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, \$1·80 to \$2·50 per 100 lb.; Bermuda, \$1·00
PEAS—Split, \$6·00 per bag of 210 lb.; Canada, \$3·40 to \$3·50 per bag of 120 lb.
POTATOS—\$3·50 per 160 lb.
RICE—Ballam, \$5·50 (188 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.; Demerara Ballam, \$4·70 to \$5·00 per 180 lb.
SUGAR—Dark Crystals, 96° \$2·22½; Muscovado, 89° \$1·75; Centrifugals, \$2·20 to \$2·30.

British Guiana,—Messrs. WIETING & RICHTER, June 26, 1909; Messrs. SANDBACH, PARKER & Co., June 25, 1909.

ARROWROOT—St. Vincent, \$9·00 per 200 lb., no demand.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. to 50c. per lb.
CACAO—Native, 13c. to 14c. per lb.
CASSAVA—60c.
CASSAVA STARCH—\$6·00 per barrel of 196 lb.
COCOA-NUTS—\$12·00 to \$16·00 per M.
COFFEE—Creole, 8c. to 13c.; Jamaica and Rio, 13½c.; Liberian, 7c. to 8c. per lb.
DHAL—\$4·40 to \$4·50 per bag of 168 lb., weak; Green Dhal, \$5·50.
EDDOS—\$1·44 per barrel.
MOLASSES—Yellow, 21c. to 22c.
ONIONS—Teneriffe, 2½c. to 3½c.; Bermuda, 2½c. to 3c. per lb.
PEAS—SPLIT \$5·90 to \$6·00 per bag (210 lb.); Marseilles, \$3·00, over stock.
PLANTAINS—16c. to 36c. per bunch.
POTATOS—Nova Scotia, \$2·40 to \$2·75 per 100 lb.
POTATOS—Sweet, Barbados, \$1·44 per bag.
RICE—Ballam, \$5·50 to \$5·60; Creole, \$4·25 to \$4·40.
TANNIAS—\$1·44 per bag.
YAMS—White, \$2·40 per bag; Buck, \$2·64.
SUGAR—Dark crystals, \$2·25 to \$2·27½; Yellow, \$3·00 to \$3·10; White, \$3·60 to \$3·80; Molasses, \$2·00 to \$2·30.
TIMBER—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—\$3·75 to \$5·75 per M.
——— Cordwood—\$2·00 to \$2·40 per ton.

Trinidad,—Messrs. GORDON, GRANT & Co., June 26, 1909.

CACAO—Venezuelan, \$11·15 to \$11·30 per fanega; Trinidad, \$11·00 to \$11·50.
COCOA-NUTS—No quotations.
COCOA-NUT OIL—76c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 9c. per lb.
COPRA—\$3·25 per 100 lb.
DHAL—\$4·30 per 2-bushel bag.
ONIONS—\$1·25 per 100 lb., fair demand.
PEAS—SPLIT \$5·25 to \$5·50 per bag.
POTATOS—English, \$1·25 to \$1·40 per 100 lb.
RICE—Yellow, \$4·50; White, \$5·00 to \$5·25 per bag.
SUGAR—American crushed, \$5·10 to \$5·20 per 100 lb.; Yellow crystals, no quotations; Bright molasses, no quotations.

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CONTENTS.

Green Dressings and Their Application.

I. THE EFFECT ON THE BURIED PLANTS.

THE practice of the application of green dressings to soils is one which has existed from the earliest times: in fact, the first records of any rules which have been made for the regulation of agricultural operations show unmistakably that the value of burying green plants in the soil for the benefit of future crops was fully recognized many centuries ago. That this conclusion, reached empirically though it was, is not at fault, has been proved again and again by the most rigid methods of modern scientific investigation. Thus a feeling of security in the following of the practice has resulted and, in many cases, where no account has been taken of local conditions, actual serious harm has accrued from it. Like all other agricultural operations, that of the application of green dressings is one which is governed by complex, rather than simple, considerations.

It is evident that the results of such a method of manuring, as far as subsequent crops are concerned, depend on two factors: (1) the effect on the buried plants, (2) the effect on the soil. As a matter of convenience, the subject will be dealt with in relation to these two factors. It is not within the scope of an article like the present one to give illustrative examples, so that reference is made to the chapter on Green Manuring in Professor J. G. Lipman's * *Bacteria in Relation to Country Life*, pp. 237-63, where a very complete account of the practice may be found.

That the plants used in green dressings must undergo great changes before they can be of any use to the crops which they are intended to benefit is a matter of common knowledge. These changes take place through the action of bacteria, and, owing to adverse conditions, they may be delayed, or even affected in such a way as to render the action of the manure positively harmful. This is the case in light, as well as in heavy, soils. In the first instance, the fact that such soils are liable to quick drying may, in the event of this taking place, so interfere with the normal bacterial action as to cause the buried material, when the soil becomes wet again, to lose its most valuable

* The Macmillan Company, New York, 1908.

constituent—nitrogen—instead of undergoing those changes which would render that element more available. In the second case, an excessive rainfall, or insufficient drainage, will induce a formation of acid substances which will act as a preservative against that decay upon which the material absolutely depends for its effectiveness.

For reasons which are closely connected with what has just been stated, green dressings should never be buried deeply. The depth of cover may be greater in light soils than in those which are heavy. The same considerations govern the procedure when it is a question of applying the dressing when fresh, or after it has been dried. A soil with a large water-holding capacity is more likely to induce beneficial changes in the dried, than in the green, material, while, on the other hand, a light, well-drained, sandy soil will show the opposite tendency. Nevertheless, with some crops, and under the best conditions, fresh green dressings and dry green dressings show an equal efficiency as providers of nitrogen.

Setting aside other considerations, as far as the crop which is intended to provide the green dressing is concerned, the best time to apply the latter is when it just reaches maturity; that is to say, at fruiting time, when about half of the leaves have turned yellow, for at this period the plant has reached the limit of production for that season. An additional reason for not allowing the manuring crop to stand too long is that the water-content of the soil may be reduced to such an extent as to decrease the number of beneficial bacteria to a degree which will inhibit its proper action when it is eventually ploughed in.

Such a consideration, however, namely that of the age which the manurial dressing should reach before it is applied to the land, is governed by another important factor. In soils in the tropics, where bacterial action takes place very quickly, there is a danger that the food which has been rendered available to plants and which, consequently, has become all the more soluble, may be largely washed out of the soil before the crop which is intended to benefit by it has reached the stage when it is capable of taking it in. Thus it is unmistakably indicated that, under the climatic conditions of the West Indies, land which has been treated with green dressings must be put to use soon after their application, in order that loss due to wastage may be avoided as far as possible.

Dependence is often placed merely upon one or two kinds of plants for the provision of green dressings. This should not be so, especially where there are facilities for raising, and experimenting with, a number of different sorts. The diseases and pests to which various plants are liable have very distinct limitations in respect to each kind of plant, and it is reasonable to conclude that several different kinds of plants, raised on a given area, are likely to give a much better yield than one or two varieties. In the matter of leguminous plants, the consideration is further advanced. A reference to the article on 'Soil Inoculation' in the *Agricultural News*, Vol. VIII, No. 184, of May 15, 1909, will make it plain that different leguminous plants require different varieties of bacteria for the purpose of nitrogen-fixation, and that, therefore, the raising of as many kinds of those plants as is possible in a given area of soil will result in the largest employment of the bacteria which are present for that purpose.

It requires little consideration to reach the conclusion that, as buried plants are dependent upon the action of certain bacteria for the production of useful plant food from them, any means of increasing the number of those bacteria in the soil will make the efficiency of such buried plants all the greater. This theoretical consideration receives practical support from experiments which plainly show that the admixture of pen manure with the dressings before ploughing in, even in proportions too small for the manure to have any action, of itself, in increasing the yield, has hastened and directed the decay of the green crop in such a way as to cause the maximum benefit to be derived by the one which succeeded it.

The action of bacteria, then, is the chief determining factor in the changes, eventually beneficial or otherwise, which are undergone by green dressings. That this action is of paramount importance in the matter under review will be rendered all the more evident in the next article which, as has been stated, will deal with the effect of the buried plants on the soil.

An interesting tropical parallel to the well-known 'clover-sickness' of soils in England is instanced in the *Annual Report of the Experimental Work of the Dharwar Agricultural Station*, 1907 (Department of Agriculture, Bombay). This was furnished by the ground nut, which, of course, like clover, is a leguminous plant. It was found that the cultivation of that crop on the same land in two successive years has a decidedly injurious effect on the yield in the second year, for the same varieties sown on a piece of land which had not been under the ground nut in the preceding year gave much higher returns.

SUGAR INDUSTRY.

Seedling Sugar-canes in Louisiana

An article by Mr. W. R. Dodson. Dean of the College of Agriculture and Director of the Experiment Station of the Louisiana State University, is published under the above title in the report of the American Breeders' Association, from which the following facts are taken :—

The sugar-cane season in Louisiana only lasts for about nine months in the year, and consequently, the main object of the planters is to obtain a cane which will grow rapidly and mature early, while possessing at the same time a high sugar-content, and giving a good yield of cane per acre. Attempts were first made to improve the sugar-content of the canes by selecting for planting only canes which showed a high percentage of sugar when a portion of each of them was analysed. These experiments, however, gave no results.

When, however, seedling canes had been obtained in the West Indies, some of the new varieties were imported, and found to give much more satisfactory results than the canes usually grown, D. 95 and D. 74 being found particularly well adapted to the subtropical conditions in Louisiana. The climatic conditions are such that it is impossible to obtain arrows from the canes in the field in Louisiana, and all attempts to grow canes for this purpose under glass were completely without success.

Attempts were next made to germinate imported seeds on the spot, so that they might be acclimatized from the beginning. These trials were unsuccessful until 1907, when Mr. A. E. Weller succeeded in producing canes from seed, as a result of very careful methods of planting and growing. These seedlings were obtained from seed coming from almost all parts of the world. The seedling canes themselves are small and of very little value, but the results appear when these canes are planted, the second generation canes being well-grown and of good sugar-content. They cannot, however, be tested on a large scale until the third year, so that no field results are yet forthcoming, though several of the canes produced from the seedlings gave great promise when analysed individually.

Last year Mr. Weller obtained numerous seedlings, chiefly from seed produced in Trinidad, Barbados, Hawaii, and Demerara. These experiments give very fair promise that the stock of canes in Louisiana can be considerably improved.

New Companies in Jamaica.

The information contained in the following article has been taken from a newspaper account which appeared in a recent issue of the *Barbados Advocate* :—

Two new schemes for the agricultural development of Jamaica have been recently brought forward, each of which seems at present to have every prospect of success. The first deals with sugar production only. It originally arose out of the renewed activity among those interested in sugar in Jamaica, which resulted from the signing of the Brussels Convention. The first intention was to erect a sugar factory in St. James, but this project was interfered with by the disturbance caused in commercial circles by the earthquake of January 1907. Since then, the scheme has been revived, and the capital for it, a sum of £20,000, has been subscribed already. The situation of the factory will be to the south-east of Montego Bay, and within 2 miles of that place. The company will be responsible for an advance to cultivators of £5 for every acre of cane-land guaranteed, and for a payment of 12s. per ton of cane sent to the factory. The growing of canes by the company itself is conditional : it will be undertaken only in the event of there being a deficiency in the supply from the cultivators who have come in under the scheme.

The second company has a much wider scope than the one which has just been described. It will not confine its attention to sugar alone, but will have additional interests in rum, logwood, fustic, mahogany, bananas, pimento, cacao, cassava, Guinea grass, and Para grass, so that there will be an unusual diversity in its operations. It has been formed under the name of the Jamaica Estates and Rubber Plantations Company, Limited, with a capital of £300,000, half of which has been subscribed already by a syndicate of French banking houses.

The area over which the company will extend its operations is 29.971 acres, and includes fourteen estates. Mr. Charles Mc.Neil B.Sc., of the firm of John Mc.Neil & Co., Engineers, Govan, has made a visit to Jamaica for the special purpose of gaining the information necessary to enable him to report on the sites and equipments of the sugar factories, to be constructed under the scheme. He advises the erection of several small, rather than a few large, central factories, the number of them to be six, each capable of dealing with 20,000 to 25,000 tons of canes, at a total cost of £80,000. According to the report of Mr. W. Fawcett, recently Director of the Botanic Gardens, Jamaica, the average yield of cane from each acre of land in that island is 22 tons. It is estimated by Mr. Mc.Neil that at least 1 ton of 96° crystals and 112 gallons of rum will be obtainable from 18 tons of canes. It is also estimated that the cost of production of 1 ton of sugar and a puncheon of rum will be £10 16*s*. According to the prospectus, the Directors have concluded that, with sugar at £11 per ton and rum at £11 13*s*. 4*d*. per cask, the profit for every 18 tons of canes grown, should be £11 17*s*. 4*d*.

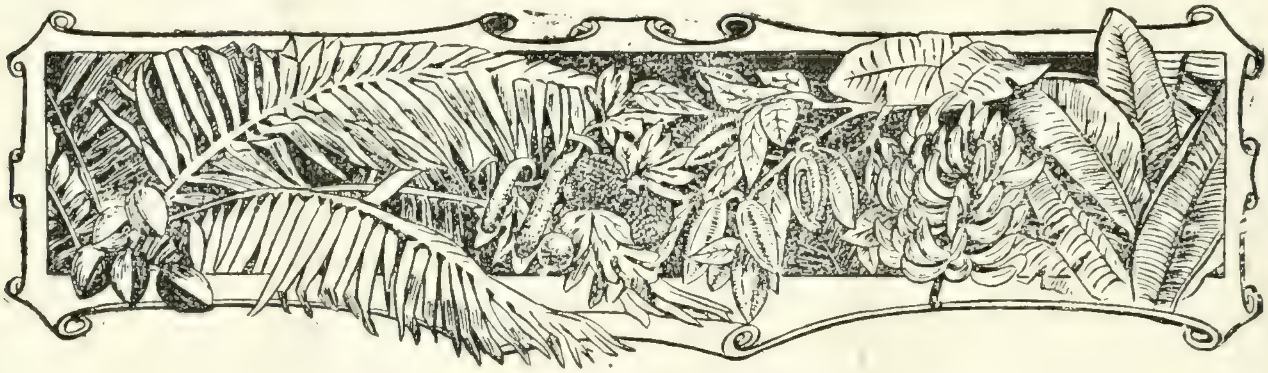
The transference of those estates which are to be taken over will take place in time for the company to be in full control for the 1909-10 crops. When this is complete and the central factories are all in operation, the area of land under cane cultivation will be 5,000 acres, leaving over 24,000 acres for rubber and other products

The directorate includes Sir Henry A. Blake, G.C.M.G., Sir Edwin Cornwall, M.P., Lord Osborne Beauclerk, the Rt. Hon. Lord Teynham, D.L. J.P., and Mr. Joseph Nolan, M.P.

A correspondent writes from Antigua : 'I note that, on page 131 of the *Agricultural News* of May 1, 1909 (Vol. VIII, No. 183), reference is made to experiments which are being conducted at the Porto Rico Experiment Station in connexion with the inducement of a change from staminate to pistillate flowers, in the case of the papaw, by the removal of the terminal bud.

It may be pointed out, in that connexion, that this is a common practice in Antigua, the removal of the terminal bud being effected by the rough method of cutting horizontally through the trunk of the tree at a distance of a few feet above the ground. Afterwards, a flat stone is placed on the wound, presumably in order to prevent injury.

A possible explanation of the fact is that, as female organs in plants, are often, in the presence of a large supply of food, produced to the partial or entire exclusion of male ones, the plant food which has been stored in the stem affords the stimulus which leads to the change.'



WEST INDIAN FRUIT.

THE NORMAL AND ABNORMAL SEEDLINGS OF THE MANGO.

In connexion with the article on 'The production of more than one Seedling from a Single Seed of the Orange and Mango', published in the current volume of the *Agricultural News* on p. 187, the following remarks may be of interest.

In the article referred to it was shown that the abnormal seedlings were of the nature of vegetative buds formed from the nucellus of the seed, and consequently, would breed true to the parent plant, while the normal seedling was the product of cross-fertilization and could not therefore be expected to come true.

Mr. Jones, Curator of the Botanic Station, Dominica, has furnished the following interesting information in connexion with this point. He says :—

'I have raised a large number of mango seedlings for stocks at various times, and I have noticed that the majority of varieties in Dominica are normal. Occasionally adventitious seedlings are formed.

'One point in connexion with this is worth noting. When several seedlings are produced from one seed, one seedling, evidently the normal one, is stronger than the rest. It has usually twice the size and much greater vigour than the others, which are probably adventitious. Should this prove correct, it means that the adventitious seedlings which may probably breed true, can be selected when in the seed beds. This would be very important. It also explains why there is hardly a case on record where good varieties, which produce both normal and adventitious embryos, breed true ; for it is certain that the weak seedlings, probably adventitious, are discarded for the strong seedlings, probably normal'.

This point should be tested by growing the weak seedlings of such varieties until they bear fruit, when it can be seen whether they have come true to the original stock or not. The same could be done with the strong seedlings which would not be expected to breed true.

In order to shorten the time necessary for these experiments, the following method, for inducing the trees to bear while still very young, might be adopted. This suggestion is also due to Mr. Jones. He finds that the shock caused by grafting and heading back will in some cases cause the stock to bear fruit when only twenty months old. Others have found that twisting the top of the stem or damaging it in any similar way will also produce the same result. In this way the seedlings may be tested while still very young

Mr. Jones further suggests that 'it would be of interest to know if varieties such as Père Louis and No. 11, which breed true, produce adventitious seedlings in clusters of equal strength, the strong normal seedling being absent'. These seedlings might also be tested to determine if they were all adventitious, or if a normal seedling is really present, though exactly resembling the others.

Should it prove to be the case that no normal seedling is present, it would point to the fact that in such varieties, which breed true, normal fertilization does not take place, and consequently, all the embryos are formed by budding from the nucellus.

In the mango, the increase in size of the fruit is attended by a decrease in size of the stone, and consequently of the reserve food material that the embryo has to draw on. This suggests that the better varieties with larger fruits are less likely to produce adventitious embryos than those with poorer fruits. This point, also, might easily be investigated, and the results would prove of interest as indicating whether attempts to grow improved varieties from seed were likely to meet with success or not.

THE OIL ENGINE FOR LIME-CRUSHING MILLS.

The following information on the advantages of the oil engine in producing power for lime-crushing is obtained from notes which were received from Mr. G. Downing, Lisdara, Dominica, through the Curator of the Botanic Station in that Island. These advantages are stated to arise both in the simplicity of the structure and working of the engine itself, and in the matter of the attention and fuel required for that purpose, as the following excerpts from the notes show :—

The construction of the engine (a 5-horse power horizontal *Hornsby*) is simple ; it is not likely to get out of order : it is compact, and is economical to work, burning, as it does, a low grade rock oil. The fuel consumption is very small ; it makes little noise ; is easily handled, and, once started, requires little or no looking after, for the oil is automatically fed into the vaporizer by the engine itself when running. When starting, it takes about ten minutes to heat the vaporizer, and then the engine is ready for use.

The engine economizes space, time, labour, and trouble ; its price is reasonable, and the workmanship excellent.

As is pointed out, such an engine should be specially useful in places where the supply of water is limited.

THE ORANGE THRIPS.

The *Experiment Station Record* for May 1909, reviews part 7 of *Bulletin 12, Technical Series*, Bureau of Entomology, United States Department of Agriculture, entitled The Orange Thrips, by D. Moulton.

The author presents a description of *Euthrips citri*, a species new to science, which has become a very important orange pest in the southern San Joaquin Valley of California. Curled and thickened leaves and scab-like markings on the oranges have been known for from ten to fifteen years, but these injuries have only recently been attributed to the thrips. While the quality of the fruit does not appear to be affected, yet, as oranges are graded and sold largely on appearance, many thousands of dollars have been lost annually.

There are apparently two broods of *E. citri*. 'Adults of the first brood appear just before the blossoms in February, March and April, and a second brood appears in July, August, September and October. Adults and larvae of the first brood feed on the small oranges just as the petals are being thrown off, the larvae usually under the protection of the sepals, and on the first growths of the foliage. The second brood feeds on the nearly mature oranges, and on the third and fourth growths of the foliage. All varieties of oranges and lemons are attacked, but the very noticeable scabbing on fruit is common only on the navel orange; it is less conspicuous on the Valencia'. That the thrips are not so prevalent on trees planted in sedimentary or loam soils as where the soils are of a clayey or adobe texture is explained in the protection afforded by the latter soil to the larval, pupal and early adult stages, which are presumably passed in the soil.

A strong tobacco extract and the cheaper soap washes are suggested as remedies.

PRE-COOLING.

In the *Agricultural News*, Vol. VII, No. 161, p. 200, mention was made of a process known as pre-cooling, the purpose of which is to keep fruits in as good a condition as possible during transit. The following additional information on the subject is afforded in a report, by the British Consul at Chicago, on the method as it is used by the Southern Pacific Railway in California:—

The process consists in rapidly refrigerating fruit, vegetables and other perishable goods at the point of shipment in the cars in which they are to be transported. The chief of the advantages of this process is that the product so pre-cooled is allowed to become thoroughly ripe before shipment; and the transportation of any fruit or vegetable, however delicate it may be, for a long distance, becomes feasible and practicable; so much so, that its condition at its destination is practically the same as that when it was shipped. As is well known, fruit is ordinarily carried over long distances in ice-cooled cars. The objection to this method has always been that, during the two or three days that it took the car to cool, the fruit was undergoing additional ripening, and this had to be allowed for by shipping it before it was quite ripe. Pre-cooling entirely obviates the necessity for this premature packing, and allows the fruit to reach the consignee in practically the same condition as it had been when freshly picked.

The characteristic difference between pre-cooling and other methods of refrigeration appears to be that, in the former, the warm air of the car is withdrawn intermittently and its place is supplied by the admission of purer, cold air which, by suitable means, is made to pass through the packages of fruit. The process is rendered all the more efficient by the production of a partial vacuum in the car before the colder air is admitted.

The first air which is driven from the car is allowed to escape, but that which has been employed in cooling is returned through a coil of cooled pipes, with the result that moisture and vapours given off by the fruit are separated. The upshot, then, is that the fruit is not only quickly cooled at first, but that it travels in an atmosphere of fairly dry, clean air which has been partly sterilized by refrigeration.

BANANAS IN NICARAGUA.

The monthly *Consular and Trade Report* of the United States, for June, states that attempts are being made to develop the banana trade in western Nicaragua along the Pacific coast.

A company has obtained a concession of 225,000 acres of land, with the privilege of constructing all necessary railways and docks, the free importation of all machinery, material and supplies necessary, and the exclusive right of exporting bananas from all districts bordering on the Pacific Ocean in Nicaragua. The concession is to last for thirty years.

The firm undertakes to run a special line of steamers and to pay 30c. gold coinage, for every bunch of bananas delivered alongside its vessels. It further assumes the responsibility for any fruit that may be lost through its failure to provide adequate transport. It is stipulated that the steamers shall begin to run within one year of the date of approval of the concession by Congress. The firm also agrees to cultivate one-half of the lands allotted to it during the first ten years of the concession, or in default to pay $50,000 American gold.

The results of the enterprise, however, are uncertain, as the district is usually considered to be too dry for the successful growing of bananas.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture proceeded to England, on duty leave, by the R.M.S. 'Magdalena', on July 13.

Mr. W. Biffen, B.Sc., Scientific Assistant on the staff of the Imperial Department of Agriculture, who has obtained leave of absence owing to ill-health, proceeded to Canada by the S.S. 'Ocamo' on the 7th instant.

Mr. A. H. Kirby, B.A., Agricultural and Science Master, Antigua, arrived in Barbados on July 13, in order to take up the duties of Mr. W. Biffen, B.Sc., while the latter is on leave in Canada.

Mr. G. A. Jones, Acting Agricultural and Science Master, Antigua, had been appointed to the post of Assistant Curator at the Botanic Station, Dominica, and will probably leave Antigua, to take up his duties there, on July 31.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland of Liverpool write as follows, under date July 2, with reference to the sales of West Indian Sea Island cotton:—

An extensive business has been done in West Indian Sea Island cotton since our last report, at firm prices. Spinners are not disposed to pay more than 14*d.* for anything, except a few small 'extra fine' lots.

The sales amount to about 800 bales, including Anguilla 13¼*d.* to 14*d.*, Antigua 13*d.* to 14½*d.*, Barbados 13½*d.* to 15*d.*, Montserrat 12½*d.* to 13*d.*, Nevis 12¾*d.* to 13*d.*, St. Kitts 14*d.*, St. Croix 12¼*d.* to 14*d.*, St. Vincent 11*d.* to 17*d.*, and 'stains' 6½*d.* to 10*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 26, is as follows:—

The unsold stock of Islands now consists entirely of planters' crop lots, held here or on plantation, aggregating 457 bales. The factors are still refusing to sell any of them under 30c., and the larger proportion are held under instructions from the planters at 35c.

The position in this market thus remains unchanged.

EXPERIMENTS IN HYBRIDIZING INDIAN COTTON.

Mr. P. F. Fyson, B.A., F.L.S., Professor of Botany at the Presidency College, Madras, has published an article on the above subject, in Vol. II, No. 6, of the Memoirs of the Department of Agriculture in India.

He worked mainly with two nearly related varieties of Indian cotton, the Jowari and Jari, the first a variety of *Gossypium herbaceum* of Gammie, the second a variety of *G. neglectum.* Numbers of plants were grown, and the behaviour of any pair of characters was studied through five generations. a result, the author comes to the conclusion that the two pairs of characters observed, namely the *neglectum* or *herbaceum* shape of the leaf, and the yellow or white flowers, segregate on Mendelian lines, the *neglectum* leaf shape and yellow flowers being dominant.

The experiments on the round and pointed shape of the boll failed owing to the damage caused by insects, and experiments on the 'fuzziness' and nakedness of the seed gave rather indefinite results, but the author thinks that this may be due to outside influences and rather incomplete dominance. In this he is supported by Mr. F. Fletcher, of the Bombay Agricultural Department, who finds that fuzziness is influenced by irrigation. Other workers in India and Egypt have found that fuzziness is dominant to nakedness, but these experiments were only for two generations.

Mr. Fyson also finds that, for two generations, length and fineness of lint are dominant to the short and rough woolly nature, and the widely opening boll dominant to that opening only a little.

If further work reveals that these characters will segregate through several generations, that is, that they will really follow the Mendelian law, it will be possible to breed plants in India, containing any desired characters, in a very short space of time.

The author also found that the hybrids, at any rate in the second generation and usually in the first, showed considerable increase in vigour—a result which agrees with those of most other workers. He also expresses the opinion that cross-fertilization is much more common in cotton than was at one time believed. Recent work by Mr. H. M. Leake supports this view.

COTTON EXPORT FROM THE VIRGIN ISLANDS.

The amount of cotton exported from the Virgin Islands during the quarter ending June 30, 1909, was 85 bales, weighing 18,854 lb. and having an estimated value of £707. This quantity was made up of 38 bales of Sea Island cotton having a weight of 8,370 lb. and an estimated value of £444 18*s.*, and 47 bales of native cotton with weight and value, similarly, of 10,484 lb. and £262 2*s.* This is more than the quantity shipped during the whole of 1907, which was only 51 bales. On comparing these figures with those of the similar period last year, it is found that, during that time, 99 bales, of the estimated value of £1,202 17*s.* 8*d.*, and consisting of 66 bales of Sea Island (estimated value £993 9*s.*), and 29 bales of native (estimated value £209 8*s.* 8*d.*) were exported.

In connexion with the editorial on the subject of Hurricanes, which appeared in No. 188 of Vol. VIII of the *Agricultural News*, it is interesting to note that a set of rules for the general guidance of those who are likely to suffer from them has been drawn up by Mr. F. H. Watkins, I.S.O., Commissioner of the Turks and Caicos Islands.

POSSIBILITIES OF PAPER-MAKING INDUSTRIES.

In the Philippines.

In the *Seventh Annual Report of the Director of the Bureau of Science,* Manila, for the year ended August 1, 1908, attention is drawn to the experimental work which is being carried out with a view to testing the suitability for paper making, of certain fibres and fibrous substances in the Philippines, and the advisability of installing a small plant with the object of making practical investigations of the pulping qualities of various materials is strongly brought forward.

There seems to be no doubt, to judge from the numerous inquiries, that ultimately, a great paper industry will be established in the Islands. The large supplies of the different classes of bamboos, grasses and other fibre-producing materials, and the diminution of the available supply in other parts of the world, will render this necessary.

It is further mentioned that, as a result of investigations at Manila, and of those of the British in Burmah, it is certain that there are a number of raw materials in the Philippines which are entirely suitable for paper-pulp manufacturing. Attention has been called to the possibilities of the industry, but the alleged reason why no development has as yet resulted, is that capitalists desire particulars of actual commercial practice, and not because the world's markets feel that the existing available supply is a permanent one. The report also makes reference to the recent legislative attempts to regulate the wood-pulp tariff in the United States, which were undertaken because of the decreasing supply of raw material and the increased cost of wood-pulp.

In Ceylon.

In connexion with the exhaustion of the wood supply for paper-making purposes, to which attention has been called above, as well as in recent numbers of the *Agricultural News,* the following extracts from a letter from Mr. W. Raitt (a chemical engineer and paper fibre expert of Bangalore, South India), to the *Tropical Agriculturist* for May, will perhaps prove of interest.

After pointing out that pulp must be produced very cheaply, and from plants which grow without cultivation, he continues :—

Bamboo alone is capable of supplying tens of millions of tons (of pulp) annually without injury to its permanence or reproduction. By what is known as the acid process, it yields an excellent pulp for news- or cheap book-paper, and at a cost considerably below that of wood. . . . . . My own investigations indicate that, in average bamboo jungle, a well-regulated system of cropping will yield 5 tons per acre annually, or 2¼ tons of pulp, worth £7 to £8 per ton, f.o.b. ; and an area of 8 square miles would suffice to keep a mill making 10,000 tons per annum supplied *in perpetuum.*

Besides bamboo, there are several species of annual grass, such as *Ischoemum angustifolium* of Central India. These are capable of being treated by the alkaline method, which involves considerably less capital outlay than the acid process, and may be worked profitably on a much smaller scale. The pulp produced is equal to that of Esparto, and suitable for high class printing and writing papers, and is worth about £9 to £10 per ton, f.o.b.

In recent numbers of the *Agricultural News* brief articles have appeared dealing with the consumption of forest products in paper manufacture, and these were published with a view to encouraging to further effort those who are experimenting in the production of paper from other materials. The present time would seem opportune for the people in the Philippines to take steps in the direction of the commercial utilization of their fibres.

FISH AND MOSQUITOS.

The following notes, in connexion with the use of millions for the destruction of mosquito larvae, are taken from the *Bulletin of the Societé Belge d'Etudes Coloniales* for June 1909 :—

It is known that millions are not the only fish which are responsible for the destruction of mosquito larvae. Terburgh states that the mosquito larvae disappeared from a ditch as soon as a certain fish, of the genus *Gabus,* was introduced. The Tropical Institute of Hamburgh has known for several years that small accumulations of water could be kept free of all larvae by fish of several species. Similar measures have been proposed for Togo, Africa, by Dr. Otto.

At Togo, experiments were made with sixteen kinds of fish from the lagoon of Anicho, all 15 centimetres long. The results were the same with all of them. In a short time after they were placed in the water all larvae were swallowed.

For further proof, six small fish, about 3 centimetres long, were put into a vessel containing 100 to 150 larvae. In two minutes, half the number was swallowed, and in half an hour there were no more larvae. This experiment was repeated three times with the same results. The little, semi-transparent fish had swelled, and one could easily verify that the stomach was completely filled. The six fish had then destroyed upwards of 400 larvae in about three hours.

These fish are all known to the natives, who are a fishing people, and who have names for them. Those particularly selected for their qualities of small size and great resistance are : (1) Sinkokpoloevi, 4 centimetres [1⅗ inches] long, which lives well in captivity, even in foul water ; (2) Boevi, 20 centimetres [8 inches] long ; (3) Akpavi, 40 centimetres [16 inches] long.

The Sinkokpoloevi is suitable for small puddles, the other two for average sized ones. All three are of the same value for large pieces of water.

At Anicho, the fight against mosquitos has been greatly hindered by the numerous boats out of service on the beach. The water in the bottoms of these boats forms an excellent breeding place for mosquitos. For a long time the natives have followed the plan of putting small fish in the bottoms of the boats.

The results in general, are much the same as those experienced in the West Indies when millions have been used for reducing the numbers of mosquito larvae. In the article which recently appeared in the *West Indian Bulletin* entitled 'Millions and Mosquitos' it was mentioned that mosquito-eating fish were known in Africa.

It may be added that a consignment of millions (*Girardinus poeciloides*) has been taken from Barbados to Southern Nigeria, and it will be interesting to know later what results are obtained from the introduction of this small fish into the waters of Western Africa.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial treats of the subject of the application of green dressings from the point of view of the effect on the plants used in the practice. The consideration of the effect on the soil will be the subject of the editorial in the next number.

In connexion with the article on page 187 of Vol. VIII, No. 186, dealing with the production of more than one plant from each seed, in the case of the orange and mango, there will be found, on page 228, an interesting account of some observations made by Mr. J. Jones, Curator of the Botanic Station, Dominica, in relation to the mango.

Two new companies have been floated for the purpose of the agricultural development of Jamaica. Information respecting these will be found on page 227.

In continuation of the series of articles that have appeared from time to time on the natural orders of insects, an account of the Hymenoptera, among which are the ants, bees and wasps, is given on page 234.

The conditions and scope of the essay, for the *Tropical Life* competition, on the fermentation and drying of cocoa are set out on page 237.

A method for the preservation of fruit, while it is in transit, known as pre-cooling, is described on page 229.

Acknowledgement.

In connexion with the editorial dealing with hurricanes in the last issue of the *Agricultural News*, it should have been stated that the block used in illustrating that article was originally kindly supplied by the United States Weather Bureau.

Distillation for Essential Oils.

For obtaining essential oils from grass or leaves at the Botanic Station, Antigua, both of the forms of apparatus described and illustrated in the *West Indian Bulletin*, Vol. IX, No. 3, pp. 276-7, have been employed and, with due precautions to prevent the escape of heat from the drum of the still, have satisfactorily extracted the oil from the raw material. Some difficulties in working have, however, been experienced. Among these are: in re-adjusting the bottom of the drum after a charge has been withdrawn, it is difficult, owing to its position, to make the joint tight again; time and fuel are wasted (in the first-mentioned type) on account of the fact that a fresh lot of water has to be introduced, and brought to boiling-point for every new charge of material.

Mr. T. Jackson, Curator of the Botanic Station, Antigua, suggests that these difficulties may be obviated, in the case of the first type, by placing the drum in a horizontal position over the furnace, instead of in a vertical one, and making the alterations in the positions of the perforated plate and supply and discharge pipes, etc., that would be rendered necessary by the change.

New Fruits.

Under the title 'Promising New Fruits', an interesting article appears in the *Year-book* of the United States Department of Agriculture for 1907. Among the fruits mentioned is the mango known as the 'Sandersha', which was introduced into the United States by the Department of Agriculture in 1901. Two inarched trees of this variety were received from Bangalore in July of that year and established at the Subtropical Laboratory of the Department at Miami, Florida. Fruit had been obtained for two seasons from these two trees, which have proved very productive, the fruit being of 'exceptionally large size, fine dessert quality, and very late ripening season, all of which points are apparently in its favour as a commercial sort.'

A second lot of inarched trees received under the name 'Sundershah' are supposed to be the same variety, but they have not yet fruited. The Sandersha is described as being long, compressed, and rather slender in form, averaging about 20 oz. in weight, occasionally attaining a weight of 2 lb. The seed is said to be small in proportion to the size of the fruit and the thickness of the flesh. It is considered well worthy of being tested in the mango districts of Florida, Port Rico, and Hawaii.

Cotton in Jamaica.

It is still hoped that a successful cotton industry may be established in Jamaica. The disappointing results of the last two years may be entirely attributed to the abnormal weather and attendant drought. This year, however, the weather appears to be returning to its more normal condition, and some satisfactory yields have already been obtained which may possibly encourage the extension of the industry, since the crop possesses many advantages which make it suitable to conditions in Jamaica.

Rainfall in Dominica.

The mean rainfall in Dominica for the year 1908, based on the returns from thirty-three stations, was 106·21 inches: this is 2·30 inches less than that of 1907. As in that year, the highest rainfall was at Lancashire and Gleau Manioc, but the positions have been reversed, Gleau Manioc receiving 236·18 inches and Lancashire 226·11 inches. Of all the stations, Batalie has continued to receive the least quantity of rain, and this is less than that of last year by 3·39 inches. July, August, September and December were the wettest months, the rainfall being greatest in December. It was during this month, too, that the greatest rainfall at any one station took place, namely at Castle Bruce, where it was 45·02 inches. February was the driest month; then January. It is interesting to note that, since the great decrease (20 inches) after 1906, the rainfall has remained steady.

Agriculture in the Bahamas.

The Report of the Board of Agriculture of the Bahamas for 1908 is especially interesting as showing the speedy commencement of a revival of agricultural prosperity after a severe crisis brought about by unfavourable natural conditions. Following a long drought in 1907, there were two severe hurricanes in September and October 1908, which caused wide-spread destruction to crops and other property. The distribution of sweet potato and cassava cuttings for the immediate needs of the people and the re-planting of the old, and opening-up of new areas of land by the planters were the first efforts made to bring about a return of prosperity.

The most important export during the year was that of sisal fibre, the total value of this being £46,669; pine-apples come next with £17,821; then grape fruit and oranges, value £6,177. But the most encouraging feature of the export trade of the colony is the increased trade, notwithstanding the adverse conditions recently experienced, in various minor products, such as tomatoes and cocoa-nuts.

According to the report, the outlook for the sisal industry is good, as the demand for the product has been growing more rapidly than that for the competing fibres, and the state of the fibre markets of the world indicates that this demand is bound to increase.

Suggested Field Staff for the Philippines.

The sugar industry is considered to be of such great importance to the Philippine Archipelago that, in the *Seventh Annual Report* (August 1908) *of the Director of the Bureau of Science* at Manila, the advisability is suggested of providing funds, for at least two years, to place in the field, a regular laboratory staff of at least three chemists with a man who has made sugar chemistry a life study at the head. Such a man, it is thought, could be obtained for a limited period, although work of this kind is in great demand in other sugar-producing countries.

Spraying for Scale Insects.

It is pointed out, in the *Journal of the Jamaica Agricultural Society*, that, although the methods of making the different washes for this purpose and those of applying them may be known and employed correctly, it is of equal importance, if the work is to be effective, to have a knowledge of the best time to use them. As the scale insect on the plant matures, its waxy shield becomes more and more impervious, and its power to protect the insect beneath it therefore increases. This consideration affords an explanation of the irregularity of the measures of success, with the same wash, which are obtained at different times.

The obvious way, then, in which to ensure the best results in attempting to reduce the numbers of any given kind of scale insect, is to spray or wash just after the eggs of a new brood have hatched.

Barbados and the Canadian Exhibitions.

An exhibit has been prepared by the Barbados Permanent Exhibition Committee for the Toronto Exhibition (1909) and will go forward by the S.S. 'Oruro' in August. It includes samples of the principal commercial products of the island, the chief of these being white, yellow, and dark crystal sugars, oscillated and muscovado sugars, molasses and fancy syrups, rums and falernums, and Sea Island cotton. In addition, there are manjak, green tar, and infusorial earth, and, among minor products, bitters, aloes, and ornamental seeds. The exhibit, which is quite up to the standard of former years, has been on view at the office of the Superintendent of Agriculture.

The *Handbook of Barbados*, which has been prepared in previous years to be distributed at these exhibitions, has not been continued this year, but the matter relating to Barbados has been included in the booklet *The West Indies in Canada in 1909*, which is being issued by the Imperial Department of Agriculture.

It may be mentioned that *The West Indies in Canada in 1909* is much enlarged over the issues of previous years.

The list of books relating to the West Indies has been added to, and a certain amount of advertising matter has been included.

INSECT NOTES.

Hymenoptera.

Several of the natural orders of insects have been briefly discussed in recent numbers of the *Agricultural News*. The Hymenoptera is the last of these to be dealt with in this series of articles.

The insects which belong to the Hymenoptera are for the most part easily recognized and distinguished from those of other orders. The ants, bees, and wasps comprise one division of the order, while the other is composed largely of parasitic insects, which are often so very small that they would never be seen except by those who are interested in them and are making a distinct effort to find them.

The Hymenoptera may safely be called the order of beneficial insects. There are, of course, injurious insects in this order, but these are a very small proportion of the whole, and in the West Indies they are very seldom seen.

The honey bee, which provides honey and wax, is perhaps the only member of this order which furnishes a product directly useful to man; but the other members of the same group, the wasps, which in some cases feed their young with insects, and in others store their nests with spiders and caterpillars, are beneficial. The ants are useful as scavengers. They are a great nuisance, especially in the tropics, but are more often beneficial than directly injurious.

The parasitic Hymenoptera are extremely useful on account of their habit of depositing their eggs in or on the bodies of other insects. The parasite is developed at the expense of the host. No insects are too large, and it might almost be said that none are too small, to be hosts for some parasites. The enormous benefit arising from the parasitic habit can scarcely be realized. It might be much greater, however, were it not for the fact that in choosing their host, many parasitic insects attack other parasites.

The adult Hymenoptera have two pairs of membranous wings similar in structure and appearance, the first pair being slightly larger than the second. The head, thorax, and abdomen are easily distinguished, the latter, in the case of the mason bee, being attached by a very long, slender pedicel.

The metamorphosis of the insects of this order is complete, the four stages—egg, larva, pupa, and adult—being distinct and well defined.

The Hymenoptera are the only insects which take care of their young during the helpless and inactive portion of their lives. The ants, bees, and wasps, all care for their young, feeding them, often moving them from place to place, and even sealing up the cells when the larvae are ready to pupate. There are in the West Indies but few species of bees. The honey bee (*Apis mellifera*) is of course to be found both wild and domesticated. The wood-boring bee (*Xylocopa fimbriata*) is the largest of our bees. It lives in stumps, posts, rails, and dead branches of trees, boring out a deep tunnel in which the eggs are laid. The main portion of the tunnel is vertical and divided into several compartments, one above another. An egg is laid at the bottom of the tunnel, a supply of food is provided for the sustenance of the larva, and a cross-wall built. This process of storing food and laying an egg is repeated until the tunnel is all divided up into chambers or cells. The curious fact is, that the insect developing from the first laid egg at the bottom is the last one to get out of the tunnel. The male of this bee is of a pale rust-red colour, while the female, which is the more often seen, is shining black. A smaller form of wood-boring bee (*Xylocopa aeneipennis*) is sometimes found in the West Indies.

The leaf-cutting bees (*Megachile* spp.) often seriously injure roses and other garden plants, and even completely defoliate such large trees as the silk cotton. They cut out circular pieces of leaf, of which they build their cylindrical nests.

The wasps are very interesting. They include the wild bee, cow bee, and Jack Spaniard, of the social wasps, and a long list of interesting, often brilliantly coloured solitary wasps. The social wasps are well known and readily recognized. They have a most powerful and painful sting, but their habits are very distinctly beneficial. The nests are built of paper, which the adult insects make by chewing up fibres collected from wood or bark. The eggs are laid singly in open cells, and the larvae develop in them. The adults bring food, generally insects, and feed the young till they are ready to pupate. The solitary wasps are able to sting spiders and insects in such a way as to paralyse them without killing them. These paralysed spiders and insects are used for storing the nests, so that the larvae, which develop later, may have living food. Some of the largest forms of Hymenoptera are found among the solitary wasps, as well as some of the most brightly coloured.

The ants are probably known to every dweller in the tropics. They are most often noticed on account of their attacks on foodstuffs and household supplies; sometimes they are remembered on account of their disagreeable stings. They build their nests in garden and lawn, and foster scale insects and mealy-bugs and plant lice, and, in the case of the parasol ant, the damage resulting from their leaf-cutting depredations is often very great.

The parasitic Hymenoptera are perhaps the most useful of all the insects in the West Indies. Almost every injurious species of insect has its parasite, often more than one; and without these useful forms of life the practice of agriculture would present far greater difficulties than at present. The eggs of the moth borer of the sugar-cane are attacked by *Trichogramma pretiosa*, which attacks the eggs of many other lepidopterous insects, including the cotton worm and the arrowroot worm. The larva and pupa of the cotton worm are attacked by *Chalcis annulata*, which probably attacks also many other caterpillars.

A very useful hymenopterous parasite is that which attacks the black scale of cotton (*Lecanium nigrum*). This insect, which has been named *Zalophothrix mirum*, is widely distributed throughout the Lesser Antilles.

There are many other parasites of scale insects in the West Indies. Many of these are now being collected for study, and it is expected that our knowledge of this useful class of insects will be considerably increased.

An example of a secondary parasite is to be found in the case recorded by Mr. C. W. Jemmett (see *Agricultural News*, Vol. VIII, p. 74). Parasites of the cotton worm were sent from Tobago (*Chalcis annulata*) and a Sarcophagid fly was found to be parasitic on the cotton worm, but a third parasitic insect (*Spilochalcis*) was present, and was found to attack the fly. It was a parasite on a parasite.

A very curious insect sometimes seen in houses, especially walking on the window panes, is *Evania laevigata*. This insect has long slender legs, and a very small abdomen, attached high up on the thorax by a slender pedicel. As it walks, it moves this little abdomen up and down with abrupt jerks. This is said to be a parasite on the eggs of the cockroach, and in turn it is parasitized by a smaller one.

FIBRE INDUSTRY IN BRAZIL.

The following information is taken from the reports of the American Consul-General at Rio de Janeiro, and the Consul at Bahia, published in the *United States Consular Report* for June last :—

PERINI FIBRE. The fibre obtained from this plant is equal to the Italian linen fibre in price, and the jute possesses the qualities of linen and hemp, with some advantages in printing and dyeing. The industry is in the hands of a Brazilian Company, that has planted an area of 680,000 square yards with the perini plant, and has contracts with planters for 1,650,000 square yards, making a total area of 2,330,000 square yards.

The rate of production of finished fibre is 3,194 lb. per acre per planting, including fibre of all grades, and there are under present conditions, two crops a year from one planting. The fibre consists of about 1,300 lb. of fine, and 1,900 lb. of coarser quality.

The prices at recent sales have been at the rate of 16·4c. per lb. of the first grade, 8·7c. per lb. for second grade, and 5·5c. per lb. for the third grade, making an average of 10c. per lb. for all the fibre grown. At this rate the earnings amount to about $320 per acre.

The plant was at first expected to give three or four crops per planting, but under the present, somewhat primitive methods of agriculture which prevail, it will only yield two crops per planting. Further, the cost of planting and cutting the crop, the transportation and other operations, has been great. There has, however, been practically no cost for land, as this was mostly granted by the Government, who originally also subsidized the industry.

Moreover, the methods employed for macerating the plants have been on the Italian and French systems, and have been mostly carried out by hand and without modern tools. The chief machine employed is limited in capacity and requires twenty-seven men to operate it. Consequently the expenses of labour and tankage in macerating have been heavier than was anticipated.

It is, however, expected that matters will soon show considerable improvement. Motor ploughs from the United States are being introduced for preparing the land, and a new macerating machine, with twice the output of the present one, and requiring only six men to work it, is being imported from the same country. This would mean a considerable increase in the production per acre, and with improved methods of maceration, considerable increase in the profits obtained.

PIASSAVA FIBRE. The Piassava (*Attalea funifera*) is a species of wild and trunkless palm, which yields a fibre suitable for brooms and brushes as well as the coquilho nut, used in the manufacture of beads, buttons, cigar and cigarette holders, etc.

It grows wild in many coastal portions of Bahia, more especially in the southern part. It prefers a very sandy soil, and consequently, the land on which it grows is very poor and almost devoid of vegetation, with the exception of sage-brush and cactus; if, however, these are burnt off the ground, the piassava is said to come up of itself.

The bark is soaked in water till the useless tissues have rotted out, when the fibre is dried, cleaned, cut into specified lengths, and sorted according to quality. It is then ready for export.

The labourers are usually paid a fixed price per arroba (32 lb.) of fibre cut, usually from 60 to 90c., according to the distance the fibre has to be conveyed after cutting, since this wage includes its delivery at a seaport or railway station.

The methods employed for cutting and macerating are very primitive, though the British firm that owns a large portion of the private plantations uses manufactured combs for combing out the fibre, and machine-made, but hand-operated, steel cleavers for cutting it into lengths. Improved machinery would probably greatly decrease the expenses of manufacturing.

The trees need no cultivation, and if carefully handled will continue to yield fibre annually for a period of thirty years. They average from ten to seventy-five per acre. For the purpose of growing this and other plants, large tracts of land may be obtained from the State at from $1 to $2 per acre.

The average exports for the last few years have been about 1,318 metric tons of fibre and 429 tons of coquilho nuts. There is an export duty of 21 per cent. on fibre and 8 per cent. on nuts, on a valuation arbitrarily fixed by State appraisers. The average export duties have amounted to $18·90 per ton on piassava, and $2·40 per ton on coquilho nuts. The fibre, cut to size and ready for manufacture, sells at $200 to $325 per ton, according to quality; and the nuts at $40 to $65 per ton, according to size.

As the lands on which the piassava grows in Bahia often contain several other forms of fibre plants also of considerable value, this industry, especially with improved methods of cutting and preparation, seems to offer considerable prospect of realizing large profits to any one interested in fibre production.

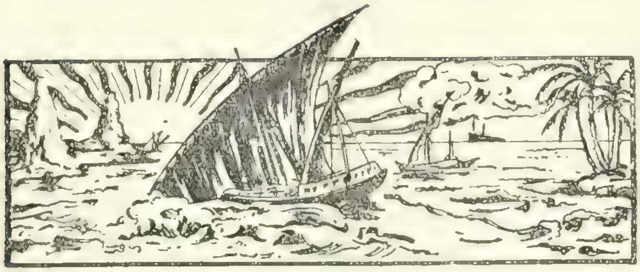
AGRICULTURAL EDUCATION IN THE UNITED STATES.

The following will serve to give an idea of the growth of Agricultural Education in the United States (*Experiment Station Record*, February 1909).

The total income of the Agricultural Colleges was $5,000,000 in 1897, $15,000,000 in 1908; the value of their property was $51,000,000 in the former year and $96,000,000 in 1907. The students in 1897 numbered 4,000; in 1908, 10,000.

One agricultural high school existed in 1897, and there are now 55. Not one normal school taught agriculture in 1897, but now 115 do so, besides many privately endowed schools. About half of the Agricultural Colleges now give training courses for teachers in agriculture; 44 States and Territories give some instructions in elementary principles of Agriculture in the lower schools. The Graduate School of Agriculture for instruction of investigators and for discussion of advanced problems of research in agriculture was organized in 1902, and is now doing work under the Association of American Agricultural Colleges and Experiment Stations. A strong movement for the systematic organization of all agencies in agricultural extension work has been started within a few years, and the National Educational association has added a department of rural and agricultural education.

Outside of schools which are for the education of youth and teachers in agriculture, the farmers have received a greatly increased degree of education by means of demonstration work and advice given orally and by letter, by countless official and private publications, by corn and live-stock judging contests, and by farmers' institutes. The number of sessions of the last named held in 1908 was 14,000, with an attendance of about 2,000,000 persons, an enormous increase over the attendance twelve years ago. About 1,200 trained lecturers are now employed in farmers' institute work in all States and Territories.



GLEANINGS.

The Grenada *Searchlight* announces that the cultivation of tobacco will shortly be established on commercial lines in that Colony.

Though accurate information is not yet to hand, it is expected that about 300 acres of Sea Island cotton will be planted this year, in Antigua.

A demand for consignments of limes, pine-apples and bananas from the West Indies is announced on the part of Thomas Nash, 72, Octagon, Plymouth.

A proposal has been made for the establishment of a Professorship of Agricultural Science at Melbourne University, at a salary of £1,000 a year.

'The first step in conserving moisture is to put the soil in such a condition that it will permit the rain to enter freely, and into a good, deep reservoir'. (*Transvaal Agricultural Journal.*)

A mosquito exterminator consisting of a powder for fumigation made from local vegetable products, chiefly Margosa leaves, is being tried in malarious districts in Ceylon. It is said not to contain any deleterious ingredients.

The *Medical Report* for St. Kitts-Nevis and Anguilla, for the year 1908, states: 'A most useful and necessary Ordinance to make provision for the destruction of mosquitos was passed during the year, giving the District Boards of Health full power to deal with the scourge'.

Messrs. Sandbach, Tinne & Co., (Liverpool) and Sandbach, Parker & Co., (Demerara) announce that the address of the Montreal agency recently opened by them under the name of the West India Company, Limited, is: St. Nicholas Building, St. Nicholas Street, Montreal.

The *Louisiana Planter* states that the weather conditions in the upper portions of that State are quite satisfactory for the growth of sugar-cane, but that the middle and lower portions are suffering from excess of rain, which is preventing the work of laying by the crop. A few days of warm dry weather would, however, speedily rectify this and render the general prospects quite promising.

In a paper by Professor Bernthsen, on the fixation of atmospheric nitrogen, read before the Seventh International Congress of Applied Chemistry, it is stated that considerable quantities of 'air saltpetre' will shortly be put on the market and that, probably, within a few years, the annual output will reach 100,000 tons.

The Curator of the Botanic Station, Antigua, reports that, during the month of June 1909, there have been distributed from that Station the following plants and seeds. Plants: lime, 650; decorative, 175; mahogany, 46; *Casuarina equisetifolia*, 11. Seeds: Barbuda bean, 100 ℔.; broom corn, 12 ℔.; miscellaneous, 13 ℔.

The June shipments brought the total export of Trinidad cacao for the half-year to the record quantity of 34,472,394 ℔., being 4,747,032 ℔. more than at the same date last year, and 1,580,570 ℔. over the previous record in 1904, when the shipments to June 30 were, 32,891,824 ℔. (*Proceedings of the Agricultural Society of Trinidad and Tobago*, June 1909.)

In *Feysmannia* (an agricultural publication of Java) information is given in connexion with a little-known variety of coffee which grows in Uganda. It is stated that this appears to be very productive, of quick growth, and little liable to be attacked by disease. The opinion is further given that this variety is quite up to the standard of *Coffea robusta*, and is probably superior to it on clayey soils.

In relation to manurial experiments with cacao, it is noted in the *Circular and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No. 15, that, at the Experiment Station, Peradeniya, it has been found much more satisfactory to take the yield from July 1 of one year to June 30 of the next, instead of that from January to December. In this way, the results obtained by the use of the different manures are more accurately indicated.

According to the *U.S. Daily Consular and Trade Reports*, No. 3,354, the agricultural interests of Panama are seriously menaced by a plague of locusts, large areas in certain districts having been denuded of foliage, and plants and crops almost totally destroyed. The most general method of extermination is to dig trenches with perpendicular sides, into which the locusts are driven by beating the grass and trees with switches. The insects are then destroyed by means of soap-suds, and the trench filled in to allay the odour.

According to the *Experiment Station Record* of the United States Department of Agriculture, Vol. XX, No. 9, instead of a grant of a lump sum being made for the carrying on of the work of the Bureau of Entomology, as has been the case heretofore, a new law has been passed whereby the grant is now divided in such a way as to restrict the expenditure under different sub-heads, a provision being added that, under unforeseen conditions, 10 per cent. of the appropriation for miscellaneous expenses under any one head may be used in addition.

STUDENTS' CORNER.

JULY.

Middle Period.

Seasonal Notes.

The young cotton plants, which, under favourable conditions, will have begun to make a good stand by this time, should be frequently hoed, in order to keep weeds down, until the plants have attained at least half their final height. Continued careful examination should be made of the plants and, if they are found to be suffering from attacks of plant-lice, to which they are prone, they should be sprayed with weak kerosene emulsion.

As dry weather has followed the planting of canes in many cases, a note should be made, if possible, of the relation between the number of plants surviving and the kind of soil in which they are growing. This, if the canes are all of the same kind, will give a hint as to the comparative water-holding capacities of the different kinds of soils. Where there is little variation in the type of soil, and different varieties of canes have been planted, observations should be made on their relative powers of becoming established under adverse conditions of water-supply. Is it beneficial, or otherwise, for canes to come up under wet conditions, and then to be subjected to dry weather?

Where green dressings are being raised, each kind should be examined with a view to its future identification. Note should also be made of those which give the best cover, and which are least subject to the attacks of insects. The importance of the consideration of the condition of a soil, as regards its water-content, in places which are liable to suffer from drought, should be recognized. A crop which is being raised in order to serve as a green dressing later on may, in the drier soils, decrease the amount of water to such an extent as to prevent the succeeding crop from being capable of benefiting from it.

In the next few months, as land will be in preparation for cane planting, ploughing will be in progress, and a good opportunity will be afforded for making observations on the different characters of the various soils ploughed up in different districts. Careful note should be made of the working of the plough: pay attention to the action of the mould-board on the furrow slice, and try to get an idea of the way in which such action helps to break up (pulverize) the soil. Time may be profitably spent in paying attention to fields that have been ploughed, from day to day, and noticing the rates at which different kinds of soils 'moulter down'. Where implemental tillage is employed, examine the various implements so as to gain a knowledge of the ways in which the different parts are employed; then, when they are in use, familiarize yourself with the various operations which they are intended to perform, and with the reasons for those operations.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Explain why some leguminous plants will not thrive on certain soils.

(2) Why should plants be cut back when they are being transplanted?

INTERMEDIATE QUESTIONS.

(1) Indicate briefly the chief sources of gain to a soil.

(2) Give some account of the relationship of lime to the action of manures on crops.

'TROPICAL LIFE' PRIZE ESSAY.

In reference to the announcement in the *Agricultural News*, Vol. VIII, Nos. 187, p. 204, and 188, p. 220, that *Tropical Life* has arranged to offer a prize of £50 for the best essay on the fermentation and drying of the cacao bean, the following rough draft (which need not be followed too closely) for the guidance of candidates, which appeared in the June number of that paper, is now given:—

The essay should record precisely and in full detail the changes resulting from the processes of fermentation and drying that take place in the bean from maturity in the pod to the time of putting the cured beans into bags for market. Biological as well as chemical changes should be noted. The action of maximum, minimum and optimum temperatures, and of checks producing differences of times in the fermentation and drying processes, should be noted for every stage. The differences due to such variations on the resultant cured bean should be clearly traced. The possibility should be discussed of producing at will by such variations, and independently of the natural character of the bean, varieties of taste and of colour, both internal and external, so as to simulate the different kinds of cocoa known on the market. Alterations that might be made in ordinary methods, so as to improve the quality of the cocoa, should be explained. Waste products should be considered, and their potential value indicated.

The experiments on which results are based should deal with the beans in marketable quantities, and samples should be submitted in illustration of statements made.

The terms on which all candidates enter the competition are as follows:—

(1) The copyright of all essays sent in becomes the property of the publishers of *Tropical Life* absolutely, whether successful in winning the prize or not.

(2) The publishers of *Tropical Life* have the sole right of publishing the essays, and the copyright of such publication to be vested in them. Permission to publish in any language must be obtained from the publishers of *Tropical Life*.

(3) Every candidate or competitor agrees to accept as final and to abide by the award of the Editor of *Tropical Life*, whose decision in the matter must be taken as binding. No correspondence can be entered into respecting the awards.

(4) An English translation must accompany all essays not written in that language, so that the onus and risk as to correct translation will rest with the competitor.

(5) Essays must be written on one side of the paper only; when possible the essay should be typewritten. In any case the writing must be clear and distinct. Corrections causing doubt or difficulty to decipher must be avoided.

(6) All essays must be sent to the Editor of *Tropical Life* at his City Office, 112, Fenchurch Street, London, E.C., to reach him on or before January 31, 1911. No essay arriving after that date will be eligible for competition. Every essay will be acknowledged on receipt.

(7) Every essay sent in must have attached to the head of the first page the competitor's full name and postal address. In submitting the essays to the Judges, the name, however, will not be made known until after the prize is awarded.

(8) After the prize has been awarded, any balance left over will be devoted to publishing those essays which, in the opinion of the publishers, are considered of sufficient merit.

(9) Competitors must fill in and attach a coupon, presented with *Tropical Life*, to their essay.

COPPER AS AN ALGICIDE.

The group of water plants known as Algae includes the seaweeds and a great variety of fresh-water forms, which occur as scums and slimes, which give the water peculiar greenish and bluish-green colours, and often impart to it an offensive odour and occasionally even render it highly unhealthy.

Water in the West Indies, in ponds, pools, tanks and reservoirs often supports vigorous growths of algae, and it may be of interest to the readers of the *Agricultural News* to know that by the use of copper sulphate such growths may be prevented, or the plants already developed may be entirely destroyed.

Bulletin 76 of the Bureau of Plant Industry of the United States Department of Agriculture, entitled *Copper as an Algicide and Disinfectant in Water Supplies*, gives results of a large number of trials, and the amounts of copper sulphate that may be present in the water without in any way injuring it as a drinking water.

The following statements taken from the conclusions and summary of the bulletin already referred to may be of interest :—

Experience has demonstrated the practical value of copper sulphate as an agent for the purification of contaminated water, and it is believed that most of the important conditions likely to obtain have been encountered and successfully dealt with. Unsuspected features may arise, however, and more complete information on the influence of the chemical constitution and temperature of the water, and on the recurrence of polluting organisms is very much to be desired. It is therefore urged that water engineers, sanitary engineers, and others who may be interested keep accurate records of treatments made, and report any unusual cases that may present themselves.

From the results of over fifty reservoirs successfully treated for the removal of algae, the following facts have been developed :—

Much less copper is required to eradicate algae from reservoirs than would be necessary to destroy algae under laboratory conditions.

The effect of this metal upon fish is of considerable importance and requires more study.

The physical and chemical constitution of a water are factors to be considered in determining the quantity of copper sulphate to use in a water-supply.

The elimination of polluting forms sometimes makes possible the development of other species, but so far these species have never been the cause of complaint.

As a result of the sudden destruction of great numbers of polluting algae, for a few days immediately after treatment of a water-supply there is sometimes an increase in odour and taste.

The use of copper is an efficient emergency method for sterilizing water contaminated with the bacillus of typhoid fever.

Metallic copper offers a convenient and efficient means of sterilizing small amounts of water.

Copper may be useful in the proper disposal of sewage.

Copper is of great value as a supplement to filtration in case of accident or mismanagement.

Under certain conditions copper may be used to great advantage in connexion with filtration.

There is no authentic record of fatal copper poisoning, and many of the best authorities do not consider copper a true poison; they hold that it is a natural constituent of the body and in minute quantities has no effect upon man.

The suggested medicinal use of copper in cholera, typhoid, and related diseases seems important.

A very useful, and at the same time, simple method for the application of copper sulphate is as follows :—

The necessary amount of copper sulphate is put into a bag of coarse mesh and slowly dragged through the water. By a process of gradual solution the water will become impregnated with the copper sulphate. In large ponds or reservoirs this may be carried out by tying the bag of sulphate behind a boat and quietly rowing about: in smaller ponds or canals the bag fixed to a pole can be dragged through the water by a man walking along the bank.

The amount of copper sulphate required to completely destroy fresh water algae is very small, but it must be mentioned that more is required in warm countries than in cool.

When a sufficient amount of copper sulphate was used to give a strength of 1 part in from 4,000,000 to 10,000,000, or say 1 pound of copper sulphate dissolved in 1,000,000 gallons of water, it was found sufficient to destroy nearly all forms of green algae, and in most instances did not injure the fish in the ponds.

The proportion in tanks and small receptacles could easily be worked out and experiments might be tried as to the smallest amount that would purify any given body of stagnant water.

RICE IN BRITISH GUIANA.

The last report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated July 9, 1909, gives information as follows :—

The weather has continued very wet during the past fortnight, and very little milling has been done by small mills in the country. The larger factories that have driers installed have been busy milling for shipment to the West India islands, and stocks of paddy are getting low.

Although the area planted this year is somewhat larger than last, the unfavourable weather experienced during the past few weeks has been responsible for the flooding of several hundred acres, where the returns will at least be poor if any crop is obtained. The planting has been late this year, and the bulk of the October-December crop will not be reaped until late in November.

Local demand has somewhat improved, and prices would be better but for the fact that a quantity of inferior rice of various grades is being offered at low rates.

Shipments to the West India islands during the fortnight amount to 2,800 bags, being principally to Trinidad and Barbados.

The exports to date are now about the same as they were at this time last year.

We quote to-day, f.o.b., Demerara, for good export quality :—

17s. 10½d. to 18s. 10½d. per bag of 180 lb. gross.
16s. 4½d. to 17s. 4½d. ,, ,, ,, 164 lb. ,,

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

The following report on the London drug and spice markets for the month of June has been furnished by Mr. J. R. Jackson, A.L.S. :—

The general conditions of the spice and drug markets during the month of June, show a decided improvement, which commenced with the month and was fairly maintained to the end. In no one particular product, however, was there anything calling for special note as will be seen from the following items.

GINGER.

As there were no auctions held in the first week of the month in consequence of the Whitsuntide holidays, it was not till the 9th that the first sale took place, at which Jamaica ginger was offered to the extent of 1,650 packages; and 300 were disposed of at the following rates: 60*s.* to 62*s.* for fair bright, 56*s.* to 59*s.* 6*d.* for middling to good middling, and 50*s.* to 55*s.* for ordinary to good ordinary. At the same auction, all other kinds offered were bought in at the following prices: unsorted native Calicut, 56*s.* to 60*s.*; brown rough Calicut, 40*s.*; rough, 37*s.*, and Japanese limed, 32*s.* A week later, the market was exceedingly quiet, the whole of the offerings of Jamaica, consisting of 384 packages, were bought in, and of 585 packages of Cochin and Calicut brought for work, only 36 were sold, washed rough Cochin fetching 41*s.* Brown rough Calicut was bought in at 40*s.* Again on the 23rd, the same quiet tone prevailed, only 40 packages of Jamaica, out of 500 offered, found buyers at from 59*s.* to 64*s.* for middling to good middling, and 52*s.* for good ordinary small. Seventy bags of Japan were brought forward at this sale, 20 of which sold at 27*s.* 6*d.* for limed wormy. On the last day of the month ginger of all kinds was represented in the catalogues, some of which, however, were not brought forward, amongst them being 64 packages of Jamaica. It was stated that private sales had been effected for good fine, at from 58*s.* to 62*s.*, Cochin fetching 39*s.* to 41*s.* for washed rough.

MACE AND PIMENTO.

On June 9 there was a steady demand for West Indian mace, the prices ranging from 1*s.* 6*d.* to 1*s.* 7*d.* for ordinary to fair, and 1*s.* 3*d.* to 1*s.* 5*d.* for broken. A few cases of good Java were bought in at 2*s.* A week later, out of an offering of 28 packages of West Indian, 25 were sold, fair pale realizing 1*s.* 9*d.*, pale and reddish 1*s.* 7*d.* to 1*s.* 8*d.*, and fair to good red 1*s.* 6*d.* to 1*s.* 8*d.* On the 23rd, 16 packages of West Indian were offered, and disposed of at similar rates. At the auction on the 16th, pimento was represented by 117 bags, 55 of which were disposed of at 2¼*d.* for fair, and 2⅛*d.* for ordinary mixed. On the 23rd, the offerings amounted to only 16 bags, which were all bought in at 2⅜*d.* for small. At the last auction on the 30th, 68 bags were catalogued, but none were offered.

ARROWROOT.

There has been a very quiet market in this article. At the auction on the 30th, 120 barrels of fair manufacturing St. Vincent were brought forward, and bought in at 2*d.* per lb.

SARSAPARILLA.

At the drug auction on the 17th, sarsaparilla was represented by 41 packages of native Jamaica, 10 of Lima-Jamaica, 21 of Mexican, and 13 of Honduras, but there was no grey Jamaica. The whole of the 10 bags of Lima-Jamaica was sold, fair fetching 1*s.* 1*d.*, and rather lumpy 1*s.* Fair red native Jamaica realized 1*s.* to 1*s.* 1*d.*, while 10*d.* to 11*d.* was paid for ordinary greyish to dull-red and yellow mixed, and 9*d.* to 9½*d.* for common dull-red. None of the Mexican nor Honduras found buyers.

KOLA, TAMARINDS, CASSIA FISTULA, ETC.

In the middle of the month, 2 bags of dull Jamaica kola, part wormy, was sold at 1½*d.* per lb. Eighteen bags of ordinary dark Ceylon fetched 1¾*d.* per lb., and for 6 bags of dull mouldy Ceylon 2⅛*d.* per lb. was paid. At the last sale on the 30th, 1 bag of green, part mouldy Jamaica realized 2¼*d.* per lb., and 1 of fair dried Jamaica fetched 1½*d.* per lb. At this same sale, out of 24 packages of Cassia Fistula offered, 13 were sold at from 16*s.* to 17*s.* per cwt. for fair Dominican. On the 16th, 5 packages of fair West Indian tamarinds in bond were sold at from 8*s.* to 9*s.* 6*d.* per cwt. Fair East Indian black were bought in at 12*s.* 6*d.* per cwt. On the 30th, 52 packages of dry Antigua in bond were offered, 42 of which sold at 10*s.* per cwt.

SPONGE FISHERIES IN THE PHILIPPINES.

We gather from the latest *Annual Report* (August 1908) *of the Director of the Bureau of Science*, Manila, that sponge fisheries which will prove to be of considerable value commercially have been located during the past year. The first shipment from the Sitkani sponge bank arrived in Zamboanga on June 3, and will be shipped to Singapore. These sponges are said to be of fine, soft texture, very tough and elastic. They compare very favourably with the best grade of the Florida 'sheep's wool sponge', and doubtless a good price will be realized for them. Twenty thousand sponges have been taken at Sitkani.

The following information in connexion with the curing of sponges and the laws proposed for the regulation of sponge fisheries may be of interest:—

When in the water the commercial sponge is black and slimy, growing in a depth of from 30 centimetres to 30 metres, or more. The sponge is taken up either with the hands, or with a hook on the end of a pole. It is then placed on shore or on a platform in the sun for a day or two, until dead. Afterwards it is placed in an enclosure built on the edge of the salt water and allowed to remain for eight or ten days, a man going over the sponges each day, or as often as is necessary, squeezing them out and beating out pieces of shell or coral. They are then threaded on strings and allowed to dry. This is the usual bleaching process. They may also be bleached by dipping them in soap-suds two or three times and placing them in the sun. Chemicals are also used, but they cause more or less damage to the fibre.

On account of the custom of taking even the very youngest sponges, prompt regulation of the sponge fisheries is urgently needed. A law should be enacted prohibiting the taking of sponges which measure less than 10 centimetres through their least diameter at the centre. If all inshore sponge grounds were declared Government property, which may be leased for a long period, it would cause every collector to take care of the ground rented by him, and to allow the sponges to grow to full size, so that he may gain a profit compatible with his holding the ground under a long lease.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, July 6, 1909; Messrs. E. A. DE PASS & Co., June 11, 1909.

ARROWROOT—St. Vincent, $1\frac{7}{8}d.$ to $3\frac{3}{4}d.$, according to quality.
BALATA—Sheet, 2/5 to 2/6; block, $1/9\frac{3}{4}$.
BEES'-WAX—No quotations.
CACAO—Trinidad, 53/- to 65/- per cwt.; Grenada, 50/- to 56/- per cwt; Jamaica, no quotations.
COFFEE—Santos 30/- to 31/- per cwt.; Jamaica, 41/- to 94/6.
COPRA—West Indian, £21 per ton.
COTTON—St. Vincent, 11*d.* to 17*d.*; Barbados, $13\frac{1}{2}d.$ to 15*d.*; Anguilla, $13\frac{1}{4}d.$ to 14*d.*; Antigua, 13*d.* to $14\frac{1}{2}d.$; Montserrat, $12\frac{1}{2}d.$ to 13*d.*; Nevis, $12\frac{3}{4}d.$ to 13*d.*; St. Kitts, 14*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 48/- to 51/-; low middling to middling, 52/- to 58/-; good bright to fine, 60/- to 67/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/- to 1/3 per gallon; concentrated, £18 15*s.* per cask of 108 gallons; distilled oil, 1/10 to 1/11 per lb., good quality firm.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Firm.
RUBBER—Para, fine hard, $6/3\frac{1}{2}$ to 6/4; fine soft, 6/2 per lb.
RUM—Jamaica, 3/- to 3/3; Demerara, no quotations.
SUGAR—Crystals, 14/9 to 16/9; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York,—Messrs. GILLESPIE, BROS. & Co., June 15, 1909.

CACAO—Caracas, 12c. to $13\frac{3}{4}$c.; Grenada, 12c. to $12\frac{1}{2}$c.; Trinidad, 12c. to $12\frac{1}{4}$c.; Jamaica, 10c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, \$22·00 to \$23·00; culls, \$13·00 to \$15·00; Trinidad, select, \$21·00 to \$22·00; culls, \$13·00 to \$14·00 per M.
COFFEE—Jamaica, ordinary, $7\frac{3}{4}$c. to 8c.; good ordinary, $8\frac{1}{4}$c.; and washed up to 11c.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, no quotations; Barbados, 55c.; St. Thomas, St. Croix, St. Kitt's, 45c. to 48c. per lb., dry flint; Antigua, 50c. to 52c.
GRAPE FRUIT—Jamaica, \$4·50 to \$6·00 per barrel.
LIMES—Dominica, \$3·50 to \$4·25 per barrel.
MACE—28c. to 35c. per lb.
NUTMEGS—110's, $8\frac{1}{2}$c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—$4\frac{1}{2}$c. to 5c. per lb.
SUGAR—Centrifugals, 96°, 3·92c., Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., July 17, 1909; Messrs. T. S. GARRAWAY & Co., July 19, 1909.

ARROWROOT—St. Vincent, \$3·75 to \$4·00 per 100 lb.
CACAO—\$11·21 to \$12·00 per 100 lb.
COCOA-NUTS—\$18·00 for husked nuts.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., according to quality—scarce.
HAY—\$1·20 to \$1·25 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00; Sulphate of potash, \$67·00 per ton.
ONIONS—Strings, \$2·25 to \$2·50 per 100 lb.; Bermuda, \$1·80.
PEAS—Split, \$6·00 per bag of 210 lb.; Canada, \$3·75 to \$3·90 per bag of 120 lb.
POTATOS—\$3·50 per 160 lb.
RICE—Ballam, Calcutta, no quotations; Patna, \$3·80; Rangoon, \$3·00 per 100 lb.; Demerara Ballam, \$4·70 to \$5·00 per 180 lb.
SUGAR—Dark Crystals, 96° no quotations; Muscovado, 89° \$1·70; Centrifugals, no quotations.

British Guiana,—Messrs. WIETING & RICHTER, July 10, 1909; Messrs. SANDBACH, PARKER & Co., June 25, 1909.

ARROWROOT—St. Vincent, \$8·50 to \$9·00 per 200 lb., demand limited.
BALATA—Venezuela block, 32c.; Demerara sheet, 48c. per lb.
CACAO—Native, 14c. per lb.
CASSAVA—72c.
CASSAVA STARCH—\$5·00 per barrel of 196 lb.
COCOA-NUTS—\$12·00 to \$16·00 per M.
COFFEE—Creole, 8c. to 13c.; Jamaica and Rio, $13\frac{1}{2}$c.; Liberian, 8c. per lb.
DHAL—\$4·50 to \$4·60 per bag of 168 lb., weak; Green Dhal, \$5·50.
EDDOS—\$1·08 to \$1·44 per barrel.
MOLASSES—Yellow, 21c. to 22c.
ONIONS—Teneriffe, $2\frac{1}{2}$c. to $3\frac{1}{2}$c.; Bermuda, $2\frac{1}{2}$c. to 3c. per lb.
PEAS—SPLIT \$6·00 to \$6·20 per bag (210 lb.); Marseilles, \$3·00, over stock.
PLANTAINS—24c. to 60c. per bunch.
POTATOS—Nova Scotia, \$2·60 to \$3·00 per 100 lb., Bermuda, \$3·75.
POTATOS—Sweet, Barbados, 96c. to \$1·32 per bag.
RICE—Ballam, \$5·50 to \$5·60; Creole, \$4·40, good demand.
TANNIAS—\$1·20 to \$1·68 per bag.
YAMS—White, \$2·16 to \$2·40 per bag; Buck, \$2·40 to \$2·64.
SUGAR—Dark crystals, $\$2·27\frac{1}{2}$ to \$2·45; Yellow, \$3·00 to \$3·10; White, \$3·60 to \$3·80; Molasses, \$2·00.
TIMBER—Greenheart, 32c. to 55c. per cubic foot.
Wallaba Shingles—\$3·75 to \$5·75 per M.
——— Cordwood—\$1·80 to \$2·00 per ton.

Trinidad,—Messrs. GORDON, GRANT & Co., July 10, 1909.

CACAO—Venezuelan, \$11·25 to \$11·30 per fanega; Trinidad, \$11·10 to \$11·50.
COCOA-NUTS—No quotations.
COCOA-NUT OIL—78c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 9c. per lb.
COPRA—\$3·25 per 100 lb.
DHAL—\$4·30 per 2-bushel bag.
ONIONS—\$1·50 to \$1·80 per 100 lb., light demand.
PEAS—SPLIT \$5·50 to \$5·75 per bag.
POTATOS—English, \$1·25 to \$1·75 per 100 lb.
RICE—Yellow, \$4·50 to \$4·60; White, \$5·00 to \$5·25 per bag.
SUGAR—American crushed, \$5·10 to \$5·20 per 100 lb.; Yellow crystals, no quotations; Bright molasses, no quotations.

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CONTENTS.

Green Dressings and Their Application.

II. THE EFFECT ON THE SOIL.

In cases where the plants which are intended to provide green dressings are to be turned into the soil on which they are raised, as is the common practice, the first effect which has to be considered is that arising from the circumstance that they have been grown on that soil.

Under favourable conditions, the burial of plants of any kind will add humus to the soil, thus improving the tilth, with the well-known additional benefit, in the case of legumes, of the increase of its nitrogenous content. There are instances, however, where the special circumstances surrounding the raising of the crop prevent the acquisition of these benefits. In a light, open soil having a small water-holding capacity and liable to suffer from drought, the lowering of the water-content may act so disastrously on the succeeding crop as to make it impossible for it to attain a condition in which it may benefit by the presence of the additional plant food which has been provided for it. Then, too, repeated raising and ploughing-in of green manures on the same soil, as the sole attempt to keep it in condition, will lead to the temporary exhaustion of its mineral constituents, as will be explained later. Thus must the general history of a soil be considered first, when the question of the application of green dressings is under debate and, in the event of a favourable conclusion being arrived at, what follows here is then, and only then, a matter that can have relation to that particular soil.

Turning, now, to the effects of the buried plants on the soil, the subject may be viewed conveniently from the aspect of the uses of such plants when they are applied in this way. These uses may be grouped under two heads: that of the prevention of the loss of plant-food already present, and that of the provision of additional plant food.

In the first connexion, it may be remarked that the very important effect of green dressings in preventing the loss of useful soil constituents is very often given much less recognition than it deserves. It is well known that nitrates, owing to their solubility, are very likely to be lost in drainage water and that the prevention of such loss is a matter of supreme importance to agriculturists. Green manures are especially efficacious in this direction, for they take up those bodies and form stable combinations with them, which are subsequently rendered available by bacteria in the ordinary way. A similar action takes place in regard to other food-constituents, such as phosphoric acid, potash and lime; not, however, because, like nitrates, they are liable to be lost in the wash-water, but because the green dressing unites with them in such a way as to render them more directly available. These maintenance effects follow the use of any kind of green dressing, but they are augmented, in the case of leguminous plants, by the fact that the presence of the latter helps to lessen the number of those organisms which cause soils to lose nitrogen.

The second use of the practice which is under consideration, that of the provision of plant food in addition to what is already existent in the soil, is one which, so far as has been satisfactorily demonstrated up to the present, is solely connected to the ability of leguminous crops to add nitrogen to the soil. It is not the purpose of this article to deal with this aspect of the subject; if further information is required, attention is directed to the recent one on Soil Inoculation, *Agricultural News*, Vol. VIII., No. 184, of May 15, 1909, to which reference has already been made. It will not be out of place, however, to draw attention, at this stage, to the influence of former leguminous crops on the later ones. The fact that a soil has already had the benefit of nodule nitrification hastens succeeding efforts in this direction, for the reason that such a soil already contains an amount of nitrogen sufficient to stimulate plant-growth, and because the fact that nodule bacteria have already been raised in it hastens the infection of the later legumes with those useful organisms.

The kind of soil to which green dressings are applied must, naturally, be an important factor in regard to the results of such application. The action in light, open soils must be very different from the one which will take place in those which are heavy. Their effectiveness is generally far greater in the former case than in the latter. The lack of plant food in sandy soils, their openness, their small capacity for holding water and their lack of humus all contribute to the great change for the good which often follows the application of plant-material. There is certainly the fear that, in well-watered soils of this kind, acidity may result from the practice; but this tendency may be controlled by judicious action in the matter and by the use of lime as a corrective. It is quite another matter in the case of heavy soils. These do not require applications of green dressings as often as they are demanded by the lighter ones. They hold water well, the activity of the bacteria which cause decay is smaller, they retain nitrates to a much greater degree, and, under good conditions of drainage, are much less likely to suffer a loss of nitrogen from the action of bacteria. None the less, such applications are eminently desirable from time to time, because they have the effect of quickly freeing otherwise slowly accessible stores of potash and phosphoric acid, and because of their improvement of the condition of the soil.

Sufficient has already been said to indicate that care must be exercised in the use of green dressings. Damage to the soil will obviously cause harm to the plants which such dressings were intended ultimately to benefit. By what criteria shall we chiefly judge in particular instances, whether benefit or harm will accrue? The answer is, as has been stated differently already: By those in which the first consideration is given to the conditions regulating the bacterial life, both in the buried plants and in the soil.

DIPLODIA DISEASE OF MAIZE.

This is the title of an article, in the current number of *Science*, written by Dr. E. F. Smith and Florence Hedges.

These investigators made observations on this disease of corn, which is now becoming serious in some parts of America, in order to determine its method of infection. A careful examination of some cobs seemed to indicate that the mycelium spread to the seed from inside the stem, and that it was not a case of local attack as was previously believed.

To prove this conclusively, plants were grown in pots with the soil previously inoculated with pure cultures of *Diplodia*. In nearly every case the fructifications of *Diplodia* appeared on the roots or at the collar of the plant, while the mycelium was traceable well up the stem and in the roots. In one case, the fructifications appeared in the stem on the first four internodes and were especially abundant at the nodes. It was fully determined that the mycelium in the roots and stem was that of *Diplodia*, as the pure cultures of the fungus were obtained from material inoculated with it.

This makes it almost certain that the fungus attacks the roots first from the soil and finally spreads to the cob, so that the same ground, when once infected, should never be used for planting two crops of corn consecutively. It is also suggested that the fungus may be the cause of the cornstalk disease of cattle in the west of America, as well as of the pellagra disease of human beings which results from the consumption of mouldy corn.

SUGAR INDUSTRY.

Sugar Growing and Manufacture in Northern India.

The following article, from the *Agricultural Journal of Northern India*, Vol. IV, Part 2, gives some facts in connexion with the sugar industry in Northern India :—

Several attempts have been made in recent years to manufacture white sugar direct from sugar-cane as is done in the West Indies, Egypt, Mauritius, and other sugar-growing countries. Considerable capital has been invested in these undertakings, the best up-to-date machinery imported from Europe, and skilled Europeans with expert knowledge, commercial, technical and scientific, have been employed. In spite, however, of what would appear to be most favourable auspices, careful supervision, and a very large demand for the manufactured article, none of these undertakings have so far achieved more than a very moderate success, and most have had to face serious pecuniary loss.

At first sight, no country in the world would appear to offer a better field for the cane and sugar industry than India. The consumption of sugar by the inhabitants of this country is enormous, and upwards of half a million tons of sugar are imported into India annually. Why then has the sugar-making industry not made better progress? Various causes have contributed to handicap these pioneer efforts. Although sugar-cane has been grown throughout Northern India for some 2,000 years, the quality of the crop has never been as high as in other cane-growing countries, either as regards the weight of cane grown per acre, or the sugar content per 100 of canes.

The Indian cultivator at his best is hard to beat, although his methods and implements may appear primitive to western agriculturists. He is quick to adopt improvements in cultivation and seed if he is satisfied that they will increase his profits ; but in the growing of sugar-cane, he is faced with two serious problems. The soil has been exhausted by many centuries of continuous cropping, and the supply of suitable manures at a moderate cost is very limited. A greater difficulty still is the climate. The annual rainfall, though usually sufficient in quantity, is badly distributed throughout the year, being concentrated into a few months, followed by many months of extreme dryness. These two causes, however, would not alone be sufficient to account for the indifferent success of large central cane factories ; fresh sources of manure can be discovered, and the short period of growth, due to the concentration of the rainfall, can be mitigated by carefully thought-out schemes of irrigation.

The Indian cane factory has against them, on the credit side, the saving in manufacturing losses by a continuous process, and the economy in freight and transit charges by having a ready market at the door. The greatest difficulty, however, with which a central cane factory has to contend is the nature of Indian land tenure, by which the country is split up into a multiplicity of small holdings, and this seems to be an insuperable one. The effect of this system of cultivation in innumerable small farms is that concentration of crop round the factory is in most instances, impossible. The cane is grown in small isolated patches, and in order to feed a large factory, it has to be collected from a very large area radiating many miles from the factory, with all the consequent heavy cost of handling and carrying entailed in dealing with a commodity so heavy and bulky as raw sugar-cane ; this, combined with the inevitable deterioration and loss of sugar by inversion during the period of transit from the fields to the mill, more than counterbalances the benefit gained by the continuous process. It would seem, therefore, that central sugar factories can only be profitably worked, if at all, in canal colonies or large zamindaries where a concentrated area is available under the personal control of the owner or planter.

If the sugar industry in India is to hold its own against the foreign importer, development will have to be along the line of intense cultivation by the grower, to increase the outturn of sucrose per acre, and improvements in the making of raw jaggery or *Gul* by the villager, preventing the heavy losses by inversion and adulteration entailed by the crude methods at present employed. If this can be done, the Indian refiner will have nothing to fear from foreign competition in India, and may even in time be able to export to other markets, if not barred by prohibitive protective duties.

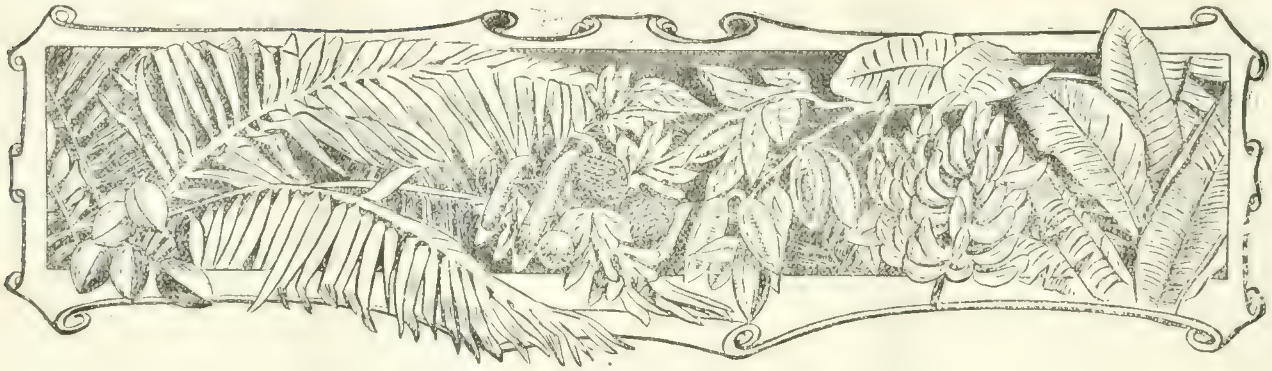
FORESTRY IN TRINIDAD.

It will be remembered that, in the issue of the *Agricultural News* dated May 29, 1909, the editorial dealt with the subject of timber production. Special reference was made, in the last paragraph of that article, to the work in Jamaica and Dominica in this connexion.

Since then, through the courtesy of Mr. C. S. Rogers, Forest Officer, Trinidad, information has been received concerning the forest work in Trinidad and Tobago. This information is comprised in the Annual Reports of the Forest Officer for the years 1901-8, in a Report (1900) by Mr. F. Lodge, I.F.S., on Forest Conservation in Trinidad and Tobago, and in the Crown Land Forest Produce Rules for those islands. The following account which has its origin in the above sources, will serve to indicate, in some measure, the work that is being done :—

The annual vote on the estimates for forestry in Trinidad for the last eight years has been £1,000, and, although this annual sum is not large, the work has been steadily continued during the whole of that period. The chief object of conservation is the protection of the water-supply. Subordinate to this, nevertheless of great importance, are those of the conservation of areas required for the present or future supply of fuel to towns and villages, and the regulation of the rate of removal of timber and other forest products. In furtherance of these objects, the chief work that is being done includes the following: the demarcation of forest reserves and the subsequent improvement of them ; the issuing of leases and licenses for the cutting and disposal of timber, etc., and the enforcement of the rules under which these operations may be performed ; the preparation of plans and boundary records of the reserves ; the inspection of the boundaries of the reserves.

The revenue from timber and other forest produce for the year 1906-7 was £2,147 against £1,872 the year before, showing an increase of £275 over that year, and £1,037 over the average for fourteen years. That in the period 1907-8 showed a decrease of £775 from the one in 1906-7. The decrease is due to the less work being done on roads, and the large areas of land sold, from which the timber was disposed of at lower rates than those fixed for timber from Crown lands.



WEST INDIAN FRUIT.

THE COCOA-NUT IN HAWAII.

In view of the increased interest in the cocoa-nut palm and its products which is being taken in several parts of the West Indies, the following information from the *Philippine Agricultural Review*, Vol. I, No. 6, may be found useful. Hints on cocoa-nut cultivation have already been given in the *Agricultural News*, Vol. VIII, Nos. 181 and 187; what follows here deals more particularly with the uses of the chief products of the plant, and with its habitat:—

While the cocoa-nut is one of the few species of palms native of Hawaii, being widely but somewhat sparsely scattered along all the coast lines of the group, its cultivation on an extended scale does not date before 1904 or 1905. Renewed interest in the cultivation of this extremely useful tree is due in a large measure to the rapid increase in the demand for the oil and fibre. The value of cocoa-nut oil has long been recognized for soap-making and as an illuminant. Cocoa-nut oil is the basis of a number of patented food compounds and butter substitutes, finding for this latter purpose an enormous sale within the tropics, because the melting point of the so-called 'butter' manufactured from it is higher than that of either pure butter, or any of the oleomargarine compounds manufactured from animal fat. Not only is there a more or less legitimate field for the sale of artificial butter made from the cocoa-nut oil in hot countries, but its use as an adulterant is said to be practised on an enormous scale in Denmark and other European countries, where dairying is an important industry.

Cocoa-nut oil is being rapidly displaced as an illuminant by the cheaper petroleum. A characteristic of the oil is that it burns without smoking.

The value of the by-products, after the extraction of the oil from the copra is also rapidly increasing. Cocoa-nut meal is becoming recognized as a concentrated feed of high value, and as an organic fertilizer equal to cotton seed meal.

Coir, the fibre of the husk of the cocoa-nut, is in itself a valuable product. This fibre is used in the manufacture of ropes and cordage, and is woven into matting and bagging. The stiff, harsher fibres obtained from the leaf stalk and from the mid-rib are used in the manufacture of all classes of brushes. In oriental lands the leaves provide materials for thatch, and the trunks for house and bridge construction.

Another product of the cocoa-nut, not as yet utilized in Hawaii, is obtained in the manufacture of a liquor or alcoholic beverage by fermentation of the sap obtained by bleeding the inflorescence. Elsewhere in the tropics the cultivation of the cocoa-nut for this purpose alone utilizes groves hundreds of thousands of acres in extent. Sugar was formerly made from this sap in large quantities, and even now the natives of many outlying tropical districts obtain the family sugar supply from this source.

The cocoa-nut tree demands above all things good drainage. It thrives neither in swamps nor on rocks. The roots are thick, fleshy fibres, there being no taproot, and they seem to be especially adapted for the storage of considerable quantities of water, but wherever they reach the level of permanent standing water, or wherever stagnant waters rise above the level of roots already formed, these rot, and the tree sends out new and shorter roots only as far as the perfectly drained and well-aërated soil extends. The tree is a heavy feeder, requiring cultivation and fertilization, giving best results where these can be augmented by irrigation or abundant rainfall.

Another factor is that the tree grows best in windy locations. Specimen trees in sheltered valleys, where the wind never strikes them, are more liable to be spindling and unhealthy. The requirements of the cocoa-nut may be summed up in having light and room in windy locations, where the soil is rich and well drained, and there is abundant artificial or natural irrigation.

A MECHANICAL POLISHER FOR CACAO.

The following information respecting a mechanical polisher for cacao, invented by Mr. George Barnard of St. Lucia, and known as 'Barnard's Patent Cacao Polisher', has been received through the Acting Agricultural Superintendent in that island:—

This cacao polisher consists of a hollow cylinder, made of wood or iron, through which runs a shaft on to which are keyed a number of 'eccentrics'. Attached to the lower or under side of these eccentrics are feet or 'pedals' which are jointed, like the human ankle, in order to give a rocking motion as the eccentrics rise and fall. Hard rubber pads are attached to the bottom of these pedals which give under pressure to prevent the beans from being crushed; an additional safeguard against crushing is that the pedals do not come within 2 inches of the cylinder, and are spaced sufficiently far apart on the shaft to allow the cacao to stir about freely and become thoroughly mixed as the pedals rise and fall alternately.

The cylinder and shaft are run in opposite directions, so as to complete the stirring of the beans, in order that each bean shall get an equal amount of polish. The cylinder is driven at the rate of ten revolutions per minute, and the shaft at sixty to eighty. At this rate of work, the machine in operation at Park estate, which is a four-pedal machine, polishes one bag of cacao of 200 lb. in ten to twelve minutes. This is a record unattainable by the present method, in which the polishing is done by means of the human foot. The machine may be had in various sizes, from those which may be worked by hand to those which are engine-driven The beans are fed into the polisher and damped (just as at present) before starting and, on removal, are placed either in the sun on trays or direct into the drier. Thus it will be seen that with a polisher and a drier the cacao planter is now enabled to hold his own against the uncertainty of the weather, the excessive rainfall in some districts at the reaping season, or the indolence of the labourer.

PACKING AND SHIPPING FRUITS.

The following is taken from an article in the *Hawaiian Forester and Agriculturist*, Vol. V, No. 5. It deals with the packing and shipping of five fruits: the avocado pear, the mango, the papaw, the banana and the pine-apple:—

The picking of the avocado pear should be done within as short a time as possible previous to the sailing of the steamer, for this fruit begins to soften quickly, and should therefore be placed in cold storage as soon as possible. Even if there are facilities for keeping this fruit at a low temperature for a time until the steamer arrives, the change of temperature consequent on its removal is likely to do serious harm. In picking, the stalk should be cut at a distance of ¼ or ⅛ inch from the fruit, and great care should be exercised so that the fruit may not be bruised. For packing, crates large enough to hold one dozen, or at the most two dozen fruits, are most convenient, and each of these crates should be only one tier deep. All fruit should be wrapped in rather thin, but strong paper; packing paper between the fruits is inadvisable, as it interferes with refrigeration and ventilation. The time during which this fruit will keep in good condition in cold storage is at least three weeks, and, probably, the best temperature is between 45 and 50 degrees Centigrade. The first signs of deterioration under conditions of refrigeration are the darkening of the flesh near the seed and the presence of a rancid smell.

The treatment of the mango is much the same as that for the avocado pear, with the following exceptions, namely: though the crates should be small, there is no need for them to be as small as those for the avocado pear, and they may be made with two or three tiers; the mango can be kept longer in cold storage, for six weeks' exposure to such conditions will not harm the fruits.

The papaw should be picked as soon as the faintest signs of yellow appear, and as in the case of the avocado, just before the time of despatch. About 1 inch or 1½ inches of the stalk should be left on the fruit, which must be handled with great care. The wrapping should be done with rather heavy paper, preferably glazed, in order to prevent the free passage of moisture, to the sound fruits, from any of those which may have begun to decay or get soft. While the fruit is in transit, ventilation alone is insufficient to keep it in condition; it must travel at a reduced temperature.

Bananas for export should be cut before they become too 'full', that is before the ridges on them disappear; naturally, the exact stage at which to cut will depend on the time which must elapse between their despatch and their arrival in the market. As a wrapper, grass has been used, but this is liable to absorb and hold moisture; banana leaves are much preferable, as they will keep dry. In some places, this fruit is being exported in drums made of cardboard or thin wood, large enough to contain a single bunch. The chief feature of the drums is that the top hoop holds a strong piece of paper in place, to which the bunch is tied by its stalk, so that the weight is supported by the latter. The practicability of such a method of shipping, in the case of any particular place, would depend on local conditions. Bananas cannot be carried at a very low temperature, as they turn black without ripening; the temperature may be lowered, but only sufficiently to delay the ripening process a little. The Jamaica is superior to the Chinese variety as it is not subject to the disease known as 'ripe rot', and because the individual fruits do not show so great a tendency to drop from the bunch.

As regards pine-apples, those cut with long stalks arrive at their destination in much better condition than those which have been cut off short. The crates for packing should not be too large, and are made preferably with rounded corners in order to prevent damage by the splitting-off of staves. The packing material may be grass or any other suitable vegetable material so long as it is quite dry. As in the case of the papaw, the wrapping should be of heavy paper and preferably glazed; it should be large enough to cover the whole fruit with the exception of the crown. Finally, fruits should be packed solid in order to prevent damage from being shaken against one another.

SELECTION OF GROUND NUTS.

The following factors, which should be taken into consideration when varieties of ground nuts are being examined for selection, are given in the *Annual Report on the Experimental Work of the Agricultural Station*, Surat, 1907-8. This information, together with that recently published in the *Agricultural News*, Vol. VIII, No. 187, pp. 206-7, should be of assistance to those who are making experiments with different kinds of ground nuts. The factors which are given are:—

(1) The suitability of the variety to the existing climatic conditions.

(2) The percentage of seeds on the weight of unshelled pods. With different varieties, this varies considerably.

(3) The percentage of the oil on the weight of seed from which it is extracted. This is important when the nut is being chosen for oil-extraction rather than for edible purposes. A value of over 50 per cent., in this respect, indicates a valuable commercial ground nut.

(4) The yield per acre, which, when considered in conjunction with the foregoing factors, determines the real value of the variety.

(5) If the uncrushed nuts are to be sold for oil-extraction, the thickness of the shell is important in deciding if the variety can be economically crushed for this purpose.

In the same report, figures are given from which some idea can be gained as to the varietal differences in the percentage of seed on unshelled pod. The lowest percentage was 71·78 and the highest 82·06, giving a difference of over 10 per cent. Information is also given as to the variation, in a similar manner, of the percentage of oil on seed. This was one of about 8 per cent., between the highest at 53·50 and the lowest at 45·69. With inferior kinds of ground nuts, these percentages would not, of course, be as high.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland of Liverpool write as follows under date, July 19, with reference to the sales of West Indian Sea Island cotton :—

West Indian Sea Islands have been in moderate request since our last report. The sales amount to 400 to 500 bales and comprise Anguilla, Montserrat, Barbados, St. Kitts, St. Croix, Antigua, Virgin Islands, Barbuda and Jamaica, chiefly at 13*d.* to 14½*d.*, with a few St. Vincent at 15*d.* to 16*d.*

The market remains firm and prices in Charleston and Savannah are advancing, owing to the local American demand, but we understand that the American Sea Island crop is progressing favourably.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the weeks ending July 3 and July 10, is as follows :—

The unsold stock of Islands now consists entirely of planters' crop lots, held here or on plantations, aggregating 457 bales. The factors are still refusing to sell any of them under 30c., and the larger proportion are held under instructions from the planters at 35c.

The position in this market, up to July 10, thus still remained unchanged.

COTTON EXPORTS FROM TRINIDAD, GRENADA AND BRITISH GUIANA.

The returns of the cotton which was grown in and exported from the colonies of Trinidad and Tobago, Grenada and British Guiana during the quarter ended July 30, 1909, are to hand. From these it appears that the kinds of cotton exported from the two first-mentioned colonies were Sea Island and Marie Galante. The amounts of these kinds exported from Trinidad and Tobago were respectively 5 bales, weighing 1,125 lb., and 10 bales, weighing 4,000 lb. ; no estimated value is given. In the case of Grenada the quantities were, similarly, 31 bales, weighing 8,678 lb. having an estimated value of £469 19*s.*, and 827¾ bales weighing 248,455 lb, and of an estimated value of £6,884 5*s.* 6*d.* The destination of all this cotton was the United Kingdom.

No cotton of any kind was exported from British Guiana. It may be mentioned that returns, for the same period, from the Virgin Islands were given in the last number (189) of the *Agricultural News.*

THE BY-PRODUCTS OF THE COTTON INDUSTRY.

The following interesting information in regard to the by-products of the cotton industry is contained in an article in the *Transvaal Agricultural Journal,* Vol. VII, No. 27 :—

For a hundred years, in the Southern States of America, cotton seed used to be regarded of so little use and such a nuisance, that ginneries were built near to, and even over, streams, in order that the seed could be washed away, as the accumulating heaps of decomposing and rotten seed on the land had proved a serious menace to health. Times have now altered, and the seed is worth practically one-fifth of the value of the cotton crop. At first, the seed was allowed to partially decay, and was then returned to the land to supply plant food for future crops. Now, after the seed has been subjected to varied treatments, and valuable oil, etc., extracted, the residue is made into cattle food, and after it has been fed there is still available three-fourths of the original fertilizing value in the manure from the animals.

A ton of 2,000 lb. of seed-cotton usually averages 665 lb. of lint and 1,335 lb. of seed ; 18 lb. of lint or short fibre still remains on the seed after ginning. From the seed can be manufactured or prepared 490 lb. of meal and 186 lb. of oil ; 561 lb. consist of hulls (also used for feeding), and the balance of 80 lb. is waste material, such as dust, sand, etc.

By the practice of feeding cotton seed or its equivalent in meal, the feeding value is got out of it, and it can afterwards be returned to the soil in the form of manure, which is rapidly available as plant food for the forthcoming crop. It is stated that 100 lb. of ground cotton seed equals in feeding value 116 lb. of maize, and 100 lb. of cotton seed meal equals 175 lb. of maize. There is still much to learn as to the best way to combine cotton seed meal with other foods in order to secure the very highest feeding value possible, and it is within the range of possibility that human food also will be produced from it, as cotton seed meal contains all the elements necessary for wholesome, nutritious food.

Failure to return the cotton seed to the soil in some form or other leads to depletion and poor crops. From a fertilizing standpoint, the oil contained in cotton seed is more objectionable than serviceable. For feeding to live stock it is unfavourable to digestion, and the oil is of no use to the soil, nor is it a source of food for the plant. Consequently, it is to the farmer's benefit to have the oil extracted from his seed, so that the latter may become of more value to him as a feed or a fertilizer. In artificial manures, nitrogen is the most costly element of plant food that is purchased, and for this reason its production by means of home-made manures must be very carefully taken into consideration. The decay of cotton seed meal in the ground is rapid although its effects are lasting. Nitrate of soda is more rapidly available as plant food, but soon becomes exhausted.

A ton of cotton seed yields something like 40 gallons of crude oil, therefore the oil obtained from many tons of seed can be transported long distances to a central refinery in a small bulk space, thus showing the advantage of having small oil mills situated in the centre of each cotton-producing district. Two products are obtained from the crude oil, the crude oil proper and the settlings; the first is barrelled for shipment and the latter is used as soap stock. Refined oil is largely used in the manufacture of butter compounds, and the higher grades are used for oil for cooking, salad dressing, etc. Cottolene, a substitute for lard, is also manufactured from refined oil, after bleaching, and is a very popular product.

LAND DEVELOPMENT IN DOMINICA.

A company called 'The Dominica Lumber and Land Development Company, Limited' has recently been formed. The information given below as to its objects and interests is taken from the Prospectus, dated July 9, 1909.

This company has been formed with the object (among others) of acquiring the benefit of a valuable Concession dated September 29, 1908, granted by the Administrator of the Island of Dominica, with the approval of the Colonial Office, for the construction of a light railway from a point on the leeward shore of the island of Dominica, B.W.I., south of the Layou River, to a point in the interior near Basinville, in order to render available the enormous quantities of hardwood and other timber with which the interior of the island is covered, and to facilitate planting up and developing the rich lands in the district and the transport of produce.

The inaccessibility of the interior has hitherto prevented its development, but in the year 1906 a syndicate was formed of leading planters and others in the island, under whose auspices a complete survey of the route of the proposed line was made and plans and estimates prepared, and by whom the favourable terms of the Concession have been negotiated.

By the terms of the Concession very important rights of way through Crown lands and other valuable rights and franchises necessary for the success of the enterprise have been secured by the syndicate, including the right to a free grant of 100 acres of land for each mile of railway not exceeding 12, and an option to purchase 5,000 acres of land at 10*s*. per acre, subject to the reasonable conditions of construction and working, cultivation of cleared land and other conditions laid down in the Concession.

The scheme has received the cordial support of all the planters whose estates are on the route of the proposed line.

The company will, on complying with the conditions of the Concession, have a tract of 6,200 acres of standing forest, of which 1,200 will be free Government Grant and 5,000 will be purchased. Lumber rights have already been secured over most of the estates adjoining the railway, while negotiations are in progress to secure them over the remainder. The additional area involved is some 2,700 acres, of which at least 1,000 acres will be available for immediate felling.

The line will be in heavy timber by the time the first 8 miles have been constructed, when large profits should accrue, and it is probable that not long after the construction has been commenced a small trade in hardwood, fuel, and staves will be done.

The survey shows that the gradient will nowhere be greater than 1 in 25, which is suitable for a light locomotive hauling 10 tons up hill, while the load that can be taken down will be limited only by the number of trucks put on. It also shows that no heavy bridges or tunnels will be necessary, or other serious engineering difficulties encountered. The line will be a single line, with a 2-foot gauge, and will be constructed so as to carry all probable future traffic. It will be properly ballasted, and the earthworks, drains and culverts will be designed to minimize any possible damage from tropical rains or hurricanes, against the contingency of which, moreover, insurance to a large extent can now be effected at moderate rates. The curves will be wide, and so laid out as to admit of a fair rate of speed over the whole length of the line, and the carriage of long baulks of timber. A belt 150 feet wide on either side of the line will be cleared to prevent any danger from trees falling across it. For immediate purposes, a length of 13½ miles of line (including a branch line) has been surveyed. An extension of some 2 miles will be necessary to enter the Crown lands reserved for the company, and this extension will be constructed as soon as required.

The lumber trade which the railway will develop in the first instance seems capable of producing large profits. The interior of Dominica is covered with virgin forest, containing a large proportion of heavy timber, the quantity of hardwood timber and fine cabinet woods immediately available being very great. The botanical and descriptive list of Dominica timbers prepared by the late Dr. Imray, and lately reprinted in 'Notes on Dominica and Hints to Intending Settlers', revised in 1909 by W. Douglas Young, Esq., C.M.G., Administrator of the island, shows that no less than 176 different timber trees grow in this island, many of them being of great value and likely to find a ready market, while none are of so poor a quality as to be worthless.

Additional interests of the company will include the planting of cacao, limes, oranges, rubber, etc., on such of the land which it possesses as has been cleared by it, and the working of the sawmill plant to be acquired from the syndicate mentioned in the prospectus. The list of timbers mentioned above appears in the *West Indian Bulletin*, Vol. IX, p. 329.

Tree-growing Experiment.

The Pacific Coast will soon be the scene of an interesting tree-growing experiment. The United States Forest Service is planning to introduce a number of the more important eastern hardwoods into California, and will this year experiment with chestnut, hickory, basswood, red oak, and yellow poplar or tulip trees. Small patches of these trees will be planted near the forest rangers' cabins or the national forests, and if these do well, larger plantations on a commercial scale will soon be established on wider areas. There are over 125 different species of trees in California, a number of which produce some of the most valuable varieties of lumber in the country. Although considerably over one-half of the species are hardwood or broad-leaved trees, yet, with the exception of the exotic eucalyptus, there is not a single species of hardwood here ranking in commercial importance with the leading eastern hardwoods. Climatic conditions in many parts of California are favourable for the growth of a number of the valuable hardwoods and the absence of these trees is due mostly to unfavourable factors of seed distribution. (*Science*, June 11, 1909.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number continues the subject of green dressings and their application, the chief matter under consideration being the effect on the soil.

In the Insect Notes, on page 250, there will be found an account of some new species of *Cecidomyiidae*, that is, flies related to the flower-bud maggot of cotton.

The first of a short series of articles on the life-history of the fungi appears on page 251.

The account of a quick and thorough germination test for corn, on page 255, should be of interest to those who raise this product in any quantity, especially as this test affords an indication as to the ears which should be used for providing seed for the next crop.

An interesting account of the chief by-products of the cotton industry is given on page 246.

A Company has recently been formed for the purpose of land development in Dominica. Particulars as to its objects will be found on page 247.

Attention is drawn to the reviews, on page 254, of three pamphlets which have been recently issued by the Department.

Useful hints in connexion with the selection of ground nuts are given on page 245.

Copra Exports from Ceylon.

Information concerning the trade of Ceylon during 1908 was given in the *Agricultural News*, Vol. VIII, p. 153. Following on this, it is stated that the advance in the export of copra is still maintained, being 114,373 cwt. during the first quarter of 1909, an advance, on that of the corresponding quarter of 1908, of 31,500 cwt.

The Cultivation of Citrus Fruits.

In the *Agricultural News*, Vol. VIII, No. 184, there recently appeared detailed information in regard to this subject. An account of the treatment to which citrus trees are subjected in Eastern Spain, after they have become established, which appears in the issue of the *Agricultural Journal* of Victoria for January 1909, should form an interesting addition to that information. This treatment has for its object the combating of the diseases known as 'collar-rot' and 'mal-di-gomma', which have been prevalent in that part of Spain in the past. It consists in digging a hole underneath the tree, when it is about three or four years old, and completely sawing off the tap-root. The hole left after the operation is about a foot in width and depth; it is not filled in, but rather kept purposely open. The trees do not appear to suffer in any way through the treatment; on the contrary, they are reported to be very healthy, and to bear fruit well.

Abnormalities in Para Rubber Trees.

According to the publication *Circular and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No. 18, it is a common occurrence for Para rubber trees there to possess lumps of woody growth, on their trunks, which interfere somewhat with tapping. There are two types of these swellings or 'burrs', one of which depends entirely for its origin on the wounding to which the tree has been subjected in tapping, while the other is not caused by that process, but may be stimulated to growth through it.

The first of these is caused by the action of the cambium layer, which, after healing the wound made by the collector's knife, continues its activity and thus forms a swelling over the site of the wound. It does not offer a serious obstacle to tapping.

In the case of the second type, tapping is seriously interfered with, as the swellings project abruptly from the stem in a rounded form, and so prevent the cut from being made across them. Examination of these swellings reveals the fact that each possesses a core of wood, with a cambium of its own which is neither connected with that of any of the other swellings nor with the cambium of the tree itself. It is, of course, by means of this disconnected cambium that the swellings are formed. Similar bodies are found in the cortex of apple, pear and beech trees. The cause of this formation is not known at present; it is certainly not due to insect or fungus injury, nor to dormant buds. The swellings may be got rid of by slicing off part of the outer layer and shelling out the woody core.

Sugar in Porto Rico.

In connexion with the report of the estimate of sugar production in Porto Rico, for the crop to be reaped in 1909, which was given in the issue of the *Agricultural News* for May 15, 1909, it is of interest to note that, according to the *Porto Rico Horticultural News*, this estimate has been exceeded: that the actual production of sugar for that period was 281,399 tons as against 230,095 tons for the season ending 1908. Of the amount of sugar made, 5,700 tons was muscovado, and it is likely that there will be a moderate manufacture of this product in that island for some time to come, in view of the high prices that are obtained for choice Porto Rico molasses.

A Simple Trap for Mosquitos.

The *Indian Planters' Gazette* of January 9, 1909, describes a simple and cheap mosquito trap, which has been devised by Mr. H. Maxwell-Lefroy, M.A., F.Z.S., F.E.S., late Entomologist to this Department and now of the Indian Entomological Department. A small box, 12 inches by 9 inches, which is fitted with a hinged lid, is provided with a small opening which can be closed by means of a piece of wood made to slide over it. The floor of the box is made of tinned iron and it is lined with green baize. The trap depends for its effectiveness on the well-known fact that mosquitos, during the day, hide from the sunlight in the shadiest part of the room, so that, when the box is placed there, those entering in the morning fly into it. After a while, the lid is shut, about a teaspoonful of benzene is poured through the small opening provided for the purpose, and the slide drawn over it. In a trial of the apparatus, 2,300 mosquitos were trapped in a month, so that it would appear to be effective in reducing the number of those insects.

Variation in Seedling Canes.

In the *West India Committee Circular* of July 6, 1909, particulars are given in regard to experiments conducted under the direction of Prof. J. B. Harrison, at the Experiment Station in Georgetown, to determine the variations that may possibly take place in the appearance of the cane B. 208. Those which have been demonstrated show marked departures from the normal type, in which the colour is greenish-yellow, while there is a prominent characteristic swelling just above the internode. Fourteen modifications of the original type were obtained by growing the cane under different conditions of soil and sunlight. In many of these, the swelling no longer exists. Great changes, too, have taken place in colour; in some, crimson blotches are present; in others, there may be found crimson, greenish or purplish stripings in addition to the original yellow colour. Continuous cultivation in a heavy clay soil has given rise also to a peculiar reddish modification. All this serves to illustrate the fact that the characteristics of seedling canes are not constant under differing conditions of environment.

Selection of Disease-resistant Plants.

In selecting disease-resistant varieties of a plant, all those obtainable should be grown on infected ground in order to obtain a knowledge of their relative resistance to disease. Experiments conducted in this way may bring forward some variety which is exceedingly resistant to the disease in question, and further work will be unnecessary except to keep the variety pure. Usually, however, all obtainable varieties will be more or less susceptible and, if this is the case, the least susceptible of these varieties must be subjected to further observation, and then selection must take place according to the method just described. In short, the most promising varieties must be chosen, and then individual selection must be practised with these.

The Preservation of Timber.

For this purpose a method of treatment known as the 'Powell Wood Process', appears to have met with success. It consists in impregnating wood with an antiseptic substance in order to render it immune from the attacks of wood ants and other insects, and to prevent it from rotting. The introduction of the preserving material into the substance of the wood is said to make no alteration in its appearance in most cases, and, where this does take place, an improvement is the result. Various severe tests of the value of the process have been made, notably in India, and others are in train. These mostly consist in subjecting pieces of untreated wood and of 'powellized' wood to the same unfavourable conditions and, so far, the latter has passed the tests successfully.

The method is reported to be cheap, and capable of being applied on an extensive scale.

Agricultural Education in Ceylon.

The *Report of the Director of the Royal Botanic Gardens*, Ceylon, for 1908, states that the number of schools brought under the scheme for school gardens there is 180. A special committee, which was appointed to enquire into, and report on, the work of school gardens and the subject of agricultural education generally, made recommendations to the effect that the number of school gardens be increased and the work encouraged by means of prizes; that a special course of lectures to teachers on Nature Study be arranged for; that a Manual of Nature Study Lessons and an Agricultural Reader suitable for Ceylon should be prepared; that, in specially selected schools, definite agricultural teaching be provided and illustrated by practical experiments; that the curriculum of teachers under training at the Government College be made to include instruction in Nature Study, and a special teacher to take charge of the work be appointed as soon as available; lastly, that a school of agriculture be started at Peradeniya for training agricultural instructors, and that a shorter vernacular course be provided for the benefit of candidates nominated for village headships.

INSECT NOTES.

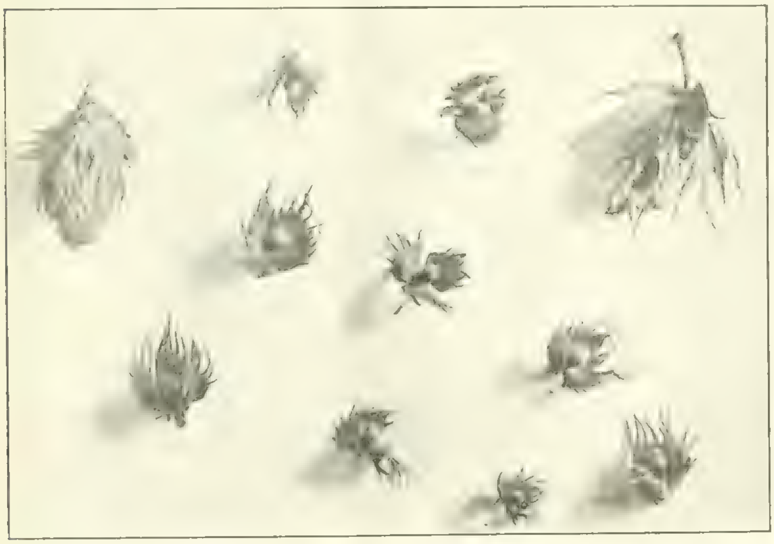
New Species of Cecidomyiidae.

The flower-bud maggot of cotton (*Contarinia gossypii*), which has twice appeared at Antigua as a serious pest, and which has also occurred at Montserrat, has formed the subject of several articles in the *Agricultural News* (see Vol. VII, p. 155, Vol. VIII, pp. 10, 58), and of a paper in the *West Indian Bulletin* (Vol. X, p. 1) by the Entomologist on the staff of the Imperial Department of Agriculture.

The flower-bud maggot was first described and given a name by Dr. E. P. Felt, New York State Entomologist.

During the investigations which were carried out in Antigua in January of the present year, in connexion with the attack of flower-bud maggot, several additional species of closely related flies were obtained. A collection of this material has been studied by Dr. Felt, who has given names to three species new to science.

The following notes may be of interest to the readers of the *Agricultural News*. Only one species of flower-bud maggot has been obtained from the cotton, although the buds and flowers of both the wild cotton and Sea Island cotton have been collected and flies reared from them. Caravonica cotton is also attacked, probably by the same species, but the adult flies have not been studied.



INFESTED FLOWER-BUDS OF COTTON SHOWING CHARACTERISTIC FLARING OF THE BRACTS OF THE SMALL BUDS OWING TO THE ATTACK OF THE FLOWER-BUD MAGGOT.

The Privet or Wild Coffee (*Clerodendrum aculeatum*) is attacked by, or at least harbours in its inflorescence, some three or four species of Cecidomyiid flies. One of these is the same as that which attacks cotton, one is stated to be another species of *Contarinia*, one a species of *Prodiplosis*, and there is another which, from its relation, might be called the privet maggot. This species Dr. Felt has named *Asphondylia attenuata*.

Another insect belonging to this family may often be seen in Antigua about the lights, or more accurately, may be seen on the sides of the lamps where they have been killed by coming in contact with the film of oil generally to be seen on the outside of kerosene lamps. This species has been named *Lobodiplosis spinosa*. Another new species of this family has been recorded from Barbados, the maggot living under the bark of the twigs of Mango (*Mangifera indica*). Grafted mangos seem to be the more often attacked, and these when young are often seriously injured and sometimes killed by the attacks of the maggot. This insect has been named *Asynapta mangiferae*.

Previous to the appearance of the flower-bud maggot in Antigua in the season of 1907-8, only a few species of Cecidomyiid fly had been recorded from the Lesser Antilles, and none of these were known as pests. This was the maggot of cotton (*Porricondyla gossypii*) which made its appearance as a pest of cotton in Barbados in 1904. It has since been seen in Montserrat. The maggot of this species lives under the bark of the stems of the cotton plant and often causes the death of all the plant above the point of attack.

The family to which these insects belong is called the Gall-midge family, but none of the West Indian species of which the life-history is known forms any gall or conspicuous swelling, and the adult insects are so small that they would not be likely to be seen or known at all, if it were not for the damage they do.

SELECTION OF CATTLE FOR MILKING CAPACITY.

The following is taken from a notice, in the *Indian Agricultural Journal*, of a paper read before the Farmers' Club by an Essex dairy farmer:—

The method followed depended upon making the milking capacity of the cow the chief factor in selection for breeding purposes, and remarkable figures were given to illustrate the results obtained, in the matter of the output of milk for each cow, by the adoption of such a scheme. The information which was required for guidance in selection was obtained by carefully measuring and recording the milk given by every individual cow on a certain day in each week. This practice was not only useful in affording the owner the means of estimating, with a near approach to accuracy, the profit and loss on each cow, but it possessed a greater value in that it was a guide to indicate those cows which should be employed for the rearing of calves. Thus, on one side, the chief criterion in selection was the possession of a good milk pedigree. On the side of the sires, a similar consideration obtained, which was that the bulls should also have come of good milking stock, that is one in which the same, or similar, records have been kept. A pedigree bull from a herd bred simply for beef was not necessarily of any value; what is required is one of a stock whose cows possess milking capacity superior to that of the preceding generation.

The writer of the paper had, by the adoption of such methods, obtained heifers after the first calf, which, at the age of two and a half years, gave 14 quarts of milk a day, as against 11 quarts for the same class a few years ago.

The methods set forth are not new, but are suggestive, and indicate that if their adoption results in improvement of the more highly selected English stock, much more, then, would it do so in the case of ordinary West Indian cattle.

FUNGUS NOTES.

In continuation of the information contained in an article in Vol. II, No. 22, pages 61-2 of the *Agricultural News*, it is intended to publish, in this and the next two numbers, a short article giving an account of the principal points of interest in the life-history of the fungi, and to indicate their connexion with practical agriculture. The present number contains the first of these.

PART I.

Spores. Their Formation and Purpose.

All publications on the subject of plant diseases caused by fungi include some reference to the spores produced by the parasites, and indicate that it is by means of these spores that a fungus is able to spread. Consequently, the prevalent idea is that the spore is a form of seed, though very small. This idea is to a certain extent correct, but in one or two points there is a fundamental difference between the two, as will appear later.

The simplest type of spore formation is as follows. A single thread, or *hypha*, as it is called, of the fungus swells slightly at the end and becomes very full of protoplasm; it then becomes constricted just below the tip, and this constriction proceeds until the tip is completely cut off in the form of a round or oval spore (see Fig. 1). The spore contains a nucleus and dense protoplasm, and is usually

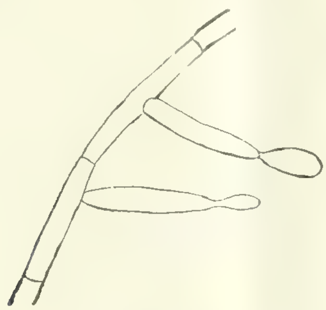


Fig. 1.

surrounded by a firm, smooth wall or coat. Such a spore is nothing more or less than a small portion of the original fungus plant, and is really more properly compared to the bud of a plant than to a seed.

It is true that the seed and the spore have certain points in common. Both serve the purpose of reproducing their kind and, also, both are adapted for dispersal, so as to prevent competition with the parent. Again some forms of spores, and most seeds, are capable of existing under very adverse circumstances such as extreme drought, or excessive cold, which will kill the parent plant, and the continuation of the species is by this means made certain; for this purpose they both contain supplies of reserve food-material. Here the similarity ceases. The fundamental difference is that the seed of a flowering plant always contains a small complete plant, or embryo, while a spore never does, but usually consists of one cell which can produce a new plant. Besides this, owing to cross-fertilization, it is by no means necessary that the young embryo in the seed will, when full-grown, exhibit the same characters as the mother plant on which it was borne, while the spore, being usually merely a piece of the original individual, is bound to be exactly like that individual. Even when spores are produced sexually as is sometimes the case, the sexual processes are between two parts, often closely related parts, of the same individual; this might be compared broadly to self-fertilization in flowering plants, and consequently, the resulting plants are very like the parent.

Thus there are usually two forms of spore produced by a fungus. The method of production of the first has already been described for the simplest case. These spores are carried by the wind or insects to a suitable place, as for example, some definite host plant, where they germinate at once, thus ensuring the increase in numbers of that species of fungus. But as circumstances often become unfavourable, owing, usually, to the exhaustion of the food supply on which the fungus is growing, or to adverse conditions of weather, another form of spore may be produced. The formation of these spores often entails a very simple form of sexual union. To illustrate what is meant, the process exemplified by the Mucors, or mould fungi, may be described. Two hyphae from the same plant, lying near one another, become swollen at the ends. These ends grow towards one another, touch and finally fuse together, the wall between them being absorbed. The nuclei then unite and the fused tips are cut off by cross walls in the hyphae. Next, the outside of the spore thus formed becomes hard and warty and, in this way, a spore is produced with dense contents, some reserve food, and a thick coat, which is capable of existing under adverse circumstances, and which will not begin to grow again till several weeks or months have elapsed, and circumstances are again favourable. Such resting-spores are often coloured owing to the presence of coloured oils, or to the colour of the thick coat.

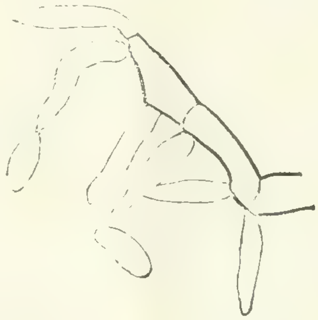
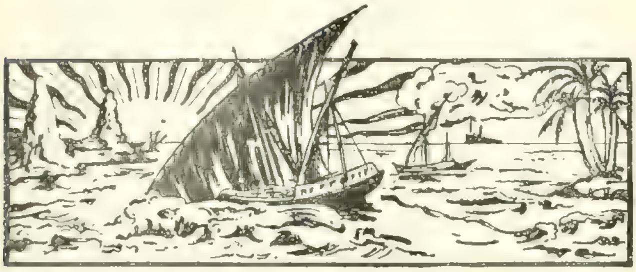


Fig. 2.

Other methods by which such spores are produced are mainly modifications of that by which the quick-growing form arises, only that for resting-spores the contents are denser, and the coat is always hard, and often ridged or warty on the outside, as has been stated. A similar kind of spore is that produced by the fungus causing rind disease of the sugar-cane, *Colletotrichum falcatum*. Under adverse circumstances, the walls of any cells of a hypha of this fungus, inside the host plant, can become covered with a hard coat, and so form resting-spores. An example of this is shown in Fig. 2. The cells shown with thick walls are resting-spores, which have germinated to form the kind of spores first described.

It is clear, then, that the first or quick-growing kind of spore is directly responsible for all epidemics, and is hard to deal with, once it has gained a hold, owing to the immense numbers in which it is produced. But the second form, which is often much less numerous, is really more important, as it is responsible for the continuation of the fungus from year to year, and it is the presence of this form of spore in particular which makes the destruction of all diseased material, especially at the end of a crop, a matter of such vital importance to the planter.



GLEANINGS.

According to the *Progress Report of the Ceylon Agricultural Society*, No. XLIV, the Yampee or Kash-Kush yam of the West Indies has proved too delicate for the comparatively damp climate of the Western Province of Ceylon, as the vines at the Government Stock Garden have all died out, in spite of attention given.

It is considered by many authorities in the United States that there is very little possibility of extending the Sea Island cotton industry of that country. The principal reasons for this conclusion are that the cost of labour is very high, and that the crop gives but small returns there, unless it is planted under the best conditions.

According to No. 4,191 of the *Diplomatic and Consular Reports, Annual Series* (which deals with the trade of Newchwang, China, during the year 1908), experimental farms are in operation in the north of Manchuria, for the purpose of testing the possibility of establishing a beet-sugar industry in that country.

The value of the chief staple products exported from Barbados during the year 1908 was as follows: muscovado sugar, £279,536; molasses and syrups, £217,712; cotton, £61,579; sugars other than muscovado, £8,900. It is a matter of special interest at the present time that the value of imports from Canada was £151,671 as against £101,943 for the year 1907.

The *Board of Trade Journal*, June 3, 1909, reports that the number of bales of cotton imported into the United Kingdom during the week ended May 27, 1909, was 56,745, including 43 bales British West Indian and 290 bales British West African. The number imported during the twenty-one weeks ended May, 27, 1909, was 2,130,963, including 4,080 British West Indian, 5,711 British West African, 3,381 British East African, and 282 bales foreign East African.

No. 600 of the *Annual Colonial Reports* gives the following information relative to the Protectorate of Uganda. The revenue collected during the year 1907-8 was £111,883, which was £27,000 over the estimate, and far exceeded the collections of any previous year. The increase, as compared with 1906-7, was over £15,000; this increase was contributed to under all heads except those of Customs, land sales, and sales of old Government property.

The *Natal Agricultural Journal* states that, at the end of the year 1908, the total acreage of farms in Zululand, held under lease from the Natal Government, was 68,565, of which 5,524 acres were in cane. The amount of cane cut and delivered for sugar-making during the season just ended was 41,200 tons. This was taken from 1,466 acres, making the average yield of cane, per acre, 28 tons.

The *Report of the Secretary of Agriculture for Southern Rhodesia* for the year 1908, states: 'No properly organized Forestry Division has yet been formed, though the enormous destruction of native timber which is annually taking place, for supplying the mines with fuel, demands that some scheme of systematic afforestation on a large scale should be undertaken by the Administration without delay, to avoid the disaster which is bound to follow the denudation of the country of timber which is taking place'.

An Ordinance has been proposed for the purpose of preventing the importation and growing of the water hyacinth (*Eichornea crassipes*) in Ceylon. Its object is to prevent the dissemination there of that plant, as it is feared that it may make its way into the inland waters of the island and, being of rapid growth, impede the navigation of them. Power is also taken to extend by proclamation the provisions of this Ordinance, prohibiting importation to any noxious weed or plant to be specified in such proclamation.

At a fair held at Wilmingham, U.S.A., an exhibit was shown for the purpose of demonstrating that bees do not injure sound fruit. It consisted of a three-storey glass hive in which the bees were working in the two lower storeys, while the upper one contained ripe fruit. Although the bees moved freely among and over the sound fruits, they did not injure them in the least, though they quickly made use of the contents of one of the grapes in the exhibit which burst on the second day. (*Gleanings in Bee Culture*, Vol. XXXVII, No. 4.)

The *Bulletin of the Agricultural Experiment Station*, University of Wisconsin, No. 170, illustrates the beneficial effect of the inspection of commercial feeding stuffs. In 1902, nearly 60 per cent. of the samples of ground corn and oats analysed in that State exhibited either unmistakable or suspicious signs of adulteration. Later, in the years 1906-8, the policy of inspection which had been carried on in the meantime resulted in the disappearance of unmistakable signs of adulteration, while the number of examples suspected of it never exceeded 14 per cent. of the total number analysed, finally reaching the lowest proportion, namely 7 per cent., in 1908.

The Cocoa and Nutmegs Ordinances of Grenada, dated 1896 and 1906, for the regulation of the sale of those products in that island, have been amended by the Cocoa and Nutmegs Ordinance (Amendment) Ordinance, 1909, so as to include cotton lint and cotton seed. In addition, the rules under which licenses to sell the above products are issued have been revised. Certificates valid for one year are to be granted by a magistrate at special sessions to be held for the purpose, and the Treasurer may or may not, at his discretion in any particular case, issue a license on the production of such certificate. Should the Treasurer refuse a license under such conditions, he must report his grounds of refusal to the Governor in Council, who may confirm or reverse his action.

STUDENTS' CORNER.

AUGUST.

FIRST PERIOD.

Seasonal Notes.

By this time, the sugar crop for the season 1908-9 will have been brought to a close, and chemical manures will, as a rule, be applied to the land as soon as possible. Students should make a plan and prepare a memorandum with the object of placing on record, for their own use, the scheme according to which the different artificial manures have been applied on different parts of an estate. This will enable them to make continuous notes on the visible effect of the various manures, and on the quantity required to produce the maximum profitable returns in the various districts. Although it is extremely important, it is not sufficient merely to note the effect of a manure just as the crop is about to be reaped. Where different kinds of manure are being applied to one kind of soil for the benefit of a particular plant, try, during the growth of that plant to see if it gives any indications as to the presence or absence of quickly acting manures. Note should be made of the methods employed for the application of artificial manures to the soil. It is especially important, during this stage, to make observations on the effects of the different manurial constituents on the sugar-cane, more particularly with a view to comparing the growth, where potash has been applied in conjunction with nitrogen, with that where canes have been treated with nitrogen alone. The effect, if any, of the application of the various forms of phosphate should also be carefully observed, as experiments which have extended now over many years, and which have been performed in several colonies, show, when all the circumstances are considered, that it is doubtful if the application of this constituent is profitable.

With favourable conditions as regards rainfall, the planting of limes will have begun. For this purpose, on estates near the coast, holes should be prepared some time before the plants are placed out. Holes made in stiff soil in wet districts hold water for some time after rain has fallen, and the plants which are put in them become sickly and die, chiefly because they are deprived of oxygen through the displacement of a great deal of the air, which was in the spaces in the soil, by the flowing in of water. A good way to prevent this from happening is to fork within a circle about 3 feet in diameter at the place where the tree is to grow and, by throwing the soil toward the centre, to make a mound on which the lime is planted. Great care should be exercised in lifting young lime plants from the nursery beds. They should always be topped in order to remove the young shoots and tender leaves, for this, in addition to lessening the amount of transpiration, diminishes the chance of attack by fungi. If these instructions are followed, together with those in *The A B C of Lime Cultivation* (Pamphlet No. 53 of this Department), there should be little loss. The distances apart at which to place the transplanted plants require to be carefully considered; district, position and elevation are the chief factors to be taken account of in determining these.

In planting fields of cacao, the lining and holing should be done with due regard to the requirements, when they shall be full-grown, of each of the plants that are being put in. Great care must be exercised in placing out young cacao plants growing in bamboo pots, and the soil should be pressed firmly round the roots. Wind-breaks will already be in existence where they are required; find out what trees serve this purpose best. For shade, such plants as tannias and bananas should have been planted some time previously. In this connexion, consider carefully why shelter from the direct sun and wind is necessary to some plants when they are young.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is carbon assimilation, with regard to plants, and how is it effected?

(2) Why are artificial manures usually in the state of powder? What special significance has the fineness of this powder in the case of basic slag?

(3) Give reasons why cotton seed germinates badly in very wet weather, and also when the soil has been badly prepared.

INTERMEDIATE QUESTIONS.

(1) What is meant by surface tension, in connexion with soil-moisture?

(2) Name the principal fungoid diseases of the sugar-cane, and give an account of the best methods of combating them.

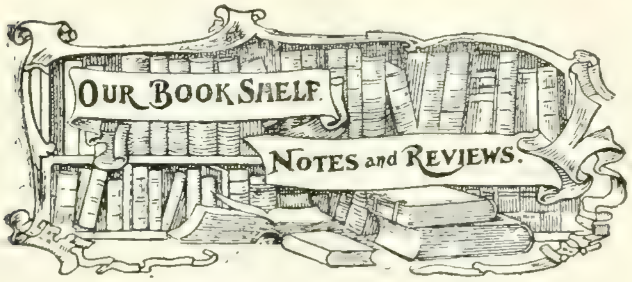
(3) Compare the chief source of the energy of a growing green plant with (*a*) that of a germinating seed, (*b*) that of a fungus.

AGRICULTURE IN KATANGA, CENTRAL AFRICA.

The following information regarding the commerce and agriculture (apart from the mining industry, for which it is best known) of the Katanga district, which is situated north of Rhodesia, is taken from the *Board of Trade Journal* for June 3, 1909:—

Although favoured with a larger and more regular rainfall than South Africa, the Katanga will not, probably, be able to compete with that country in producing cereals. Lying as it does almost entirely within the fly belt, it does not at present offer any facilities for cattle-breeding except in the extreme south-west. But it offers enormous opportunities for intensive cultivation, for the produce of which the mining centres will presumably afford a market. Owing to its geographical position, the Katanga enjoys many of the advantages of both South and West Africa. Its fertility is astounding, and practically anything can be grown, as may be instanced from native cultivation, which includes, in addition to the staple foods, cassava, maize, etc., rice, ground nuts, tobacco, coffee, sugar, cotton. Saltpans are numerous throughout the territory. In exportable produce the chief items at present are rubber and ivory. The amount of rubber exported cannot be regarded as an exact indication of the quantity which the county contains or might be made to produce, because of the lack of administrative control and the poor price paid. This applies in an equal degree to other products of the soil.

The native races of the Katanga are very amenable. Labour is cheap, and rubber, cotton and ground nuts might be cultivated and made to pay. In the neighbourhood of the mines, market gardening, and fruit and poultry farming should prove profitable undertakings.



THE GRAFTING OF CACAO: By Joseph Jones, Curator, Botanic Station, Dominica.

'The Grafting of Cacao' is the title of No. 61 of the Pamphlet Series of the Imperial Department of Agriculture, which has just been issued. This pamphlet, which contains twenty-four pages and twelve illustrations, will be found to be both interesting and useful. Brief mention is made of earlier attempts to bud and graft cacao, but the remainder of the pamphlet deals with the practices and experiences of, and the results obtained by, Mr. Jones during the past four years at the Dominica Botanic Station

During this time, over 1,200 grafted cacao trees have been produced, and some 800 distributed to planters in the island for trial. Grafted trees do not make great progress the first year in the field, but in the second and third they make good growth. They develop a low branching form of tree, and, so far, the indications are that these trees will prove very prolific.

Directions are given for grafting by approach, and estimates are made for grafting cacao on a large scale.

COTTON GINS, HOW TO ERECT AND WORK THEM.

A pamphlet with the above title, which is now being issued, is No. 60 of the series published by the Imperial Department of Agriculture.

The pamphlet has been compiled from notes by Mr. E. Y. Connel of St. Kitts, whose long experience of work of this nature should render all that he has to say of great interest to everyone connected with cotton gins. In editing the pamphlet great care has been taken to avoid the use of technical terms, and it is hoped that all that it contains will be readily understood by any one approaching the subject for the first time.

Valuable information is given on the methods of adjusting gins, so that the driving and driven shafts are level and parallel, and the pulleys consequently parallel and in the same plane. This ensures that the belts shall run true, and not tend to work to one side or other of the pulleys.

Directions are also given for setting and repairing the knives and the roller, with methods for preventing the lint from being carried round and causing the knives to 'back-lash'.

Part II of the pamphlet gives directions for mounting and fastening belts, with instructions for making a simple form of clamp to draw the belt to the required degree of tightness. Detailed information will also be found on lacing and cleaning belts, and advice on the best measures to take for preventing slipping.

In the appendix are directions for making gauges, so that all parts of the gin may be readily adjusted and elaborate calculations avoided.

The pamphlet is well illustrated throughout with diagrams by the author, and contains a preface by the Imperial Commissioner of Agriculture.

THE WEST INDIES IN CANADA IN 1909, issued by the Imperial Department of Agriculture, is a revised and enlarged edition of the Handbook which has been distributed at the Canadian Exhibitions in previous years. As in previous years, this Handbook is printed in the size and style of the *West Indian Bulletin*. The facts and figures relating to imports and exports have been revised and brought up to date as far as possible. The matter descriptive of each island or colony has been revised also, while the portion relating to West Indian products has been enlarged, and several new illustrations have been inserted. The list of books is a new feature; it includes titles and authors of publications relating to Agriculture, Natural History and Commerce in the West Indies, as well as those of historical works and fiction.

The pamphlet contains fifty-nine pages, and sixteen pages of advertisements; a sketch map of the West Indies and eighteen illustrations of tropical plants, crops, etc., are also included.

These books are prepared for free distribution at the Exhibitions, and should do much to increase knowledge of the West Indies in Canada.

SYNOPSIS OF THE BRITISH BASIDIOMYCETES: By W. G. Smith, F.L.S. *Printed by order of the Trustees of the British Museum, by William Clowes & Sons, Limited, 1908.*

This book has been compiled from the manuscript descriptions by Mr. W. G. Smith, F.L.S., attached to the series of coloured drawings of British Fungi which are exhibited in the Public Gallery of the Department of Botany of the British Museum. It contains a full account of all the species native to Great Britain, together with those that have become naturalized in the open.

Keys are provided to all the orders and genera, and there are numerous careful outline drawings. The derivation and meaning of the Latin names of the species are also inserted, and this should prove of value in enabling students to remember the characters of the different species of any given genus.

THE OFFICIAL REPORT ON FRUIT FLY AND OTHER PESTS, IN VARIOUS COUNTRIES, 1907-8.

This is the report prepared by Mr. W. W. Froggatt, dealing with his trip round the world for the purpose of studying the fruit fly and other pests of fruit, and of other crops, and the methods employed for combating them, and especially those methods which include the use of natural enemies in the form of parasitic or predaceous insects.

It will be remembered by the readers of the *Agricultural News* that Mr. Froggatt arrived in Barbados in January 1908, in time to attend the West Indian Agricultural Conference, of which he was made an Honorary Member, and that he addressed the Conference on some phases of insect control, stating interesting work that he had seen in progress during his trip.

The report under review includes a complete account of Mr. Froggatt's visits and his notes on the injurious and beneficial insects which he saw; it is very well illustrated.

Mr. Froggatt concludes that, while great help in the control of insect pests is to be expected from their natural enemies, these latter can not be depended upon to protect thoroughly the fruit trees and crops: that for Australia, at least, it will be necessary to continue spraying and fumigating for the control of scale insects, and to continue the use of recognized remedies for other pests.

A QUICK AND THOROUGH GERMINATION TEST FOR CORN.

From time to time, articles have appeared in the *Agricultural News* dealing with the subject of seed testing. Among these, attention may be drawn specially to those in Vol. IV, No. 28, p. 153, and Vol. VII, No. 172, p. 369. The importance of this subject is often not fully recognized, and, as no steps are taken to ascertain the germinating power of the seed used for sowing crops, the failure of these to make a good stand, and the consequent serious loss, are ascribed to untoward conditions in regard to soil or climate, or the presence of pests, when, as a matter of fact, they are really due to the low vitality of the seed employed. In such cases, even if a second sowing is made where it is needed, the stand is still imperfect because the seed, being the same as that used at first, is itself imperfect; and, of course, there is the added loss in expenditure on the extra seed and labour required.

A good illustration of the loss attendant on the use of seed with inferior germinating power is given in *Farmers' Bulletin*, No. 253, of the United States Department of Agriculture, entitled 'The Germination of Seed-corn'. As the title implies, the case especially dealt with is that of Indian corn (maize). Here it is shown that many planters in the United States have been satisfied with seed which possessed a germinating power of 60 to 85 per cent., when such seed can easily be selected to obtain a germination of 95 per cent. Accounts are given, further, of experiments which proved that tests, made in the way to be described below, increased the stand by 13·7 per cent., which, calculated on the average yield and price of corn in the United States for the years 1896 to 1906, would mean an increased annual crop of about 298 million bushels, with a value of over 100 billion dollars.

A quick method of thoroughly testing and selecting good seed from a large quantity of seed-corn is given in the Bulletin referred to above. The usual method, namely that of taking at random one or more lots, each containing one hundred seeds, and finding the number in each lot that will germinate, is satisfactory so far as it goes, but it does not give any indication as to the way in which the best seed may be found in the heap, nor does it supply information as to the strength of the plant that the seed is capable of producing. Both of these points can be elucidated by the method described in the Bulletin, which is as follows.

The best ears of seed-corn are selected to a number greater than that which will be required to provide seed for planting. From each ear, six grains are chosen and placed in a germinator in the ordinary way, care being taken that each lot of six can be identified subsequently with the ear of corn from which it was removed. These are allowed to remain in the germinator until the sprouts are about 1½ inches long. At the end of that time, every lot is examined, and, in cases where any of the six grains have failed to germinate, or where the seedlings have grown badly, the corresponding ear is rejected as far as sowing purposes are concerned. On the other hand, ears which have yielded lots of six grains which have successfully passed the test may be relied upon to provide good seed, and consequently good plants.

It is evident that this method depends upon an important fact, namely, that if a few grains from an ear of corn are all capable of furnishing good, healthy seedlings, practically all the grains on that ear will be capable of doing so. This fact has been proved by careful experiment, and the recognition of it has afforded a means of obtaining a speedy and thorough test of seed-corn for planting purposes.

A POSSIBLE SUBSTITUTE FOR JUTE.

It has long been known that the fibre yielded by an Indian plant known as Sida is of considerable merit, and the Indian Textile Journal for November 1908, discusses at length the possibility of its becoming a substitute for jute.

Several varieties of Sida are found in India, the commonest being *Sida rhombifolia* and *S. carpinfolia*; others are *S. veronicaefolia* and *S. cordifolia*. Of these, *S. rhombifolia* and *S. cordifolia* are said to yield the best fibre. The efforts which have been made to extend the cultivation of this plant have not been successful for several reasons, the chief of which were certain difficulties connected with its cultivation, and the stable position in the market of jute. The chief of the difficulties of cultivation are the possession of a hard seed, which will not germinate unless the coat has previously been softened, and the tendency of the plant to form branches, the latter of which, of course, is a serious handicap in any attempt to gain its recognition as a fibre plant. These difficulties, however, are not insuperable. The first can be overcome by placing the seeds in sulphuric acid for a time, or by passing them through a machine of the kind that is used in the same connexion for those of Java indigo, but as these methods are not of general application, investigations have been made for the purpose of finding one which can be adopted by everybody. As a result, it has been discovered that germination can be increased by soaking the seed in hot water for a time—a very simple process. It is also suggested that a solution of the problem may be possibly afforded in another way, namely by careful cultivation and selection.

It has been proposed to try to overcome the second difficulty, that of a tendency to form branches, in a similar manner, that is by careful cultivation and selection. A simpler way of dealing with it has been found, however, in the discovery, in Burma, of a straight-growing variety.

The cellulose-content, and therefore the durability, of some samples of Sida have been found to be superior to that of jute, for it reaches a value of 83 per cent., placing this fibre on a level with *Rhea* and flax. More generally, however, this value is nearer to that of jute, but it is possible that the finer texture would lead to its replacing the better kinds as well as to its being used for special purposes.

An offset to the fact that samples of Sida have been valued more highly than jute is afforded by the circumstance that the cost of its cultivation is greater. There is no reason, nevertheless, to suppose that the yield per acre cannot be improved upon; and, if this is so, it may be possible, in the near future, definitely to place Sida on the market as a fibre plant.

The amount of produce exported from Barbados during the present year, up to July 29, is 10,032 tons of sugar and 63,698 puncheons of molasses and syrup. The quantities of these which were produced in, and sent out of, the island during the corresponding period of last year were 29,177 tons and 48,076 puncheons, respectively.

MARKET REPORTS.

London,—The West India Committee Circular, July 20, 1909; Messrs. E. A. de Pass & Co., June 9, 1909.

Arrowroot—St. Vincent, 1¾*d.* to 3¾*d.*, according to quality.
Balata—Sheet, 2/4½ to 2/6; block, 1/10½.
Bees'-wax—No quotations.
Cacao—Trinidad, 53/- to 65/- per cwt.; Grenada, 50/- to 55/- per cwt.; Jamaica, no quotations.
Coffee—Santos 30/7½ to 31/10½ per cwt.; Jamaica, no quotations.
Copra—West Indian, £22 10*s.* per ton.
Cotton—St. Vincent, 15*d.* to 16*d.*; Anguilla Montserrat, Barbados, St. Kitts, St. Croix, Antigua, Virgin Islands, Barbuda and Jamaica, 13*d.* to 14½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 45/- to 50/-; low middling to middling, 52/- to 56/-; good bright to fine, 58/- to 64/-.
Honey—25/- to 33/6.
Isinglass—No quotations.
Lime Juice—Raw, 1/- to 1/3 per gallon; concentrated, £18 15*s.* per cask of 108 gallons; distilled oil, 1/10 per lb., Otto of limes 6/.
Logwood—No quotations.
Mace—Steady, but quiet.
Nutmegs—Steady to rather dearer.
Pimento—Quiet.
Rubber—Para, fine hard, 7/3; fine soft, 6/10 per lb.
Rum—Jamaica, 3/- to 3/3; Demerara, no quotations.
Sugar—Crystals, 14/3 to 15/3; Muscovado, 11/6 to 13/6; Syrup, 13/6; Molasses, no quotations.

New York,—Messrs. Gillespie, Bros. & Co., July 9, 1909.

Cacao—Caracas, 12c. to 12¾c.; Grenada, 12c. to 12½c.; Trinidad, 12c. to 12¼c.; Jamaica, 9¾c. to 11c. per lb.; Dominica, 11c. to 11½c.
Cocoa-nuts—Jamaica, select, $22·00 to $23·00; culls, $13·50 to $15·00; Trinidad, select, $21·00 to $22·00; culls, $13·00 to $14·00 per M.
Coffee—Jamaica, ordinary, 7¾c. to 8c.; good ordinary, 8½c.; and washed up to 11c.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, no quotations; Barbados, 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 27c. to 50c. per lb., dry flint; Antigua, 50c. to 52c.
Grape Fruit—Jamaica, $2·25 to $4·75 per barrel.
Limes—Dominica, $4·00 to $5·25 per box.
Mace—29c. to 35c. per lb.
Nutmegs—110's, 8½c. to 8¾c. per lb.
Oranges—Jamaica, $2·50 to $3·00 per barrel.
Pimento—4½c. to 4¾c. per lb.
Sugar—Centrifugals, 96°, 3·92c., Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. Leacock & Co., July 30, 1909; Messrs. T. S. Garraway & Co., August 2, 1909.

Arrowroot—St. Vincent, $3·75 to $4·00 per 100 lb.
Cacao—$11·21 to $12·00 per 100 lb.
Cocoa-nuts—$18·00 for husked nuts.
Coffee—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., according to quality—scarce.
Hay—$1·20 to $1·25 per 100 lb.
Manures—Nitrate of soda, $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00; Sulphate of potash, $67·00 per ton.
Onions—Strings, $2·00 to $2·50 per 100 lb.
Peas—Split, $6·00 to $6·20 per bag of 210 lb.; Canada, $3·75 to $4·00 per bag of 120 lb.
Potatos—$2·50 to $3·25 per 160 lb.
Rice—Ballam, Calcutta, no quotations; Patna, $3·80; Rangoon, $3·00 per 100 lb.; Demerara Ballam, $4·90 to $5·25 per 180 lb.
Sugar—Dark Crystals, 96° no quotations; Muscovado, 89° $1·70; Centrifugals, no quotations.

British Guiana,—Messrs. Wieting & Richter, July 24, 1909*; Messrs. Sandbach, Parker & Co., July 25, 1909.†

Arrowroot—St. Vincent, $8·50 to $9·00 per 200 lb., demand limited.*†
Balata—Venezuela block, 32c.*, Prohibited†; Demerara sheet, 48c. per lb.*; 48c. to 50c. per lb.†.
Cacao—Native, 14c. per lb.*; 12c. per lb.†
Cassava—60c. to 72c.*
Cassava Starch—$6·00 per barrel of 196 lb.*
Cocoa-nuts—$12·00 to $16·00 per M.*
Coffee—Creole, 8c. to 13c.*, 12c. to 13c. per lb.†; Jamaica and Rio, 13½c.*†; Liberian, 7c.,†; 8c. per lb.*
Dhal—$4·40 to $4·50 per bag of 168 lb.*; $4·50 to $4·60 per bag;† Green Dhal, $5·50.*
Eddos—$1·44 per barrel.*
Molasses—Yellow, 21c. to 22c.*
Onions—Teneriffe, 2½c.†; Madeira, 2½c. to 3c. per lb.*; 3½c.†
Peas—Split $6·20 to $6·25 per bag (210 lb.),* $6·25†; Marseilles, $3·00, over stock.*†
Plantains—20c. to 40c. per bunch.*
Potatos—Nova Scotia, $3·25 to $3·50 per 100 lb.*, $3 25 per barrel†; Bermuda, $4·50.*
Potatos—Sweet, Barbados, 96c. per bag.*
Rice—Ballam, $4·50,* $4·75 to to $5·00;† Creole, $4·40,* $4·00 to $4·40.†
Tannias—$1·80 per bag.*
Yams—White, $2·00 per bag; Buck, $2·00.*
Sugar—Dark crystals, $2·20 to $2·40;* Yellow, $2·90 to $3·00,* $3·00.† White, $3·60 to $3·80;*† Molasses, $1·90 to $2·20,* $2·00 to $2·30.†
Timber—Greenheart, 32c. to 55c. per cubic foot.*†
Wallaba Shingles—$3·75 to $5·75 per M,* $3·50 to $5·50 per M.†
—— Cordwood—$1·80 to $2·00 per ton.*

Trinidad,—Messrs. Gordon, Grant & Co., July 24, 1909.

Cacao—Venezuelan, $11·30 per fanega; Trinidad, $11·10 to $11·50.
Cocoa-nut Oil—80c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—$3·25 per 100 lb.
Dhal—$4·25 per 2-bushel bag.
Onions—$1·50 to $1·80 per 100 lb., light demand.
Peas—Split $5·50 to $5·75 per bag.
Potatos—English, $1·25 to $1·75 per 100 lb.
Rice—Yellow, $4·50 to $4·60; White, $5·00 to $5·25 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 lb.

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is fifty-nine. The following list gives particulars of all the pamphlets which are still available. The missing numbers are out of print and can no longer be supplied :—

SUGAR INDUSTRY.

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CONTENTS.

The Formation and Storage of Molasses.

DURING the past sugar season the muscovado molasses of Antigua and Barbados, and to a lesser extent, that of other West Indian Islands has obtained a remarkably high market price, the value of sucrose in muscovado molasses having been, during the greater part of the season, nearly one and a half times as great as its value in muscovado sugar. This occurrence forms a good instance of a point which has often been illustrated in other industries, namely the attainment on the part of a by-product of a value considerably in excess of that of the substance which it was the original purpose of the industry to produce. That such a state of affairs should arise is, of course, mainly a question of supply and demand, and in this instance it has arisen mainly from the wants of fishermen and lumbermen on the North American continent. For a number of years past the price of this article has been good, though it has not attained so high a value as during the past season, and therefore it appears that there is a fair amount of stability in the demand; moreover, the high price of the muscovado product has served to raise the market value of the exhausted vacuum-pan molasses of the Antigua Central Factory for which ordinarily little or no demand exists: on this account the conditions governing the formation, composition and keeping power of molasses assume considerable importance.

Molasses may be defined as the viscous solution containing sugar and various impurities left after sugar has been crystallized from evaporated juice or from a sugar solution. It is possible to obtain further sugar from this product, which is known as first molasses, by re-boiling, but eventually a syrupy liquid remains which will not give any more sugar on being evaporated. This is termed exhausted molasses; it always contains sugar that cannot be recovered, by reason of the presence of other constituents, which render the remaining sugar uncrystallizable. In any process of sugar-making, unless everything but cane-sugar and water could be removed from the juice, molasses must always be formed.

Having defined molasses, and considered it in relation to the possibility of the extraction of sucrose, it will be convenient to deal with the question of the modes of formation of this product. The oldest explanation of the matter is that which is known as the mechanical theory, and consists in the statement that the viscosity of the solution prevents the extremely small particles of cane-sugar from coming together to form crystals. At the present time the mechanical theory is almost entirely abandoned, having given place to theories attributing the retention of sugar in solution to the chemical action of impurities. The earliest of these chemical theories was that the formation of molasses was entirely due to the presence of glucose, which formed uncrystallizable compounds with the sucrose present. This, however, is now largely discredited in the light of modern investigation, and has been succeeded by the more generally accepted glucose-ash theory of Hertzfeld, and more especially Prinsen Geerligs. In this, the chief responsibility is placed upon the mineral matter which the juice originally contained, and upon that which has been added in the process of 'liming'. Cane-sugar forms very soluble compounds with part of this ash material, which are practically impossible to crystallize, and the difficulty of recovering it from the molasses is accounted for in this way. In the case of the molasses of the beet sugar factory which contains practically no glucose, this theory, which was originated by Hertzfeld, sufficiently accounts for all the observed facts. On the other hand, cane-sugar molasses, containing as it does glucose in varying but relatively large proportions, evinces features not completely accounted for by the theory outlined above. For the elaboration of this theory to fit the facts in relation to cane-sugar molasses, we are indebted to Prinsen Geerligs.

He has pointed out that cane-sugar forms soluble compounds with the ash constituents less readily than glucose does under similar conditions; hence it follows that the greater the proportion of the latter which is present, the less is the likelihood of the cane-sugar forming compounds with the ash from which it is uncrystallizable, and that, therefore, the greater the glucose content of the molasses is, the larger will be the possible recovery of cane-sugar. Prinsen Geerligs has adduced, in support of this view, a large number of analyses of molasses from the cane-sugar factories of Java, and has shown that, within limits, the greater the ratio which the glucose content bears to the ash content, the lower will be the ratio which the sucrose bears to the water. Peck, in Hawaii has drawn attention to another cause which may prevent the growth of sugar-crystals in a massecuite; that is the presence of gummy matter. He has shown that removal of gum from molasses promotes the further recovery of sugar crystals, and he is inclined to attribute this to mechanical action, and to return to the older mechanical theory of molasses formation. The suggestion has however been put forward that the real action of the gum is, under certain conditions, to coat the small crystals as they are formed and thus to stop their increase in bulk from the sugar which is in solution. Experience at the central factories in Antigua furnishes support to this explanation, for it has been found that continued stirring of second massecuites, after the first crystals have been formed, decreases the recovery of sugar; better results are obtained if they are allowed to stand undisturbed for some time before curing, when considerable quantities of gum rise to the surface. It is suggested that the foregoing may form an explanation in harmony with the accepted theories of Hertzfeld and Geerligs, and also with the observed facts in relation to gums.

It is well known that molasses, on storage, generally undergoes very evident changes; these are usually broadly referred to as fermentation, and include 'frothing' and 'souring'. The former of these occasions direct loss owing to the overflowing of the liquid consequent on effervescence; it does not appear, however, that there are any consequent deep-seated alterations in its more valuable contents. Careful experiments have gone to show that it is not of the nature of a true fermentation; that is one in which organisms are thriving at the expense of these contents, but that it really has its origin in the breaking up of easily decomposable gummy products. Thus no internal loss may be apprehended in the presence of this phenomenon. The latter change, that of 'souring', though less evident in its natural outward manifestations, is far more serious both as regards the sugar content and the palatability—and therefore the market value—of the molasses. It is due entirely to the presence of living organisms and, as this is so, if infection of the molasses by such organisms is guarded against, it can be entirely prevented. At the present time it is feared that, in the case of the majority of muscovado boiling houses and molasses storehouses in the West Indies, little is done to secure that cleanliness which is the essential feature in preventing infection. Attention may be directed to the report of the Committee of the Barbados Agricultural Society appointed to enquire into the reasons underlying the souring of molasses in that island, and to the excellent list of suggestions for the prevention of its occurrence appended thereto. These, if thoroughly carried into effect, should go far towards minimizing this. The report was published in pamphlet form by the Barbados Agricultural Society and was reproduced in the *Agricultural News*, Vol. VII, p. 67.

In conclusion, a word may be said regarding conditions which influence favourably colour and flavour in molasses. Of these, by far the most important are care and attention to the tempering of the juice by the addition of lime to the clarifier. If it is desired to obtain a product of good colour, excess of lime must be rigorously avoided; above all, it is essential that *lime should never be added in the tayches,* once the juice has left the clarifier. Other factors which appear to influence the character of the molasses to a certain extent, are the variety of cane used, soil and climatic conditions under which the crop was produced, and the boiling of the juice in a copper tayche over an open fire. The last one appears to have a slight but appreciable effect on both the colour and flavour of the resulting product.

In the foregoing have been indicated a few of the more salient points in relation to the formation of molasses and its subsequent storage. It is suggested that these are worthy of careful attention by sugar producers, especially in view of the present high market prices which obtain for the product.

The following comparative table will serve to illustrate what has been said above, and at the same time indicates the composition of various grades of molasses :—

	Muscovado Molasses (Antigua).	Centrifugalled First Molasses.	Centrifugalled Second Molasses (Exhausted).
	Per cent.	Per cent.	Per cent.
Cane-sugar ...	50 to 55	40 to 60	20 to 40
Glucose	5 ,, 15	7 ,, 20	15 ,, 40
Non-sugar ...	3 ,, 8	..	...
Ash	3 ,, 5	3 ,, 6	3 ,, 10
Water	24 ,, 30	25 ,, 28	17 ,, 28

HALF-YEARLY EXAMINATION OF AGRICULTURAL SCHOOLS.

The following are the general reports of the examiner (Mr. F. W. South, B.A.) on the recent half-yearly examinations of the pupils at the Agricultural Schools in Dominica, St. Vincent and St. Lucia :—

DOMINICA AGRICULTURAL SCHOOL.

Nineteen boys sat for the examination. Of these ten took the papers set for the junior class and nine were new boys. The average percentages of marks obtained by the two classes were as follows : juniors, 78 ; new boys, 72. Of the juniors, Paul, Roper, Lewis and Marie sent in good papers, and might be allowed to proceed to the senior course ; of the new boys, Antoine and Defoe showed good work. The standard throughout the school is satisfactory, any special weaknesses have been indicated in the detailed reports.

Agriculture and Chemistry were good, and Arithmetic and Botany satisfactory, though there is some room for improvement, especially in the drawing of diagrams. The Geography of the juniors should receive attention, and Writing, English Grammar and Spelling throughout should receive great care ; there is considerable difference between the juniors and new boys in this respect, but occasionally the answers of the new boys were scarcely intelligible. Attention might also be paid to details such as the careful subdivision of subject-matter, and, in Arithmetic, to the careful indication in every case of what any given set of figures represents.

Considering the examination as a whole, the results indicate considerable improvement, which can however be increased if attention is paid to the points already mentioned.

ST. VINCENT AGRICULTURAL SCHOOL.

Seventeen boys sat for this examination. Of these four were seniors, ten juniors and three new boys. The average percentages of marks obtained were as follows : new boys 68 ; juniors 79 ; seniors 85. These averages show considerable improvement on last year's and indicate a very high standard of excellence for the seniors. Both Arrindell and J. Samuel showed some very satisfactory papers, among the seniors, and of the juniors Learmond, Jarvis, Simmons and Derrick obtained a very high average of marks. Learmond and Jarvis, at any rate, might be allowed to proceed with the work prescribed for the senior class. Randolph Quashie was extremely weak throughout and needs very careful attention if he is to make any progress.

The subjects in general were very satisfactory ; reference to any special weakness will be found in the detailed reports. With very few exceptions, the English, Spelling, Writing and general neatness were good throughout. Arithmetic shows considerable improvement but still needs attention. Composition and Agriculture were good ; Chemistry and Geography need attention among the juniors, and the Botany of the seniors leaves some room for improvement.

The papers, as a whole, indicate that the pupils are receiving very careful attention and should possess a sound knowledge of elementary scientific principles.

ST. LUCIA AGRICULTURAL SCHOOL.

Seventeen boys sat for the examination. One took the senior papers, ten the junior, and there were five candidates and one new boy. The average percentages of marks obtained by the three classes, including the new boy with the candidates, were as follows : senior 73 ; junior 74 ; candidates and new boy 64. These results were quite satisfactory. Auguste and Monrose, of the juniors, did very creditably, and the former might be permitted to take the work prescribed for the senior course. Angier and Marshall are the most promising of the candidates.

The writing was satisfactory and the papers were neat, but attention should be paid to the drawing of diagrams and maps. Arithmetic and Composition were good and the Agriculture of the senior and junior pupils very fair, though the candidates were weak in this subject. Chemistry, Botany and Geography need attention, especially Geography ; great attention should be paid to English Grammar and Spelling which were often very weak, though this is no doubt mainly due to the prevalent conditions in the island.

Considering the papers as a whole, the results are satisfactory and show that the pupils are receiving careful attention but there is room for improvement in several subjects, as has already been indicated.

WEST INDIAN FRUIT.

'PINK DISEASE' OF CACAO IN ST. LUCIA.

In January of the present year, several plots of cacao in St. Lucia were found to be seriously affected by this disease. The plants were, in consequence, treated according to the advice given in Pamphlet No. 54 of the Department, entitled *Fungus Diseases of Cacao and Sanitation of Cacao Orchards*. Success has followed the adoption of the measures there suggested, as will be seen from the following account, which should be supplemented by reference to the above-mentioned pamphlet:—

The disease is caused by a fungus (*Corticium lilaco-fuscum*). The chief symptoms are the occurrence of pink incrustations on the woody branches; these generally cover the younger ones, while in the case of those which are fairly old, it is usually limited to the damper and more shaded sides. The final effect is to cause splitting of the bark, which ultimately peels off. The fungus spreads actively during the wet season and in damp, shaded situations. The harm caused by it is not always direct, but as it provides openings in the tissue for the entrance of spores of very harmful fungi such as *Nectria*, *Diplodia*, etc., it is very important that it should be kept in check.

The remedial measures consist in washing the affected branches with a lime-sulphur wash, which is prepared as follows: A mixture consisting of $7\frac{1}{2}$ lb. of slaked lime and $2\frac{1}{2}$ lb. of flowers of sulphur is boiled in 10 gallons of water until it becomes orange in colour. This, when cold, is well rubbed on the affected branches wherever the fungus is seen to be present. In addition, all the younger branches that have been killed should be cut off and burned; it may also be advisable to remove the more badly affected of the older ones.

The successful adoption of these measures in the case mentioned above was reported by the Agricultural Instructor in St. Lucia, after examination of the attacked plants during one of his visits to the district in which they were growing.

PINE-APPLE INDUSTRY IN INDIA.

The following information appears in the *Agricultural Journal of India* for April 1909:—

In recent years, the demand for Indian-grown pine-apples has so greatly increased that an effort should be made to establish this industry on a commercial scale.

The pine-apple is grown extensively in many parts of India and Burma. On the Malabar Coast, in Northern Bengal, in Assam and in Burma, it produces fruit of very good quality. On the Khasi Hills in Assam, it grows excellently and yields a fine fruit. There has been no particular effort made to develop the cultivation of the fruit on a commercial basis. Therefore, pine-apples from the Straits Settlements, Ceylon and Mauritius, find a ready sale in India at remunerative prices.

A warm, moist atmosphere, a fairly high rainfall, a friable soil and a porous subsoil appear to be best suitable for pine-apples in India. They thrive well on soils which have been improved, in forests, by partial clearing and by the natural addition through rainfall of leaf mould. A friable moist soil with a fairly high proportion of organic manure is apparently essential for successful cultivation.

In Bengal, the season for planting out pine-apples is August. The plant there flowers in February and March, and its fruit ripens in July or August. In September and October, it makes its perfect growth.

The leaves yield a good fibre. In the London market it fetches about £30 per ton. In the Rangpur District of Eastern Bengal and Assam, the fibre is largely used by the shoe-makers as string; in the Southern Mahratha country and Goa, it is used for necklaces. The Fibre Expert to the Government of Eastern Bengal and Assam is, however, of opinion that the extraction of fibre from pine-apple plants is not likely to be an extensive enterprise in any part of India

VARIETIES OF CACAO.

In the *West India Committee Circular* for July 20, 1909, there appears the first of a series of articles by Mr. J. H. Hart, F.L.S., on Cacao. In this, the characteristics of the different varieties of *Theobroma Cacao* and *T. pentagona* are set forth in a useful table, from which they may be summarized as follows:—

T. pentagona, or alligator cacao, is mainly distinguished from *T. Cacao* by the fact that the fruit is covered with many warty excrescences, while it possesses five distinctly raised ribs. Of *T. Cacao*, there are three well-marked classes; the Criollo ('native'), Forastero ('foreign'), and Calabacillo ('calabash-shaped'); the first of these has light-coloured 'beans,' in the second they vary in colour, and are contained in a rough, ridged pod, in the last they are dark-coloured, in a smooth oval pod.

The kinds of Criollo are three: Trinidad Criollo, Venezuelan Criollo, and Nicaraguan Criollo; the fruit of the first is thin-skinned and bottle-necked, and those of the last two thick-skinned and high-shouldered, a mark of distinction between these being that the former is sometimes pointed, while the latter is not. Each of these kinds is divided into two varieties, Amarillo and Colorado, the difference being that the colour of the fruit of the former is yellow, while in the latter it is red. Of Forastero, also, three kinds are distinguished by fruit characters: Cundeamor veraguso, Ordinary or Typical, and Amelonado; the first and the third are separated from one another by the fact that the former is warted and the latter melon-shaped. Each of these, again, has two varieties: Amarillo (yellow) and Colorado (red). A secondary division into kinds does not obtain in Calabacillo, as all the fruits are small, smooth, thin- or thick-skinned, with flat beans; it is immediately separated into two varieties, which, like those of the kinds mentioned above, are named Amarillo and Colorado, and for the same reason.

Of the classes of *T. Cacao*, Criollo yields produce of a high value, but it is not as vigorous as the others. Forastero in the West Indies is variable, but, typically, a strong grower, bearing rough, ridged pods. Calabacillo is inferior to these; it is a strongly-growing tree, however, which flourishes on lands where the others refuse to thrive; this property, combined with the fact that it can do with less shade, recommends it as a stock for grafting selected varieties.

In the classification given there are thus fourteen types, arranged under three classes. It must be understood, however, that these are not separated from one another by a definite margin, and that intermediate forms will be found on estates, showing every conceivable form of variation. This tendency to vary, in the absence of control, is harmful, as it results in the production of inferior kinds, and therefore in gradual deterioration—a process which is aided by the continual propagation of the plant from seed.

WILD IPECACUANHA AND ITS EFFECT ON CATTLE.

It will be remembered that, in the *Agricultural News* of July 10, 1909, information is given as to the possible poisonous action of this plant when eaten by cattle, and that a request was made that planters and others should send any suggestions or observations which they may have to make in connexion with the matter to the Imperial Department of Agriculture. Since then, a note by Dr. W. J. Branch on the subject has been forwarded by the Agricultural Superintendent of St. Kitts, from which the following information is taken:—

The generic portion of the name of this plant is the Greek form of the Latin Esculapius, the god of medicine. The name of this particular species—curassavica—indicates the belief that it came originally from the Island of Curaçao. It is now to be found in abundance in nearly all tropical countries. The plant spreads with great rapidity, owing to the coma on the seeds, by means of which they float on the wind. The young plant will take root and thrive in any soil. Grisebach considers *Asclepias curassavica* as indigenous to the West Indies, as its specific name indicates. Among the different names for it are: Indian root, wild ipecacuan, Curaçao swallow root, red head, and bastard ipecacuan. Most of the vernacular names of this plant refer, like the names of the Genus and of the Natural Order to which it belongs, to its indubitably powerful medicinal properties. Grisebach says it is a diaphoretic medicine.

The Genus *Asclepias* belongs to the Natural Order of the Asclepiadeae. Nearly all the plants of this Order have a milky juice, which is generally more or less poisonous, and in some, it is exceedingly virulent. *Gonolobus macrophyllus* has a juice that is used to poison arrows; *Periploca graeca* kills wolves. On the other hand, valuable medicines can be got from some of the Asclepiads. From *Calotropis gigantea* is got the famous Mudar, much esteemed in India as a cure for dysentery; *Tylophora asthmatica* is also relied on in that country in the treatment of dysentery. *Asclepias nivea*, a West Indian plant, is used by the negroes, according to Loudon, as a medicine. *Asclepias decumbens* is much valued in Virginia in the treatment of pleurisy; it induces profuse sweating without raising the temperature. *Hemidesmus indicus*, the synonym of which is *Asclepias pseudo-sarsa*, makes a slightly sudorific syrup, and is largely used in big doses as a flavouring and colouring ingredient in many mixtures prescribed by modern physicians. Some of the Asclepiads also furnish fodder for cattle and food for men. *Oxystelma esculentum*, a synonym of which is *Asclepias rosea*, is used in the East Indies as fodder for cattle. The people in the French part of Canada eat the shoots of *Asclepias syriaca*. *Pergularia edulis* has a root like a yam and as big as a man's head; this is eaten by the Hottentots. But the most notable of this class is *Gymnema lactifera*, the Cow-tree of Ceylon. It is a pity that this has not been introduced into the West Indies, for its copious milky juice is an admirable substitute for milk, for the use of human beings.

It does not seem probable that the recent scare in St. Kitts about the poisonous effect of *Asclepias curassavica* on stock is quite justifiable. It is not impossible that some animals may get diarrhoea and loss of appetite from eating it in any quantity, if they can be induced to do so. But it is curious that only now, and in St. Kitts, has its virulent nature been discovered, though the plant is most abundantly distributed through the West Indies and in other tropical countries. Its properties, moreover, have been diligently studied by the natives of the countries where it grows, and it has been freely administered as medicine to men, women, and children. If it was destructive to stock, the fact ought to have been found out and published long ago. At the same time, this plant is perhaps unwholesome as food for stock, if the animals really eat it, and if so, its presence in abundance on pasture lands must detract from the value of such lands as feeding-grounds for stock. The plant does not seem to the writer of these notes to be nearly as common in St. Kitts as in Barbados. As an illustration, it is noteworthy that a very common butterfly in the latter island is *Archippus*, the caterpillar of which feeds on *Asclepias curassavica*, while this insect is very rarely seen in St. Kitts.

'Coffea robusta' in Java.

In the *Monthly Trade and Consular Reports* of the United States for July 1909, an account is given of the results of the introduction of *Coffea robusta* into Java.

This species was discovered growing wild in the Congo, but attempts to cultivate it there were not productive of useful results. Plants were sent to the Jardin Botanique at Brussels, and thence to Java, in 1902. It is stated to have met with wonderful success in its cultivation there, so much so in some instances as to save old estates from ruin. It thrives on ground where *Coffea arabica* and *C. liberica* have ceased to yield any profit, and at the same time is prolific, giving about 850 pounds per acre after three years. At five years, under good cultivation, it has produced twice as much as this.

The trees are planted about 6 feet apart, and topped at about 5½ feet high; when young they require shade. The bean is very small, and for the first two crops lacks the characteristic aroma of coffee; later crops improve in taste and aroma. The output for the year 1908 is given as 217,600 lb., valued at approximately £6,750.

WEST INDIAN COTTON.

Messrs. Wolstenholme & Holland of Liverpool, write as follows under date July 29, with reference to the sales of West Indian Sea Island cotton:—

A good business has been done in West Indian Sea Island cotton since our last report. About 450 bales have been sold, including Barbados $13\frac{1}{2}d.$ to $15d.$, Antigua, St. Martin and St. Croix $13d.$ to $13\frac{3}{4}d.$, St. Lucia $15d.$, and St. Vincent $13d.$ to $19d.$ Stains from various islands realized $7d.$ to $8\frac{1}{2}d.$

Prices remain firm, and the unsold stock does not amount to more than 100 bales.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 31, is as follows:—

The unsold stock of Islands now consists entirely of planters' crop lots, held here or on plantation, aggregating 457 bales. The factors are still refusing to sell any of them under 30c., and the larger proportion are held under instructions from the planters at 35c.

There has thus been no change in this market since the report for the week ending June 19.

SEA ISLAND COTTON IN THE UNITED STATES.

Information concerning the present position of the Sea Island cotton industry in the United States are given in a report by Messrs. W. W. Gordon & Co., Savannah, Georgia:—

In some of the countries in the south west of Georgia, where the Sea Island acreage was fairly large a few years ago, the planting of Sea Island cotton has been practically abandoned. In Florida, the acreage is practically unchanged. An effort has been made to plant selected seed as far as possible and, in some cases, fresh seed has been imported for the purpose from the Islands.

So far, the crop is clean, but recent rains have caused grass to appear in some parts. A continuation of these rains will prove detrimental to the crop. The reports of its condition throughout the area, compared with that of last year, vary from 'worse' to 'much better'; that in the north is the best at present.

The prospect of the yield is fair in some places and good in others; in only one county is it bad. The crop will probably be a late one. While some early cotton will make its appearance during the first fifteen days of September, the new crop will not begin to move freely until October 1. It is estimated to be one of 70,000 to 110,000 bales, but this does not include some places where it is considered to be too early as yet for prediction. All the estimates stipulate for a long, open end to the season, if a full crop is to be produced.

The Carolina Island acreage is reported to have been reduced 5 per cent. The weather is favourable and the prospects are good.

COTTON IN EGYPT.

The following facts in connexion with cotton-growing in Egypt are taken from the issue of *Nature* for July 15, 1909. The reference to the depreciation of the Egyptian varieties through the concurrent cultivation of the less valuable Upland cotton is of special interest in relation to proposals that have been made in various quarters from time to time that the latter should be grown extensively in the West Indies:

The prosperity of Egypt depends largely on the successful cultivation of the particular types of cotton known as 'Egyptian'. During the last twelve years, however, the yield of cotton has steadily and appreciably diminished, the loss amounting, at current rates, to about £5 per feddan (1·109 acres). Many causes have been suggested as contributing to this result, and in 'Cotton Investigations in 1908' (*Cairo Scientific Journal*, February 1909), Mr. W. Lawrence Balls puts forward the view, for which there is some direct evidence, that a rise in the water table in Egypt has been an important factor. Owing to improvements in irrigation, the supply of water in Egypt is greater than formerly, whilst the natural loss remains more or less constant. Artificial drainage is lacking, and in his view Egypt is in danger of becoming water-logged, in which condition the soil is rendered impervious to the roots of most plants. The remedy advocated is extension of the drainage system, an expensive proceeding, but justifiable if the reduced yield is due to the rise in level of stagnant water. Another important matter dwelt on in Mr. Balls's paper is the depreciation of cottons grown in Egypt, owing to the hybridizing of the Egyptian varieties by the less valuable 'American Upland' races, cultivated because of their heavy yield. To combat this, he proposes the breeding of a cotton bearing flowers in which the stigma is buried deeply among the stamens, thus reducing to a minimum the risk of natural crossing. The report is accompanied by a photograph of a section of such a synthesised flower. Egypt is leading the way in the practical application of Mendel's discoveries, for 1909 has seen the establishment, by the Khedivial Agricultural Society, of a Mendelian Experiment Station.

INJURY TO RUBBER TREES BY TAPPING.

The results of an investigation conducted by Professor Fitting, of the University of Tübingen, at the Botanic Gardens of Buitenzorg, into the physiological principles which underlie the ways in which the best methods of rubber-tapping may be found, is given in a supplementary number of *Tropenpflanzer* for February 1909. These were briefly indicated in the *Agricultural News*, Vol. VIII, p. 212. A more detailed account may be given as follows:—

Attention is drawn to the fact that the part of a rubber tree which is commonly called the bark is not only the place where latex is formed and stored, but that it serves a more important purpose from the point of view of the life of the plant. The food which is elaborated in the leaves would be useless unless there was some means by which it could be carried to those parts where it is required, such as the regions of vegetative growth, the chief of these being the leaf-buds, the cambium and the root ends, and of reproductive growth, that is where flowers, fruits and seeds are being formed. The transference is effected through tubes in the bast, or what is usually known as the inner part of the bark. In these tubes, as long as the plant is actively growing, there is a current of food passing along the branches to the main stem, and down the stem to the roots.

In considering the effects of tapping, there has been a tendency in the past to forget that injury may be done to this important food-conducting system of the tree. The greatest attention has been given to the cambium layer, as it was well recognized that any extensive injury to that part of the tissue would result in retardation of the growth of the tree, or even in its death, either from direct causes or owing to the admission of fungi. Perhaps the reason why so much attention was given to this tissue was that there was a full recognition of its importance as the actively growing part of the stem, and it is for the same cause that, in considering the value of different methods of tapping, attention was not given only to their efficiency in producing the greatest quantity of latex with the least amount of labour, but also to the likelihood of their causing damage to the cambium layer. This consideration is, of course, important, but the one in which account is taken of the method of the transportation of elaborated food, which is explained above, is equally so. If the tree is to attain its best growth it must be well supplied with roots. If roots are to grow, they in their turn must be well supplied with food. They cannot thrive directly on the mineral plant food which they absorb; they must be fed freely and easily from the food which has been prepared in the leaves, therefore there must be nothing to interfere seriously with the carriage of this food from the place where it is made to that where it is required. This is why, if a fairly wide strip of bark has been removed from all round a tree, as deep as the cambium, the plant eventually dies.

In the methods of tapping which are commonly employed, a sloping cut is made which, although it does not reach the cambium, goes far to check the downward current: this is especially so if the pricker is used as well as the knife. It follows naturally that the amount of obstruction varies directly with the width of the area operated on. The practical application of this consideration is simple. It will lead to the adoption of those methods which involve the cutting of the bark in such a way that the longest effective cut is made with the least severing of the bast tubes in their vertical course through the stem. This condition is fulfilled by the herring-bone and half herring-bone systems, as these only affect a quarter of the circumference of the tree in any one tapping.

VITALITY OF WEED SEEDS IN MANURE.

The following information, obtained from the *Maryland Station Bulletin*, No. 128, appears in *Farmers' Bulletin*, No. 334, of the United States Department of Agriculture:—

It is well known that there is considerable risk of introducing new weeds by the purchase of manure, hay, and other feeding stuffs. At the Maryland Station more definite information on this point was obtained, especially as regards dissemination through manure, by studying the effect of the fermentation of manure handled in different ways, and of passing through the digestive systems of animals, on the vitality of various weed seeds, including seeds of about fifty of the worst weeds found in Maryland.

In experiments in which the manure remained (1) for six months in a barnyard heap, and (2) for a short while in piles as when shipped in carload lots from cities, it was found that in the first case there was no danger, and in the second case little danger, of distributing live weed seeds. In the experiments in which the weed seeds were fed to yearling steers, and the manure handled in various ways, it was found that:—

(1) Where the manure was hauled directly from the stable as a top dressing, an average of only 12·8 per cent. of the seeds fed to animals germinated.

(2) Where manure was hauled directly from the stable upon the land and ploughed under, 2·3 per cent. of the seeds fed to animals came up.

(3) Where the droppings remained in the pasture fields unadulterated as they fell, an average of only 3·1 per cent. of the seeds fed to animals germinated.

The results indicate that, in general, it is safe to assume that the vitality of weed seeds is destroyed in well-rotted manure, but that many pass unharmed through the digestive tracts of animals, and may be carried to the land if the manure is not well rotted before use.

TIME OF GROWTH AND RIPENING OF CACAO PODS.

The account of the following observations on the time of growth and ripening of a cacao pod, which were made in Trinidad, appears in the *Bulletin of Agricultural Information* of the Department of Agriculture in that island:—

The first appearance of the fruit was made on July 17, when it was about as large as the head of a pin. In twenty-nine and forty-five days, respectively, it was 1⅝ inches long and 3 inches long, while in sixty-one days the length was 4½ inches and the largest circumference 5 inches. Three more measurements, made in seventy-six, ninety-four, and 107 days from the commencement, gave 5½ inches, 7 inches and 8 inches for the length, and 7 inches, 9¾ inches and 13 inches for the circumference. No growth was observed after the 107th day, and the fruit took thirty-five days more to ripen, making 142 days in all for its full development.

As is pointed out, during this period of about two-fifths of a year, while the cacao pod is arriving at maturity, it is exposed to insect and fungus attacks, so that the necessity for good sanitation on cacao estates is made very evident.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial deals with the subject of the formation and storage of molasses. Special stress is laid on the means by which a good product with a reliable keeping quality may be obtained.

A report of the successful treatment of the 'pink disease' of cacao is given on page 260.

On page 261 will be found some interesting facts in connexion with wild ipecacuanha (*Asclepias curassavica*).

The present prospects of the Sea Island cotton industry in the United States are dealt with on page 262.

Much difference of opinion exists as to the best methods of tapping rubber. On page 263 an account is given of an attempt to arrive at a conclusion from a consideration of the structure of the plants operated on.

An interesting photograph of the first seedling canes raised in Barbados is reproduced on page 266.

The second of the short series of articles on fungi, which was commenced in the last issue, appears on page 267. It deals with the mycelium, or vegetative part of a fungus.

Page 271 contains particulars as to the treatment which broom corn receives preparatory to being manufactured into brooms.

Cotton-growing Prospects in Ceylon.

According to its report for 1908-9, the efforts of the Ceylon Agricultural Society to introduce cotton-growing on a large scale have not met with encouraging results. There is a general desire to take up the cultivation, but the chief drawback has been uncertainty with regard to the best area, the proper season and the best variety to grow in that country.

Sugar Industry in St. Lucia.

The Annual Report of the Agricultural Instructor in St. Lucia for 1908-9 states that the sugar industry of the island is, though comparatively small, on a good footing, the number of factories being four. Of the canes grown, the Bourbon has held out longer than is the case in any of the other islands, but it has been decided to give up its cultivation this year because of the frequency with which it is attacked by pests compared with that of other canes. The cane best suited to conditions in the island seems to be B. 208, which gives an average yield of 36 tons of cane per acre. B. 147 is not planted as extensively as B. 208, but gives fairly good results and ratoons well. White Transparent does well both as plant canes and ratoons. The report also states that several varieties of cane have been distributed from the Experiment Station during the year and that one of the sugar companies working in the island has imported several hundred plants of B. 376, which were planted in November 1908, and are doing well.

Shipping Rings.

The Report of the Royal Commission appointed in 1906 to consider the subject of shipping rings has just been issued. In it are considered the effects of the operations of such rings in limiting competition in carrying goods on certain routes by 'pooling' freights or by fixing regular rates of freight and dates and ports of sailing. Competition outside the ring is met by six-monthly reductions of 10 per cent. in the freight bill at the end of a year, for all those who have sent no goods, except by lines in the ring, for that period.

The conclusion arrived at in the report is that the system has both advantages and disadvantages, but that it is liable to be abused. Among the disadvantages quoted are the diversion of orders from England to other countries and the existence of arbitrary and high rates. Nevertheless the majority did not feel warranted in proposing that the deferred rebates should be made illegal, as effective legislation in this direction 'must prohibit all combinations and all agreements tending to create a monopoly in oversea trades'. The minority holds that the majority overrates the advantages of the system and inadequately states its dangers.

The proposals of the majority are: that associations of traders, under the partial control of the Board of Trade, should be formed for the purpose of discussing rates and other matters, and that further rebate agreements should be notified in confidence to the Government and tariffs should be published. The minority proposals are for publicity in Parliament and more direct supervision of the conferences.

Rate at which Weathering Takes Place.

From the point of view of soil formation, the rate at which the rocks of the earth are broken down by atmospheric agencies into particles small enough to be classed as soil, that is by weathering, is an important consideration. Observations recently made on the continent of Europe go towards giving an answer to this question. In Austria it was found that in certain ruins, during 500 to 600 years, there had formed from limestone a layer of soil 4 inches thick and containing 4·4 per cent. of humus, while the surrounding natural soil, also resting on limestone, was about 16 inches thick and contained 7·7 per cent. of humus. If this was formed at the same rate as that on the ruins, 2,400 years must have been required for the purpose. Similarly on a fortress wall built of limestone, in the Crimea, the soil accumulation in 600 years was found to be 4 inches thick, while the depth of that on the adjoining land measured 26 inches, so that on the same basis, it should have required 3,900 years for its formation.

Increased Yields by Additional Cultivation.

The *Agricultural Journal of the Cape of Good Hope* gives interesting particulars of experiments which were conducted during 1907 and 1908, for the purpose of finding the effect of an increased number of ploughings or cultivations on the fertility of the soil. In the former year, four plots were all manured in the same way, and then ploughed in such a manner that each received one more ploughing than the previous one; that is, the first received one, the second two, and so on; they were then sown with oats, for hay. In every case, the yield increased with the number of ploughings, culminating in the fourth plot, which gave a profit (allowing for extra expense of ploughing) of £2 18*s.* 3*d.* per acre. In the latter year, the four plots were manured as before, and all were ploughed, cultivated and harrowed. This time, however, a difference was made in the number of cultivations, the second plot receiving one additional cultivation, the third two, and the fourth three. The crops raised were barley and wheat, and the net profits per acre were successively 2*s.*, 17*s.*, and £1 1*s.* for barley, and 9*d.*, 4*s.* 3*d.*, and 11*s.* 9*d.* for wheat.

In all cases the yields were far below normal owing to the attacks of ladybirds, but this did not interfere with the experiment, as each crop was affected in like degree throughout. Additional cultivations were found superior to additional ploughings, both in point of time and expense.

School Gardens in the Philippines.

A report on this subject appears in the *Philippine Agricultural Review.* It states that the work was chiefly done on Saturdays and holidays, and that willingness for this was shown on the part of all the pupils. Each owns his own plot as well as the products raised from it; seeds and manure were provided by the pupils, the former being purchased by means of contributions from the schools. The only restrictions were that each pupil should prepare the soil, cultivate the plants and save seeds according to instructions. The teaching chiefly included the giving of information on the use of manures, cultivation of plants, use of products and saving of seeds, and it was found that for such teaching to be effective, hard work and close supervision on the part of the teacher were the chief requirements.

It is believed that the gardens have been a success, especially in the matter of the inculcation of industrious habits and that of the introduction of new food plants. In the latter connexion, the interesting statement is made that such vegetables as radishes, lettuce, beets, endive, carrots, rutabaga, kohlrabi, and turnips, which were unknown as food plants in some districts before the establishment of school gardens, are now planted at the homes of the pupils.

Absorption of Mineral Salts by Soils.

The *Botanical Gazette* contains an account of experiments that were made for the purpose of investigating the power of the soil to absorb phosphates, chlorides and nitrates, the salts used being ordinary sodium phosphate, potassium chloride and sodium nitrate. The fact that absorption of the phosphate and chloride took place was indicated in four ways: (1) by chemical analysis of soil which had been placed in solutions of the salts; (2) by growing wheat seedlings in solutions of the salts of different strengths, and showing that they would thrive in a solution that was too strong for this under ordinary conditions if soil was added to the solution; (3) that this tolerance was not shown in the case of nitrates, which, it is well known, are not observed to any extent by soils; (4) that the effect of the addition on the tolerance of the seedlings for the phosphate or chloride in the solution was least in the case of quartz, greater in that of unmanured soil, and greatest when manured soil was used.

Agriculture in Primary Schools, St. Lucia.

The Annual Report of the St. Lucia Education Department contains a report on this subject by the Agricultural Superintendent in that island. According to this, the Governor in Council has approved of the suggestion, in connexion with the new scheme of a Grant-in-aid to primary schools for the teaching of Agriculture, that the inspection of the school gardens shall be undertaken by the Agricultural Instructor, and arrangements have been made accordingly for that officer to make such inspection, and to report the results to the Agricultural Superintendent. As a result, the need for the adoption of a more uniform scheme of work in the different schools, and the advisability of the introduction of box and pot culture into the curriculum of those schools which do not possess school gardens, have been manifested. In the first inspection under this scheme, out of the twenty schools examined, two gained over 90 per cent. (excellent) of the marks awarded for agricultural teaching and school gardens, two 75 to 90 per cent. (good), seven 50 to 75 per cent. (fair), six 25 to 50 per cent. (insufficient), and two under 25 per cent. (weak and insufficient), while at one school no agriculture was taught.

SUGAR INDUSTRY.

Seventh International Congress of Applied Chemistry.

The Seventh International Congress of Applied Chemistry was held in London from May 27 to June 2, 1909. It included sections dealing with practically every aspect of the application of chemistry to industry, but of the subjects discussed, those dealing with the chemistry of sugar and sugar production will be of more particular interest to dwellers in the West Indies.

The questions dealt with under this head were many and varied. Among them was that of the use of temperature corrections, in the polarization of raw sugars and other products, upon quartz wedge saccharimeters. This question has been discussed at some length at one time and another in the *West Indian Bulletin* (papers on the Polarimetric Determination of Sucrose, Vols. VI, VII, VIII, and IX). In a paper having the above title, Dr. C. A. Browne, Director of the Sugar Laboratory of the Bureau of Chemistry, United States Department of Agriculture, discusses certain points in relation to the subject, and maintains that, with certain raw sugars and molasses, the application of a correction for the influence of temperature on the specific rotation of sucrose and on the quartz wedge of the saccharimeter is unnecessary, since in low grade products it is more than counterbalanced by the opposite effect on the specific rotation of invert sugar contained in them.

Mr. L. K. Boseley dealt with the requirements of the confectionery and preserving industries in respect of sugar and glucose products intended for use therein. In this case, the ability of sugars to retain their colour on heating, and the crystallizing power, appear to be the most essential features, and a number of tests are suggested for judging sugar required for these purposes.

Mr. Lewis Eynon adduced some results of experiments in connexion with the influence of clarification with basic lead acetate solution on the valuation of sugar products, tending to confirm the views of Prinsen Geerligs and others that, while basic lead acetate is incapable of precipitating levulose from pure solutions of invert sugar, nevertheless, when precipitable non-sugar compounds are present, removal of levulose from solution can, and does, take place on clarification with this reagent. Incidentally, the accuracy of the Clerget process for the determination of sucrose is brought out.

Messrs. Ling and Maclaren brought forward some results of analyses of cane-sugar and molasses, wherein the sucrose was determined both by the copper-reducing power and by the Clerget inversion process. Other subjects included papers, by Mr. H. Main and Mr. D. L. Davell, jr., respectively, on the estimation of ash in sugars and syrups by the determination of the electrical conductivity, and on the analysis of bagasse; in the latter, comparisons are made of the alcoholic and aqueous extraction methods for the determination of sugar and fibre, with the object of gaining information as to which is the better one.

THE FIRST SEEDLING CANES IN BARBADOS.

The First Seedling Canes in Barbados.

The photograph which is reproduced on this page has been received from Sir Daniel Morris, K.C.M.G. The following note in connexion with it is kindly supplied by Mr. J. R. Bovell, I.S.O:—

The photograph was taken by Mr. R. V. Sherring, F.L.S., in 1890, and gives an illustration of the first seedling canes that were raised in Barbados. These comprised the twenty-three varieties mentioned below, which were selected for cultivation from sixty-nine self-sown seedlings that had been found in 1888 near a field in which variety experiments were being conducted. Their names were as follows:—

Morris	Jemmotte	Governor Lees
Professor Harrison	Edwards	Murray
Burke	Parris	Hutson
Callender	Wiltshire	Hart
Clarke	Fawcett	Yearwood
President	Jenman	Phillips
Shepherd	Watts	Armstrong
Governor Robinson	Connell	

Since then, other seedlings have been grown which have given better results than this batch, consequently all but one have been discarded. This variety, the Burke, is now cultivated to a small extent on one or two estates in the island, where it is found suitable.

FUNGUS NOTES.

The following article is in continuation of a short series giving an account of the principal points of interest in the life-history of the fungi, and indicating their connexion with practical agriculture. The first of these appears in the last number of the *Agricultural News*, p. 251.

PART II.

THE MYCELIUM.

The vegetative portion of a fungus is made up of long, narrow tubes or hyphae, which may or may not be divided up by cross walls. The tubes branch frequently, and often join together, spreading in all directions throughout the substance on which the fungus lives. The hyphae may be either coloured or colourless, and frequently contain large oil-drops. Some, of which *Marasmius* is an example, are encrusted with crystals of calcium oxalate.

Unlike most other plants, the fungi cannot obtain their carbon from the carbon dioxide in the air, since they have none of the green colouring matter which is necessary for this. Consequently, they have to make use of food substances which already contain a large amount of carbon, prepared by other plants, or by animals. These plants or animals on which they live may be either living or dead. When the food substance is dead the fungus is said to be a saprophyte ; but when it obtains its nourishment from a living host, the fungus is called a parasite. Saprophytic fungi are very numerous, and usually quite harmless. To this class belong the moulds found on damp bread, jam, damp leather, ripe fruit, and many other substances. Other saprophytes live on decaying tree stumps, dead leaves, and all kinds of decaying refuse ; examples are the large toadstools often seen on tree stumps.

Parasitic fungi live on plants and animals. If the fungus grows very rapidly it takes up too much food from the host, which consequently dies, and in many cases the fungus can continue to live on the dead host as a saprophyte. These fungi, more especially such as live on plants, are often very destructive, and cause planters and farmers much trouble and loss of money; but some, chiefly those that live on insects, are distinctly useful. For instance, one form of fungus will kill caterpillars, another house-flies, while several species are known which destroy the white fly and the various forms of scale insects found so frequently in the tropics.

Some fungi are only very weakly parasitic, as for example, that causing root disease of the sugar-cane, *Marasmius sacchari*. It lives mostly on the dead cane leaves or trash, and on similar substances in the soil; but when the host plant is somewhat weakened by drought or the attacks of insects, the fungus can obtain a hold as a parasite on the young roots which the plant puts out, and thus the plant suffers more and more from want of moisture, and eventually dies. Others are capable of living on many host plants, either on the leaves, stem, roots or flowers. In the case of the root they usually enter those which are young, from the ground, and spread by means of their mycelium, or vegetative part into the older roots ; in some cases eventually attacking the stem also. Fungi that attack the stem only, usually do so by means of wounds in the bark or rind, where there is a surface of dead cells on which they can begin to grow. Fungi may enter leaves either through their breathing pores (or *stomata*), or directly by boring through the skin, or epidermis, as it is usually called. In order to be able to bore through a cell wall the fungus is believed to secrete an enzyme from the tip of the hypha in contact with the wall, and on entering the cell it may secrete other enzymes which kill the cell, and enable the fungus to feed on the remains. In opposition to this, the cell also secretes other substances which may destroy the hyphae of the fungus. Large plants have also another method of repelling fungi ; that is by cutting off the water-supply completely from a diseased portion by forming a ring of cork tissue inside it and so killing the fungus. In either case, if the host plant is in good health it may win, if not and the fungus has a good start it will lose, and be possibly completely killed. Thus all methods of cultivation, manuring and drainage which strengthen the plant, help it considerably to overcome its enemy. Want of attention, on the other hand, will frequently weaken the plant and materially assist the attack of the fungus.

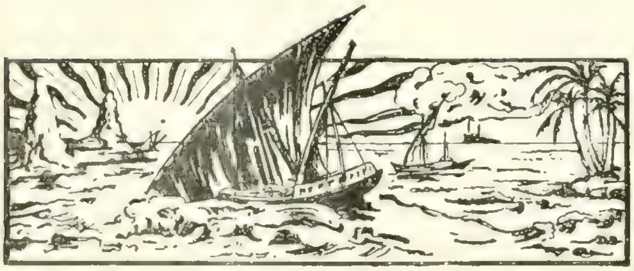
Many fungi, notably the rusts of grasses, spend one part of their life on one host plant, and another part on a different host. If either of the hosts occurs in the neighbourhood of the other, the fungus can spread during the year from one to the other, and vice versa, and the presence of one carrying disease will usually mean that the other will become infected.

Some fungi can only attack one particular form of host plant, and if this host is not grown for some time the fungus dies out. In the case of such fungi, the degree of parasitism is very advanced. It is thought probable that this limited selection is due to the presence in the host of some particular substance which attracts the germ tube of the fungus when it first grows out from the spore ; the fungus is unable to attack other allied species or even varieties owing to the absence of this chemical substance. In other cases, the immune species may possess some substance which repels the hyphae, while those subject to attack do not to any useful extent.

Species which are immune, through either of these reasons, to the attacks of any given fungus are of the greatest value to the practical planter. A fair estimate can also be formed from what has been said above of the value and importance of rotation of crops, and good cultivation when attempts are being made to combat any given plant disease.

WEATHER FORECASTS IN THE UNITED STATES.

The field of daily telegraphic meteorological observations for forecast purposes, which in 1896 was limited to the United States and Canada, has been extended by the Department to embrace at the present time the whole northern hemisphere. Forecasts which formerly were limited to a period of twenty-four to forty-eight hours in advance are now frequently made from four days to a week in advance. In 1896, forecasts were telegraphed daily at Government expense to 1,896 distribution stations, from which points they were distributed by mail, telephone, railway train service, and railway telegraph service to 51,694 addresses without expense. On June 30, 1908, the daily forecasts were being telegraphed at Government expense to 2,334 distributing centres, from which points they were distributed gratuitously to 76,151 addresses by mail, 58,008 by rural delivery, 2,139 by railway telegraph, 852 by railway train, and 3,553,067 by telephone, making a grand total of 3,690,220 addresses, of record, receiving the daily weather forecasts without expense, except for the initial cost of telegraphing the information from the forecast district centres. The storm-warning display stations have been increased from 253 to 321. There has been an addition of seventy-eight stations where daily meteorological observations are taken and telegraphed. (*Annual Report of the United States Department of Agriculture, 1908.*)



GLEANINGS.

According to official sources, the production of sugar in Java for the crop of 1908 was 1,241,885 tons. The percentage of sugar manufactured, on the weight of cane ground, was 10·04.

The annual report of the United States Department of Agriculture on the sugar-beet crop of that country states that this reached 3,416,000 tons during 1908. The average sucrose content of the crop was 15·75 per cent.

The imports of rice into the United States for the eleven months ending May 31 were 86,600 tons, valued at 4 million dollars. This includes rice, rice flour, rice meal and broken rice. (*Louisiana Planter*, July 24, 1909.)

According to the London *Globe*, an attempt to form a syndicate of Russian sugar producers and sugar refiners has definitely failed, owing to the refusal to join of M. Brodsky, the leader of Russian sugar producers.

The *Report of the Chief of the Bureau of Plant Industry* of the United States Department of Agriculture, states that the fruit industry of that country represents an area of 5 million acres, with an annual income of 150 million dollars.

Several trials, in different years, with ground nuts at the Experiment Station attached to the Agricultural School in St. Lucia have shown that this crop should be sown at a time which will ensure the ripening of the nuts in dry weather.

The statement is made, in the *Philippine Agricultural Review* for February 1909, that the present yearly rubber production of the world is approximately 70,000 tons. Most of the rubber comes from the forests of Brazil, which produced 41,000 tons in 1907.

It is stated in the *Louisiana Planter* for July 31, 1909, that weather suited to the growth of sugar-cane throughout the Louisiana district has recently prevailed. The temperature has been comparatively high, and there have been frequent showers, so that good growth is being made.

A Bill to encourage the destruction of rats in Barbados has been recently passed in the House of Assembly without opposition. A penny will be paid for the head and tail of every rat delivered to the Parochial Treasurer of each parish, or to any person nominated for the purpose.

The quantity of bananas exported from Jamaica during the first five months of the current year shows an increase of 654,780 bunches on that for a similar period in 1908. In the same way, the shipments of tobacco and cigars have increased by nearly 3,000 ℔. and cigarettes by 1,700 ℔., while those of cacao and rum have nearly doubled.

The following plants, etc., were sent out from the Botanic Stations in Montserrat during the quarter ending June 30, 1909. Plants: cacao 49, bay 140, lime 2,000, yams 20 ℔., tannias 631; cuttings: sugar-cane 370, cassava 1,020, sweet potatos 1,087; seeds: pedigree cotton 80 ℔., beans 16 ℔, horse beans 13 ℔., cowpeas 4 ℔.

The annual report on the working of Co-operative Credit Societies in the Bombay Presidency (including Sind) for the year July 1, 1907 to June 30, 1908, states that the number of members of urban societies rose from 1,930 to 3,327, and that of rural societies from 5,405 to 8,477, during the period.

The amount of cotton exported from Barbados during the quarter ending June 30, 1909, was 237,799 ℔., of an estimated value of £11,889 19*s*. Of this 227,721 ℔. (value £11,386 1*s*.) was shipped to the United Kingdom, and 10,078 ℔. (value £503 18*s*.) to the United States of America.

According to the *Transvaal Agricultural Journal* No. XXVII, *Phylloxera vastatrix* (the insect that caused a serious set-back to the French wine-growing industry for several years after 1865) has appeared in the vineyards of the Transvaal, and is expected to do a considerable amount of damage.

From a paper by Mr. A. D. Gibson, Imperial Forest Economist (India), it appears that excellent wood pulp has been made on a small scale from the silver fir and spruce of the Himalayas. There seems to be a likelihood that a factory will be erected in the Punjab or the United Provinces to find out if chemical, if not mechanical, pulp can be made in India on a commercial basis.

A remedy for sore eyes in cattle and sheep is given in the *Journal of the Jamaica Agricultural Society*, June 1909, and is as follows: Wash the eye out two or three times a day with a solution composed of 1 oz. of boracic acid dissolved in 1 quart of warm water. After three days, apply an ointment made of 1 part of iodoform in 11 parts of pure vaseline, the iodoform being thoroughly mixed with the vaseline until the particles are absorbed in it.

As is well known, the rainfall over large areas in the west of the United States is insufficient for crops to be grown in the ordinary way. As an illustration, there is the State of Wyoming in which the average annual precipitation, according to the *Monthly Weather Review* of the Weather Bureau of the United States Department of Agriculture, for the seventeen years 1892-1908, has been 13·68 inches. In such areas, the method of plant cultivation known as 'dry farming' is practised. This depends upon the principle of employing methods for the conservation of soil moisture, the selection of seeds which require a small amount of moisture, for germination, and the growing of one crop only, in the time that two or three would be raised under ordinary conditions.

STUDENTS' CORNER.

AUGUST.

Last Period.

Seasonal Notes.

In cases where artificial manures are employed for limes or cacao, notes should be made as to the kinds that are generally used in this connexion, and the reasons, in any special instance, for their employment. What manurial constituent has the greatest importance in the matter of fruit formation? Lime and other citrus plants should be specially watched after a good fall of rain in order to find out if there is an increase of the fungoid parasites of scale insects. At the same time a look out should be kept for small holes in the covering of scale insects; in this way, the presence or absence of other insects which are parasitic on them will be indicated. Where lime trees have been recently pruned, determine whether this has been carried out carelessly or not, and find out if there have been any harmful results from careless pruning or by omission to cover the wounds with tar. By careful examination evidence may be obtained that carelessness in removing branches has provided places for the entrance of the lime tree borer. Where Bengal beans were used as a cover crop last year, notice if there is any increased growth consequent on their use; also closely observe the state of trees which have become covered with this plant. A close watch must also be kept, throughout the plantation, for the return of injurious insects and the growth of love-vine (dodder). Branches infested with this must be carefully cut out and burnt, as it is not only readily propagated by seed, but also by means of small pieces of the stem.

When cacao is badly attacked by thrips, the effect of this pest on the leaves and pods, and on the trees themselves, should be noted. Examine the leaves: the surface on the under side, together with part of the interior has been eaten away. The pods also show the effects of the pest chiefly on the under side. When they are first attacked, small areas which have a deep brown colour are seen; these subsequently grow larger, and the whole pod becomes deep brown, so that such immature fruits are frequently gathered as ripe ones. A study should be made of the methods which are adopted to control the pest. Find out, if possible, which of the washes that are recommended for the purpose is the best, and what results from the application of lime on soils where there is a large proportion of organic matter present. Information regarding thrips will be found in the *Agricultural News*, Vol. V, No. 120; in the *West Indian Bulletin*, Vols. II, pp. 175-90, and IX, p. 190; and Pamphlet No. 58, *Insects Pests of Cacao.*

In going through a cotton field it will often be noticed that the plants have failed to grow evenly; some appear to be making a healthy growth, while others are dwarfed, and may even be showing very evident signs of disease. Attempts should be made to find in each case the reason, or reasons, for this. Among these are, speaking generally, the presence of too much moisture, a physical condition of the soil which is unsatisfactory as regards germination, attacks of anthracnose on the sprouting seed, and planting too deeply. What are the reasons for the lack of development of the plant from seeds that are planted deeply? The young cotton plants will now have reached the stage at which they may be thinned out. It will form a good exercise to omit this thinning in the case of a few plants, and to perform the operation roughly in that of others; then to compare the growth of the plants thus treated with that which has resulted from the careful thinning out that the others have normally received. What do you learn about root growth and absorption from this experiment?

In those parts where there has recently been a good supply of rain, attention will be drawn to the subject of drainage. That on sugar estates forms a specially useful object-lesson. The various distances at which drains are made for carrying away surplus water from different kinds of soil, and from fields on the flat and on different slopes should be noted. What special arrangements in draining have to be made (1) where there are small springs, (2) where, during heavy rainfall, the smaller particles of soil are carried away? Study the connexion between drainage and the position of the water table, with special reference to the growth of roots.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) A field, in which the soil is in good condition, is left under grass. Does the soil gain in nitrogen content?

(2) What is meant by secondary thickening of stems? Describe the structure of the stem of (a) the hibiscus, (b) the cocoa-nut palm.

(3) What changes take place when a sample of soil is heated strongly?

INTERMEDIATE QUESTIONS.

(1) A field of heavy non-calcareous clay, which had been green-dressed with pigeon peas, was found to give a very poor growth of cane. What was the reason for this?

(2) What is meant by the term 'bud variation'? Does this ever occur in the sugar-cane?

(3) What effects has the food of animals upon the resulting manure?

EDUCATIONAL AND ECONOMIC VALUE OF PLANT COLLECTIONS.

By means of a prize-scheme to operate in schools, the Director of Agriculture in Rhodesia is attempting to supplement the usual methods of gaining information with regard to the possible economic importance of such plants as are not under general cultivation, whether as products of commercial value, or because of the dangerous or objectionable properties which they may possess.

To this end, prizes to the value of £15 are offered for competition among school children, who will forward collections not exceeding 100 dried specimens. These are to be accompanied by the following particulars, as far as possible: English and native name, date of collection, habitat and geographical position, appearance, uses and properties of the part utilized. Adults are invited to assist in the work either by contributing to collections, or by forwarding specimens direct to the Department of Agriculture, whose property all such material will become. In judging the collections, regard will be had to the skill shown in selection, completeness of the specimens, fullness of their history, and to the manner of preservation of the specimens.

It seems that the adoption of such a scheme in other countries, where wild plants are put to many uses by the natives, would be useful both from an economic and an educational point of view.

INSECT NOTES.

The Mosquito and Sanitation in the West Indies.

On July 8, a lecture on 'Health Progress in the West Indies' was delivered by Sir Rubert Boyce, F.R.S., under the auspices of the West India Committee, in the Commercial Salerooms, Mincing Lane. The following is a summary of the chief points of the lecture :—

The lecturer first instanced several places, such as Havana, Rio de Janeiro and Santos, where measures taken for mosquito prophylaxis had resulted in an almost incredible improvement in the health of the population, with the consequent lowering of the death rate. He then stated that he had made personal examination of the health-conditions of parts of the West Indies in the light of his experience in other parts of the world, such as West Africa, British Honduras, and some of the Central American Republics. This examination had included St. Vincent, Grenada, St. Lucia, Barbados, Trinidad and British Guiana. There was no need to spend time in giving an account of the signs of the medical progress that was taking place in the West Indies, a progress which was evidenced by the presence of magnificent colonial hospitals and hospitals for special diseases, as well as by that of well-organized charities. What was more important to consider was the advance that has been made, on the lines of modern sanitary reform, in the West Indian group. This meant the share which the West Indies are taking in the now universal campaign against the mosquito. The term universal was rightly applied to the campaign, for every civilized State throughout the world was engaged on it, and not before this had become necessary, for it had been truly said that if the loss of life in all the great military campaigns that were best known to history was computed, it could not compare with the total number of deaths caused by the mosquito. This was illustrated by the great loss of life that had been caused by yellow fever alone, in the past, especially in Boston, Baltimore, and Philadelphia, in some of the Southern States of America, and in the Peninsula. Now, yellow fellow has disappeared from most of these places simply on account of the adoption of sanitary reforms which made for the destruction of the mosquito.

To return to the West Indies. It was a matter of common knowledge that, among those races, the Spaniards, Portuguese and French, who first carried conquest from Europe to the West, the mortality from yellow fever was very high. Later, the same experience was undergone by the English, who were accustomed to lose more than half of their troops in the West Indies, owing to that disease alone. Then came the implication of the Stegomyia mosquito with the disease. This was the outcome of a mere suspicion at first, notably on the part of Beauperthuy, Surgeon General Blair and Professor Harrison, the last of whom suggested, in addition, that yellow fever could not be directly communicated from one human being to another, but required to pass a period of time outside of the human body. This suggestion was simultaneously made by Drs. Findlay and Carter in Cuba, and it finally remained to Drs. Carroll, Agramonte and Lazear to prove conclusively that the carriage of malarial fever by the Anopheles mosquito, which had been unmistakably demonstrated by Dr. Ross, had a parallel in the transmission of yellow fever by Stegomyia. The result of this discovery was the immediate declaration of war on the last-named mosquito.

This war was waged by measures for the reduction of its numbers. These were first adopted in Havana, the Isthmian Canal Zone, New Orleans and Rio de Janeiro. Now, active measures are in operation throughout the greater part of the West Indies, not only for the destruction of the yellow fever bearing mosquito, but also for the one responsible for the transmission of malaria. In the majority of the West Indian colonies it is now a punishable offence to harbour mosquito larvae on household premises, and many hundreds of summonses have been issued. Schoolmasters, sanitary inspectors and policemen are now being trained in this special form of hygiene, and the seaports are becoming gradually as secure as any town in Europe.

PREPARATION OF BROOM CORN FOR MAKING INTO BROOMS.

The following interesting account of the processes to which broom corn is subjected before it is manufactured into brooms is taken from a United States trade publication :—

The first brooms manufactured in this country were made in 1798 in Schenectady county, New York. These were somewhat crude affairs, laboriously put together by hand, but they marked the beginning of a great industry It was not until the middle of the nineteenth century that the first practical broom-making machine was devised, and it is curious that since that time, apart from the minor improvements made in the machine, the general principle is the same to-day as it was then. From this small beginning the industry has grown until there are manufactured annually in the United States to-day $15,000,000 worth of brooms. Placed end to end, the broom handles alone of the United States would reach one and a half times round the globe. If all the brooms manufactured in the United States were made into one big one, the smallest tree from which the handle might be cut would have to be more than a mile in circumference.

Although the broom is one of the commonest articles in the world's household, not everyone is acquainted with the details of its manufacture.

From the great fields of Oklahoma, Kansas and Illinois, the corn is shipped to the factories. It is dry and yellow, and must go through another process before it is ready to be made into brooms. The big bundles are untied, and the corn shaken out, and at about four o'clock in the afternoon the 'wetting down' process begins. The stalks of corn are first dipped into a huge vat containing an aniline dye of a bluish green colour. It is allowed to soak in this for some time, when it is transferred to clear water, thus, at the same time, giving the corn the well-known greenish yellow tinge familiar to all users of brooms and imparting to it sufficient moisture to allow it to be worked. From the 'wetting down' process the corn is taken to a large asbestos-lined room, where it is loosely piled, being spread over as large an area as the room will permit. From the centre of the room is hung an iron pot, in which is placed a quantity of sulphur. The sulphur is set on fire at about six o'clock and burns until about midnight of the same night. The fumes fill the room and bleach the corn to a certain extent, at the same time removing the surplus dye. On the following day it is removed from the room and is ready to be worked into brooms.

The corn is gathered into piles and first taken to a sizing machine. This consists of a trough-like arrangement about 12 to 15 feet long, on the top of one edge of which runs an endless belt. On the other edge there are six or seven endless belts of different lengths. The corn is fed in at one end, a sharp knife trims off the bottom of the stalk and it passes on to the belt. Underneath the belts are receptacles for the various-sized spears. Each spear travels to the end of the belt which is the particular length of that spear from the main carrying belt, and having reached the end of the belt, drops into the receptacle below. Thus the short spears are dropped into the receptacle nearest the knife and the longer ones travel out further along the belts. After the corn had been thus sorted it is taken to another portion of the factory, where it is again separated into different grades for the different parts of the broom.

The first process to which each spear of corn is subjected is separating the finer from the coarser pieces. This is done by what is known as a hurl cutter. It consists of two sets of cog wheels, the larger toothed wheels being superimposed above the finer toothed ones. A revolving knife clips off the butt end of the tassel and the coarser pieces are cut by the lower wheel and thrown into a lower receptacle. This hurl cutter is usually operated by a boy who can prepare enough hurl for 150 to 200 dozen brooms per day. The corn is then piled and taken to the broom-making machines.

The export trade in brooms during the past five years has nearly doubled, while during the last two or three years there has been a remarkable gain in the exports of broom corn. Both Mexico and Canada are taking a large number of American brooms, while South America is a big buyer in this country of both brooms and broom corn. Cuba, Porto Rico, Mexico, South Africa, and Australia purchase large quantities of broom corn in this country and their trade is advancing by leaps and bounds.

NEW LEGUMINOUS PLANTS FOR GREEN MANURING.

In the *Rhodesian Agricultural Journal* for June 1909, there is an account of a leguminous plant named *Sesbania punctata,* which grows there as a weed, but which gives indications that it will become useful as a green dressing. This is important in view of the interest which is being taken at present in the practical application of the property of leguminous plants, in conjunction with certain bacteria, of fixing the nitrogen of the air.

A discovery of much possible value and great interest has been made at Westacre in the Matopos. Recently there were forwarded to the Department of Agriculture specimens of a leguminous plant bearing large quantities of nitrogen-forming nodules on its roots. It had been observed that at Westacre, land on which this herb, originally regarded as a weed, had grown, supported much better crops of lucerne and oats than elsewhere. A specimen has been identified at the Royal Botanic Gardens, Kew, as *Sesbania punctata.* This is interesting, in that recently in India a nearly related plant, *Sesbania aculeata*, 'Dainchu', has attracted attention, and is there recommended as a green manure for paddy fields, on account of its recognized fertilizing properties. The plant found at Westacre appears to be widely distributed in Rhodesia, and another form, possibly new to science, has been found to occur plentifully in the Zambesi Valley near the Victoria Falls. The indigenous occurrence and free growth sufficiently prove its suitability to the country. By growing this plant as a crop and ploughing it in while in flower and before it seeds, the ground will be provided with nitrogen, the most costly of all plant food, for future crops, and a supply of organisms provided to inoculate any other leguminous crop, such as lucerne and beans, that may be sown. Whether in this respect it is superior to cowpeas, lupins, or velvet beans, experiment can alone show, but from reports received this seems quite likely to be the case.

The Indian plant mentioned above, *Sesbania aculeata,* occurs in many islands in the West Indies, often along roadsides. It is an under shrub with a prickly, cylindrical stem and with leaves having many leaflets. The flowers are about ½ inch long and yellow in colour, the largest petal being dotted with purple. The pod is flattened, sharply beaked and reaches a length of about 10 inches. It would be useful if observations could be made on this plant and communicated to the Imperial Department of Agriculture.

The American Sugar Market.

In the report of Messrs. Czarnikow, Macdougall & Co., New York, for June 25, the important statement is made that, at present, European sugar prices are practically of no effect in fixing values in the American market.

It must be admitted that price movements have not followed the usual course of gradually hardening as the end of the Cuban crop came in sight. To-day the market is on the same level of 2·62c. c.f., for Cubas for second half July shipment as it was two months ago for sugars for April shipment, although in the interval the number of centrals at work in Cuba has declined from 169 to six. It is to be noted, too, that the price for July Cuba is ·23c. below the parity of beet just as it was for April Cubas. If European prices had any active bearing on this market we should have been tending towards their parity, but as a matter of fact our prices show that European markets are practically of no effect in fixing values here. Later, when Cuban supplies are over and refiners have to draw upon Javas, the value of European beets may have some influence in determining prices, but to what extent it is impossible to forecast.

RICE IN BRITISH GUIANA.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated July 23, 1909, gives information as follows :—

The continuous rains have flooded several districts, and, notwithstanding the larger area under cultivation, we expect that the crop will be smaller than last. The weather continued wet during the past fortnight, but a few bright days have been experienced this week and were very welcome.

There has been little cleaned rice received in town this fortnight, and stocks are low. Local demand continues to improve, and the market is now firm at an increase of about 6*d.* over last quotations.

Shipments to the West India Islands during the fortnight amount to about 2,300 bags. Exports to date are now about 250,000 lb. more than at same time last year.

We quote to-day, f.o.b. Demerara, for good export quality :—

18*s.* 3*d.* to 19*s.* 3*d.* per bag of 180 lb. gross.
16*s.* 9*d.* to 17*s.* 9*d.* ,, ,, ,, 164 lb. ,,

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, August 3, 1909; Messrs. E. A. DE PASS & Co., July 23, 1909.

ARROWROOT—St. Vincent, $1\frac{3}{4}$*d.* to $3\frac{3}{4}$*d.*, according to quality.
BALATA—Sheet, 2/$4\frac{1}{2}$ to 2/7; block, 1/$10\frac{1}{2}$ to 1/11.
BEES'-WAX—No quotations.
CACAO—Trinidad, 52/- to 63/- per cwt.; Grenada, 49/6 to 54/6 per cwt.; Jamaica, no quotations.
COFFEE—Santos 27/9 to 29/$7\frac{1}{2}$ per cwt., depressed; Jamaica, no quotations.
COPRA—West Indian, £22 to £22 10*s.* per ton.
COTTON—St. Vincent, 13*d.* to 19*d.*; Barbados, $13\frac{1}{2}$*d.* to 15*d.*; Antigua, St. Martin and St. Croix, $13\frac{1}{2}$*d.* to $13\frac{3}{4}$*d.*; St. Lucia, 15*d.*; stains from various islands, 7*d.* to $8\frac{1}{2}$*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 45/- to 50/-; low middling to middling, 52/- to 55/-; good bright to fine, 57/- to 65/-.
HONEY—24/- to 31/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/1 to 1/3 per gallon; concentrated, £18 15*s.* per cask of 108 gallons; distilled oil, 1/9 to 1/10 per lb.; Otto of limes 6/- nominal.
LOGWOOD—No quotations.
MACE—Quiet.
NUTMEGS—Steady.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 8/5 to 7/10; plantation sheets, 8/5 to 8/6 per lb.
RUM—Jamaica, no quotations; Demerara, no quotations.
SUGAR—Crystals, 14/10 to 15/6; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York,—Messrs. GILLESPIE, BROS. & Co., July 23, 1909.

CACAO—Caracas, 13c. to $13\frac{1}{2}$c.; Grenada, 12c. to $12\frac{1}{2}$c.; Trinidad, 12c. to $12\frac{1}{2}$c.; Jamaica, $9\frac{3}{4}$c. to 11c. per lb.; Dominica, 11c. to $11\frac{1}{2}$c.
COCOA-NUTS—Jamaica, select, \$23·00 to \$24·00; culls, \$15·00; Trinidad, select, \$21·00 to \$22·00; culls, \$13·50 to \$14·50 per M.
COFFEE—Jamaica, ordinary, $7\frac{3}{4}$c. to 8c.; good ordinary, $8\frac{1}{2}$c.; and washed up to 11c.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, no quotations; Barbados, 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 47c. to 59c. per lb., dry flint; Antigua, 50c. to 52c.
GRAPE FRUIT—No quotations.
LIMES—Dominica, \$4·50 to \$6·50.
MACE—$27\frac{1}{2}$c. to 35c. per lb.
NUTMEGS—110's, 9c. per lb.
ORANGES—No quotations.
PIMENTO—$4\frac{1}{2}$c. per lb.
SUGAR—Centrifugals, 96°, 3·95c., Muscovados, 89°, 3·45c.; Molasses, 89°, 3·20c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., August 16, 1909; Messrs. T. S. GARRAWAY & Co., August 16, 1909.

ARROWROOT—St. Vincent, \$3·75 to \$4·00 per 100 lb.
CACAO—\$11·21 to \$12·00 per 100 lb.
COCOA-NUTS—\$15·67.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., according to quality—scarce.
HAY—\$1·10 to \$1·25 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Ohlendorff's dissolved guano, \$55·00; Cotton manure, \$42·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00; Sulphate of potash, \$67·00 per ton.
ONIONS—Strings, \$2·50 per 100 lb.
PEAS—Split, \$6·00 to \$6·20 per bag of 210 lb.; Canada, \$4·00 per bag of 120 lb.
POTATOS—\$2·50 to \$3·25 per 160 lb.
RICE—Ballam, Calcutta, no quotations; Patna, \$3·80; Rangoon, \$3·00 per 100 lb.; Demerara, Ballam, \$4·58 to \$5·25 per 180 lb.
SUGAR—Dark Crystals, 96°, no quotations; Muscovado, 89° \$1·70; Centrifugals, no quotations.

British Guiana,—Messrs. WIETING & RICHTER, August 7, 1909*; Messrs. SANDBACH, PARKER & Co., August 6, 1909.†

ARROWROOT—St. Vincent, \$8·50 to \$9·00 per 200 lb.*†
BALATA—Venezuela block, 32c.*, Prohibited†; Demerara sheet, 48c. per lb.*; 48c. to 50c. per lb.†.
CACAO—Native, 14c. per lb.*; 12c. per lb.†
CASSAVA—60c. to 72c.*
CASSAVA STARCH—\$6·00 per barrel of 196 lb.*
COCOA-NUTS—\$12·00 to \$16·00 per M;* \$16 per M peeled and selected.†
COFFEE—Creole, 8c. to 13c.*, 12c. to 15c. per lb.†; Jamaica and Rio, $13\frac{1}{2}$c.*†; Liberian, 7c. per lb.†; 8c.*
DHAL—\$4·20 to \$4·25 per bag of 168 lb.*; \$4·50 per bag;† Green Dhal, \$5·50.*
EDDOS—\$1·44 per barrel.*
MOLASSES—Yellow, 21c. to 22c.*
ONIONS—Teneriffe, $2\frac{1}{2}$c.†; Madeira, $2\frac{3}{4}$c. per lb.*†
PEAS—SPLIT \$6·28 to \$6·30 per bag (210 lb.),* \$6·40†; Marseilles, \$3·00, over stock.*†
PLANTAINS—20c. to 48c. per bunch.*
POTATOS—Nova Scotia, no quotations,* \$3·75 per barrel†; Lisbon, \$2·00,* \$2·25 per 100 lb.†
POTATOS—Sweet, Barbados, \$1·20 per bag.*
RICE—Ballam, \$4·50,* \$4·75 to \$5·00;† Creole, \$4·40,* \$4·00 to \$4·40.†
TANNIAS—\$2·64 per bag.*
YAMS—White, \$3·50 per bag; Buck, \$3·12.*
SUGAR—Dark crystals, \$2·$17\frac{1}{2}$ to \$2·40;* Yellow, \$2·90 to \$3·00,* \$3·00;† White, \$3·60 to \$3·80;*† Molasses, \$1·90 to \$2·00,* \$2·00 to \$2·30.†
TIMBER—Greenheart, 32c. to 55c. per cubic foot.*†
Wallaba Shingles—\$3·75 to \$5·75 per M,* \$3·50 to \$5·50 per M.†
—— Cordwood—\$1·80 to \$2·00 per ton.*

Trinidad,—Messrs. GORDON, GRANT & Co., August 7, 1909.
CACAO—Venezuelan, \$11·30 per fanega; Trinidad, \$11·15 to \$11·50.
COCOA-NUT OIL—\$1·00 per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 9c. per lb.
COPRA—\$3·50 per 100 lb.
DHAL—\$4·15 to \$4·25 per 2-bushel bag.
ONIONS—\$2·00 to \$2·50 per 100 lb.
PEAS—SPLIT \$5·50 to \$5·75 per bag.
POTATOS—English, \$1·75 per 100 lb.
RICE—Yellow, \$4·50 to \$4·60; White, \$5·00 per bag.
SUGAR—American crushed, \$5·10 to \$5·20 per 100 lb.

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CONTENTS.

Animal Pests of Cotton.

AT the present time, when the cotton crop has begun to make a good stand, and when conditions must be favourable if healthy plants capable of bearing a good product are to be obtained, it is extremely important that a careful watch should be kept for the appearance of those enemies which are able seriously to weaken, if not to kill the plant, with a view to applying promptly such remedial measures as will minimize the harm as far as possible. Much should have been done already in the matter of preventive measures which, after all, are more important than those which are remedial. These would have included the burning of old cotton plants, careful cultivation of the soil and disinfection of the seed, the last of which is, of course, important in connexion with the control of plant, rather than animal, pests.

The kind of growth which the cotton plant is making at present is vegetative; this includes the extension in length and breadth of those parts which form means of support and communication, such as the stem with its branches, and the leaf-stalks; and the formation of new areas for absorption by the development of fresh leaves and rootlets. All such growth is taking place preparatory to the production of the reproductive organs and the subsequent bearing of fruit, and for it to do so successfully, it entails the active formation of plant food and the quick transference of it from the parts where this is made (the leaves) to those where it is required for the formation of new tissues. It is the presence of this food and the fact that young, succulent tissues are being continually formed, which render the plant so likely to be attacked by animal pests, especially insects, at this time. As all this has to do simply with vegetative growth, not with that which is reproductive, it will be convenient to confine the attention, at present, to those pests which attack the growing plant.

A division of these pests into two kinds may be made: those that actually disturb or consume the tissue in order to obtain food, and those that merely pierce it for the same purpose. This division is important, as it often affords a guide in selecting a method for the destruction of a given pest. The chief of those included in the first kind are: the cotton worm, the leaf-blister mite, cut worms, the red maggot and grasshoppers; the second comprises scale insects, plant lice and cotton stainers. Detailed information concerning the appearance, life-history, and modes of doing harm of these, as well as remedies for them, can be found in the *Agricultural News*, Vol. VI, No. 141, and in the articles which frequently appear under the heading 'Insect Notes'; in the *West Indian Bulletin*, Vols. IV, p. 268; VI, p. 123; IX, p. 235; and in Pamphlet No. 45 of the Department Series, entitled '*ABC of Cotton Planting*', to all of which special reference is made.

All the pests included in the first kind, with the exception of the leaf-blister mite and the red maggot, can be best controlled by stomach poisons, the most useful of which has been found to be Paris green; therefore there should be a stock of this substance on hand at the beginning of the cotton-growing season in order that it may be made use of as soon as it is required. For caterpillars and grasshoppers, the mixture of it made with lime is dusted on to the leaves, but in the case of the latter insect, if it attacks the plants when they are very young, poisoned baits composed of young grass on which the insecticide has been sprinkled should be provided. Such a bait is also useful in the case of cut worms, which eat through the stems of the very young plants; a more attractive one, consisting of bran and Paris green mixed to a mash with molasses and water, is however generally used. The leaf-blister mite and the red maggot, the latter of which seems to have reached its chief importance, as a pest, in Barbados, cannot be controlled by stomach poisons. They are best kept in check by preventive measures, these being, respectively, the destruction of old cotton, and the exercise of care, especially during cultivation, that the plants are not wounded in any way. As a remedial measure for the former, dusting with lime and sulphur has been found successful; the latter may be kept in check by the removal of affected branches and of dead and dying plants.

Of the second kind, namely, those which pierce the tissues of the plant in order to obtain food, and which, therefore, are not controllable by stomach poisons, the scale insects are generally the most likely to interfere with its growth. These, together with the plant louse, are best kept in check by the use of contact poisons, such as kerosene emulsion and whale oil soap in a spray. The preventive method, that of burning old cotton, is by far the most satisfactory, however, for the former. The cotton stainer may be shaken off the plants into a tin containing water covered with a little kerosene, or traps of heaps of cotton seed may be laid for it, which, when they have collected a sufficiently large number of the insects, are soaked with kerosene and burnt.

The cotton worm, grasshopper, and leaf-blister mite interfere with the nutrition of the plant, the first two by eating the leaves, either wholly or partially, the last by causing such distortion of them, especially when they are young, as to cause a serious loss of their power of making plant food. Scale insects, plant lice and cotton stainers suck the juices from the plant, and thus rob it of food which is necessary to growth. The last, at any rate in the West Indies, does not cause much damage in this way; it is chiefly objectionable because it stains the cotton in the boll with its excrement, or may cause similar damage by being crushed during ginning. The red maggot, which is really the larva belonging to a fly of the family of the gall gnats, gets beneath the bark by means of wounds, and feeds on the cambium layer. As this is composed of thin-walled, quickly growing cells, on the formation of which the thickening of the stem depends, any attack in which this is severely implicated will speedily lead to the death of the whole plant. Finally, the damage done by cut worms is irreparable, as far as the attacked plants are concerned; but as this attack occurs only when the plants are very young, the evil may often be remedied by supplying dead holes.

It must not be forgotten that all these pests have their own enemies which keep them in check, and that it is only when the rate of survival of them is increased by the provision of an unnaturally large amount of the plant on which they feed, that the balance of nature is upset and the parasites are not produced sufficiently quickly to deprive the pests of their abnormal advantage. In time, however, if there are no untoward circumstances to prevent it, the very fact of the increase of a pest will lead to a similar increase in the numbers of its parasites, and the balance will be restored. The best known of the insects that are useful to cotton growers in the West Indies, in this way, are two very small hymenopterous insects (*Trichogramma pretiosa* and *Chalcis annulatus*) which respectively prey on the eggs and larvae of the cotton worm, the 'Jack Spaniard' (wild bee, of Barbados) which is also inimical to this pest, and the lady-birds and lace-wing fly, or aphis lion, which are the enemies of the plant louse. All these should, of course, be encouraged and never destroyed, when it is possible to avoid doing so.

Enough has been said to indicate the serious damage that can be effected by these pests, the necessity of a constant and careful watch for their appearance, and the remedies that are useful for the purpose of coping with them. In the last connexion, it has only been possible to give a general outline in an article like the present one. For particulars, reference is made to the publications of the Department that have already been cited.

SUGAR INDUSTRY.

Sugar in Java.

The annual report of the experiment station for the Java sugar industry for 1908 (*Jaarverslag van het Proefstation voor de Java-Suikerindustrie*, 1908) has been received. The following notes are taken from an abstract of it kindly supplied by Mr. J. Lely, Chemist at the Antigua Sugar Factory.

Mention is made of the sudden dying-out of sugar cane in several cases, and the phenomenon is attributed, in most instances, to the high concentration of salts in the soil water, ammonium sulphate, even, showing an abnormally high percentage. In connexion with soil conditions also, a warning is given to the effect that phosphatic manures should not be used for sugar-cane unless chemical analysis has shown that its employment is necessary, for actual harm may result from this and expense is incurred in purchasing a useless manure. [This is interesting in view of the results that have been obtained with phosphates in manurial experiments with sugar-cane in the West Indies.] For the same reason, manuring with filter press cake is not recommended on most soils. The use of potash manures is always advised against, on account of the fact that it is an exceptional circumstance to find too little of this constituent present for the plant's needs.

The question of the advisability of removing the trash from canes is considered. It has been found expedient to strip the lower, dead leaves, as their presence on the cane interferes with the production of roots when it is earthed up. Trashing high up has never been found to be of any advantage, except in the matter of helping to prevent the spreading of cane fires. As regards the methods of planting canes, it has been found, on certain estates, that growing them in rows 4 feet apart gives a greatly increased yield.

A description is given of a new method for the extraction of soils for the purpose of chemical analysis which has been brought forward by Professor Mitscherlich. In this, a solution of carbon dioxide in water is used, and special apparatus is required in the process. Experiments on the hygroscopic properties of sugars have shown that, in the case of the higher grades, a saturation of the atmosphere of 80 does not cause any change. Above this, they absorb water; below it, they become drier.

Other subjects of experiment that are dealt with are investigations into the use of 'blankit' as compared with that of sulphur dioxide for decolourizing purposes, and the heating value of the megass from different varieties of cane. With regard to the first, it was found that the results from careful sulphuring are as good as those from the employment of blankit, with the additional advantages of lower cost and no loss of sugar. Observations on the behaviour of megass in the furnace went to show that that from some varieties of canes possessed a greater heating power than other kinds, chiefly on account of its higher fibre content. This was often conjoined with the fact that the juice from the cane supplying that megass required less heat per ton of cane to evaporate it, thus leading to an increased economy.

The report concludes with a short biography of H. C. Prinsen Geerligs, who has finally left Java after seventeen years of most successful work. Special emphasis is laid upon his efforts toward the improvement of central factory methods, and the good value of the many publications from his hands. His great work has been to bring his superior intelligence and practical insight to bear upon the sugar industry, and thus to place it on a rational basis.

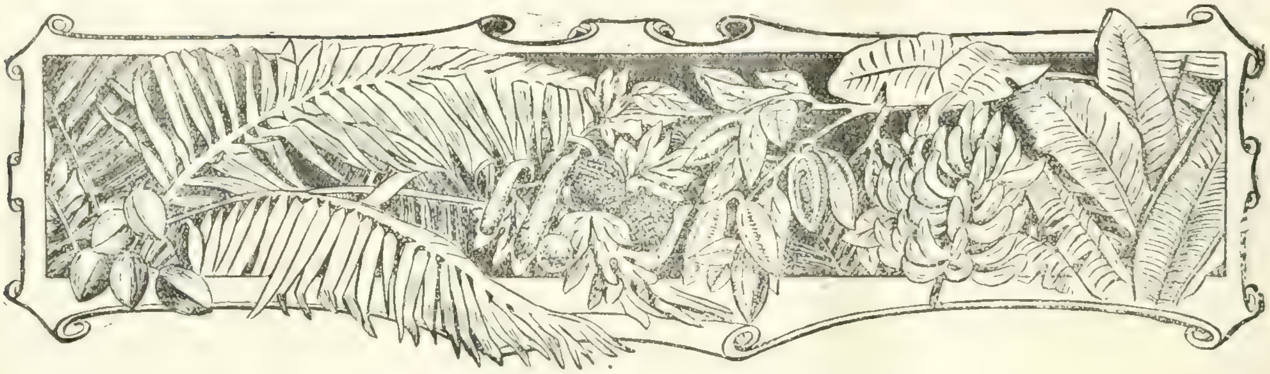
EFFECTS OF APPLICATIONS OF CALCIUM CYANAMIDE TO SOILS.

The following note on a widely published paper, by A. Müntz and P. Nottin, on the effects of applications of calcium cyanamide to soils is taken from an abstract in the *Experiment Station Record* of the United States Department of Agriculture for June 1909:—

Comparative tests of the rate of nitrification of calcium cynamide, ammonium sulphate, blood, and roasted leather are reported, showing that, taking the rate of nitrification of sulphate of ammonia during five months as 100, that of calcium cyanamide was 88, dried blood 66, and roasted leather 26. When, as in these experiments, the cyanamide was employed in amounts 10 to 20 times greater than those ordinarily used in practice, the nitrifying organisms were paralysed at first and even a small amount of dentrification occurred, but in a short time the organisms apparently adapted themselves to the medium and normal nitrification was restored. This retardation is due to the cyanamide and not to the excess of caustic lime present. Amounts of the material furnishing 35·7 lb. of nitrogen per acre may be applied without any retardation of nitrification. Very large amounts may be applied to humus soils in a very active state of nitrification without retarding this process, and still larger amounts may be used (sixty times that employed in intensive culture) if added in successive applications extending over a considerable period (four months).

Comparative field tests on different kinds of soil confirm in general the laboratory results. In only one case were unfavourable results obtained in the application of the cyanamide at the time of planting. Nevertheless, as a precautionary measure, it is advised to apply the material shortly in advance of planting. The cyanamide was applied in amounts furnishing 35·70 lb. of nitrogen per acre in March and April on wheat and oats, and in amounts furnishing 41·95 lb. of nitrogen per acre on grapes and natural grass lands. In damp weather there was no injury from such application. In dry weather the grain and grass were slightly burned, but soon recovered from the bad effects, and the final yield was not reduced. The authors advise, however, that the cyanamide should not be applied as a top-dressing except in wet weather.

The general conclusion from these investigations is that calcium cyanamide is substantially analogous to sulphate of ammonia as a fertilizer.



WEST INDIAN FRUIT.

THE BUD-ROT OF COCOA-NUT PALMS.

The bud-rot (fever) of cocoa-nut palms has already been treated of in several publications of the Department, including the *Agricultural News*, Vol. IV, pp. 299, 369, and Vol. VI, p. 75, and the *West Indian Bulletin*, Vol. VI, pp. 307-21, Vol. IX, pp. 379-81. In the former volume of the Bulletin a very complete account of the literature on the subject is given. In Circular No. 36 of the Bureau of Plant Industry, United States Department of Agriculture, entitled *The Bud-rot of the Cocoa-nut Palm,* and issued July 9, 1909, the present position in regard to the disease is reviewed, and assistance toward the study of the disease is asked for.

Notes in regard to the bud-rot of cocoa-nut palms have appeared in various publications in recent years, but it may not be generally known that, apparently, this same disease destroyed many cocoa-nut groves in the Provinces of Matanzas and Havana, Cuba, as early as 1886. A long report on the disease was published at Havana in 1882. Its occurrence was reported in Baracoa, on the eastern end of the island, in 1888, and according to the natives, it was present at least ten years before that time. In 1834 a similar disease was reported from the Cayman Islands, and in 1876 from British Guiana. To-day, what apparently is one and the same disease, the bud-rot, occurs in nearly all the cocoa-nut growing regions of tropical America.

From time to time serious diseases of the cocoa-nut palm have been reported from different parts of the world and have been variously attributed to soil or atmospheric conditions, to insects, fungi, etc., and it is not at all improbable that various environments and organisms may bring about diseased conditions in the palm. It is quite certain, however, that in many cases these diseases, supposedly distinct, are all alike in that they exhibit a putrid condition of the crown, though this condition has been attributed to divers causes. It is now generally admitted that the rot of the crown in the district of Baracoa is caused by bacteria. A published description of a disease said to be of fungous origin in the Havana district corresponds exactly to the Baracoa disease. In the island of Trinidad many of the trees said to be primarily diseased by a root-rot have all the symptoms of the bud-rot. It can not be stated positively that there is not a distinct root-rot or a fungous disease, but the writer believes that the most destructive of the cocoa-nut troubles of tropical America is of the type found in Baracoa, Cuba. Personal examination of trees in Cuba, Jamaica, Trinidad and British Guiana has offered convincing evidence of this.

The problem of identifying the disease is of increasing interest from the fact that for some years a serious disease of cocoa-nut palms has been reported from eastern countries. Of recent years these reports have described the disease as similar to that occurring in Cuba. Many of the reports, however, have claimed that it is caused by fungi, and have made no comparison with the Cuban form.

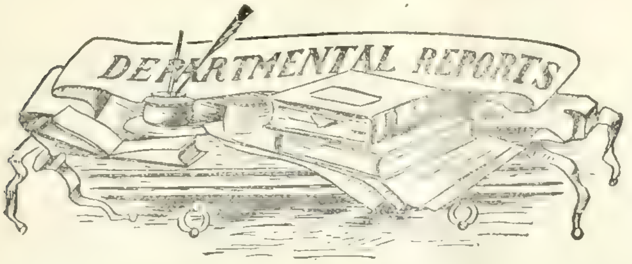
In Ceylon and in the Philippines, the disease has been likened to the bud-rot. In India thousands of cocoa-nut trees have been lost, but, according to reports, owing to fungous attacks. The description of the disease, however, corresponds in every way to the bud-rot. Descriptions of the destruction of palms in German East Africa, and in Portuguese East Africa also coincide with reports of similar ravages of the bud-rot.

As yet there is no satisfactory means of controlling this disease. Should the so-called bud-rot be found to occur in Africa, India, and the Philippines, as well as in tropical America, it will then put the investigators on a more satisfactory basis for their work.

If the disease is bacterial, it may be that soil conditions or climatic changes are important factors in its spread in a virulent form. If these conditions be determined, it may possibly be found that the only solution of the problem of identifying the disease is to obtain some variety either better adapted to local conditions or perhaps actually resistant to the bacterial attacks. It would be a long step toward this to ascertain definitely what countries are free from, and what countries are afflicted with, a rot of the crown of the palm, whatever may be thought to be the cause. If the investigators at the different stations will bear this in mind, it will aid in solving the problem of controlling one of the most baffling and destructive of tropical diseases.

The writer has in preparation a full account of his investigations of the disease throughout the West Indies, and will be glad to receive for comparison photographs or alcoholic material.

It might be well to mention the symptoms of the disease. These are: the turning yellow of the outer leaves, which ultimately hang straight down; the fact that the youngest leaves do not unfold properly, but stand upright, becoming first yellow and then brown in colour; the presence in the softer, inner parts of the bud, of rotten, evil-smelling tissues.



ST. LUCIA : ANNUAL REPORTS ON THE BOTANIC STATION, AGRICULTURAL SCHOOL, AND EXPERIMENT PLOTS, 1908-9.

The total expenditure in connexion with the St. Lucia Botanic Station during 1908-9 was £784 3*s.* 7*d.*, which is greater than the sum expended last year by £150 5*s.* 3*d.*, and less than that of 1906-7 by £25 10*s.* 2*d.* An amount of £71 6*s.* was realized from the sale of plants, flowers, etc., and is the highest on record. It was made up of £56 11*s.* 5*d.*, for plants, seeds, etc., and £14 14*s.* 7*d.* for flowers.

The total number of plants distributed was 43,492, of which 33,135 were raised in, and distributed from, the Agricultural School nurseries. The latter consisted of 23,610 limes, 9,405 cane, and 120 orange plants, besides 450 potato cuttings, 16 cuttings of cacao shade trees, and 1 gallon of seed corn. In addition to all these, quantities of seeds of vegetable and other economic plants, and of ornamental plants, as well as cuttings of the last, were sent out from the Botanic Station.

Among the seeds received from the Commissioner of Agriculture were some of the Jiquié Manicoba (*Manihot dichotoma*), and of the Remanso Manicoba (*Manihot piahyensis*). These were sown soon after arrival, and a few seedlings of each kind have been obtained. It was decided by the Agricultural Society to distribute free the seeds of Para rubber that were obtained through the Imperial Department of Agriculture in 1907, in order to encourage the planting of *Hevea brasiliensis* in the island. In addition to this, the price of grafted mango plants has been reduced from 4*s.* to 2*s.*, with an increased demand as the result.

Several of the *Castilloa elastica* trees at the Botanic Station were tapped in order to obtain rubber to be prepared and exhibited at the International Rubber Exhibition held at Olympia in September 1908. Reports on this rubber have been made by Messrs. Lewis and Peat, and by the Imperial Institute. The gist of these is that the biscuit rubber from St. Lucia was good in quality, strong, clean, and well prepared, though rather too thick, and containing a little higher percentage of resin than it should—a defect that may possibly disappear as the trees grow older. The scrap rubber was in good condition, but slightly barky.

As a result of a suggestion by the Commissioner of Agriculture that *Nature Teaching* should be used as a basis for future agricultural work in the elementary schools, the Agricultural Superintendent, after conferring with the Inspector of Schools, was asked to draw up a syllabus of lessons selected from that text-book, with the object of securing uniformity of work throughout the schools, and for the guidance of teachers. This has been done, and the syllabus is now in operation. A new scheme by which grants are made to elementary schools for agricultural teaching has been drawn up by the Government, and, in connexion with this, arrangements have been made by which such work in schools is inspected by the Agricultural Instructor, who makes his report to the Agricultural Superintendent.

The expenditure at the Agricultural School and Experiment Station was £911 10*s.* There is a monetary return, to be deducted from this, of £195 18*s.* 9*d.*, which was derived from produce sold and that raised at the Station and used as food in the School. The report indicates that the progress, conduct, and health of the pupils have been satisfactory. Details are given of the work in the Experiment Plots attached to the School. An interesting table at the end of the report discloses the fact that up to December 31, 1908, of the sixty pupils who had been admitted since the School was opened, twenty-three had completed the course of instruction, and the same number remained in residence. Of the former, thirteen were employed in the island (eleven as overseers) and ten had left St. Lucia.

The report of the Agricultural Instructor contains an interesting account of the attempts that have been made to establish the Sea Island cotton industry in St. Lucia. Advice has been given, for the guidance of those who are taking this up, by means of lantern lectures and visits by the Instructor to the cotton-growing districts. For the furtherance of the object, free grants of manure and seeds have been made to all having land prepared, the former by the Commissioner of Agriculture and the latter by the Agricultural Society. To deal with the produce, a cotton factory has been erected in Castries by Messrs. Macfarlane, Junior & Co. The rest of the report deals with cacao and limes, sugar, and agriculture in the primary schools, and contains a detailed account of the progress made with school gardens.

A SUGGESTED FOOD FOR STOCK.

A food to which the name of 'sugar meal' has been given, and which consists chiefly of rice bran and inferior sugar to which a certain amount of crushed cotton seed is added has been fed for some time to stock by Mr. N. Forte, of Bennetts, Barbados, and it is stated that the animals have thriven on it and have remained in good condition during its use. An analysis of the food conducted at the Government Laboratory, Barbados, gave the following results :—

Moisture	10·70 per cent.
Oil	2·78 ,, ,,
Albuminoids*	12·32 ,, ,,
Mucilage, starch, etc. ...	50·38 ,, ,,
Indigestible fibre	13·70 ,, ,,
Ash†	10·12 ,, ,,
*Containing nitrogen ...	1·97
† ,, phosphoric anhydride	1·01
† ,, potash ...	0·74
† ,, insoluble siliceous matter	5·22

Expressing the food-material in terms of carbohydrates, the value in units is 88 ; in a similar way, the value of cotton seed meal alone is 162 units. The albuminoid ratio of the food, that is the ratio of the albuminoids present to the oil, mucilage and starch. expressed as starch, is actually higher than that which is required for working animals, being 1 to 4·6.

It may be mentioned that rice bran consists of the outside of the grain together with part of the germ. When 100 lb. of rough rice are manufactured into clean rice, about 18½ lb. of rice bran is obtained.

It would appear that, where there is likely to be a fair quantity of waste sugar on hand, and where rice bran can be easily obtained, these materials, together with a certain amount of crushed cotton seed, can be combined to form a cheap and palatable food for stock.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 16, with reference to the sales of West Indian Sea Island cotton :—

A small business has been done in West Indian Sea Island cotton since our last report, and prices are firm.

The sales comprise a few St. Vincent at 16*d*., and odd lots from other islands at 10*d*. to 13*d*.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ending August 7, is as follows :—

The sales consisted of the Jos. T. Dill crop of 30 bales, sold for France on private terms, and being delivered from plantation, they composed the receipts.

The usual stock consists entirely of planters' crop lots held here or on plantation, aggregating now 427 bales. Factors are refusing to sell any of them under 35c., being held under instructions from the owners for this price.

Thus the position in this market still remains virtually unchanged.

THE BRITISH COTTON GROWING ASSOCIATION.

The fourth Annual Report of the British Cotton Growing Association states that the serious drought which occurred throughout the whole of West Africa in 1907 was the first important check which has yet been experienced by it. This, however, was not serious, as such droughts, though not unprecedented, are of rare occurrence, as over thirty years have elapsed since the last failure of rains. Another set-back had been the depression in trade, following the financial crisis in the United States ; this, and the one arising from the dispute in the Lancashire Cotton Industry, had had a serious effect on the transactions of the Association during 1908. The last untoward circumstances may check the development of new cotton fields. There were, however, distinct signs of improvement in trade, and it was to be hoped that, consequently, the demand for cotton may improve.

Reference is made to the Conference held in July, in Manchester and Liverpool with representatives of the West Indian cotton-growing industry, and it is stated that most valuable results are expected from that meeting.

The work of the Association has greatly increased, chiefly in connexion with the giving of engineering advice, the supply of baling materials and other stores, and the insurance of cotton and seed. In order to increase the efficiency of the first, a competent engineer has been added to the Head Office Staff, and now expert advice can be given to planters and others when machinery is being ordered, and plans and detailed estimates can be drawn up for them. The exceptional buying powers of the Association enable it to supply planters with stores on the lowest terms. The insurance of cotton and seed is effected at moderate rates, and policies are granted whereby cotton is covered against all risks, fire and marine, from the time that it reaches the planter's store until it is delivered at the warehouse in Liverpool.

Important experiments have been carried out by the Association in order to determine the efficiency of cotton seed for producing gas for gas engines, and two experimental plants have been despatched, one to Lagos, and the other to Mombasa. If the trials indicate that success will be obtained along these lines, the results will be most important, especially in regard to such places as Northern Nigeria, Uganda, the Sudan, and Nyassaland, where the price of coal is very high and the seed is at present of little value, as the latter will be the most economical fuel for providing power for almost every purpose except that of transport.

Other interests which are immediately before the Association are the provision of trained agricultural experts with a knowledge of cotton and other tropical products, the suggestion to establish agricultural scholarships in connexion with the cotton-growing industry, and the proposal for the formation of a Bureau for Tropical Agriculture for the collection and collation of information and the direction of agriculture in the British tropical possessions.

CARAVONICA COTTON IN MEXICO.

From time to time, mention has been made in the *Agricultural News* of this kind of cotton. It has not shown itself, so far, suitable to West Indian conditions, and the lint, though longer in staple than that of Upland, has been pronounced to be far inferior to that of Sea Island cotton. (See *Agricultural News*, Vol. VI, p. 55). The following facts in connexion with trials which have been made with it in Mexico are taken from the United States *Monthly Consular and Trade Reports*, July 1909 :—

Much has been written in the last few years in regard to the raising of Caravonica cotton in Australia and Mexico. As yet, everything has been in the nature of experiments, and Caravonica cotton has not reached the commercial stage, but in the limited sections in which it can be grown, there seems to be a prospect of good profits from its cultivation.

Caravonica is a tree cotton, and was produced by the crossing of a fine, long-stapled Mexican cotton with a coarse, long-stapled Peruvian cotton. This hybridization was carried out in Queensland some ten years ago by an Italian scientist—Dr. David Thomatis—and since then, seed from the resulting plants has been tried in all parts of the world. It is now being experimented with in Mexico, India, Egypt, French New Caledonia, and the Congo. Experiments in upper Mexico and the United States have proved failures, but in lower Mexico the plant grows well. It has been demonstrated that the plant will grow only in a hot climate with not too much rainfall. The seeds were introduced into Mexico in June 1906, by Dr. Pehr Olssen-Setter, who planted them at La Zacualpa Botanical Station on the Pacific Coast, and who, finding that climate suitable, has since planted 75 hectares (185 acres) and expects largely to increase this area later.

This tree cotton has been found to be very healthy and highly resistant to pests of all kinds.

THE SILK COTTON TREE IN JAVA.

The Silk Cotton Tree (*Eriodendron anfractuosum*) is cultivated in Java for the sake of the 'silk cotton', well known in the West Indies and used for stuffing cushions, pillows, etc. In Java, however, this 'kapok', as it is called, is grown and exported on a commercial scale, many hundreds of bales being sent to Europe for the use of upholsterers. The best situation for the plant is found to be on sandy soil at a fair elevation near the sea. The plant is propagated both from cuttings and seeds, but those raised from the former are not as vigorous and take longer to bear than those from seed. The seeds are sown during the rainy season, in rows about 12 inches apart, and when the young seedlings appear, they are exposed to the sun as much as possible and are kept well watered, after having been thinned out until they are 1 foot apart. After eight months' growth in the nursery, they are set out at the rate of about 140 to the acre, that is if no other crops are to be grown on the land. In transplanting, the leaves are stripped off and the plant is severely cut back. The yield of silk cotton commences in two or three years and is at its best in the fifth; it amounts to about 450 lb. of the clean product per annum from each acre, when the trees are planted in the way described above. The fibre should not be allowed to get wet before it is gathered, as water damages it. The seeds are separated by beating with sticks, or by means of a primitive form of gin in which they are removed by coming into contact with rows of pegs on a revolving cylinder. The silk cotton is exported in 80 lb. bales which must not be pressed too tightly, or the fibre loses much of its value. The seeds are utilized for the production of oil, and the residue from them is a useful nitrogenous manure.

Uses for the Plantain. Plantain meal is prepared by the natives of Central Africa for storing and sale. They simply slice the fruit, dry it in the sun and grind or pound it to powder. In Mexico, according to Colonel Colquhoun, the fruits are exposed to the sun, and when they begin to wrinkle they are peeled. If the skin is not removed, a bad taste is imparted to the fruit. They are kept for some time until an efflorescence of sugar appears on their surface, and are then pressed in masses of about 25 lb. each, and placed in boxes, or wrapped in dry banana leaves. (*Rhodesian Agricultural Journal*, June 1909.)

GARDEN NOTES.

THE CULTIVATION OF FERNS.

The following hints on this subject appear in the *Agricultural Bulletin of the Federated Malay States*:—

The nature of a fern generally suggests whether it should be grown in a pot, on a tree stem, or in a basket. Those kinds with creeping rhizomes do best in baskets, as a rule, whilst those which form crowns and fibrous roots are most suitable for pot culture. One of the most effective ways of growing many ferns is on the stems of trees, palms, etc.

Although it frequently happens that the conditions under which plants grow spontaneously cannot be artificially produced, the knowledge of the positions in which they grow naturally aids materially in their successful cultivation. It may be safely stated that the majority of ferns require shade and moisture. Most gardens possess one or more spots of this nature, under trees generally, and in those situations ferns luxuriate if reasonable care be taken in their cultivation.

Ferns grown in pots require fresh potting more or less frequently according to their rate of growth; but it is advisable to avoid over potting. Those plants generally grow best whose roots are in contact with the inside of the pots. Care must be given to watering, as ferns resent over watering as quickly as any other plant if the soil is in any way water-logged or sour; on the other hand, care must also be taken that the roots do not become too dry. In the tropics, ferns may be repotted almost at any time without ill results. Pots should be clean and dry when used, and new pots should be thoroughly soaked in water and then dried before using. The question of drainage is an important one, especially where the rainfall is so heavy. When potting ferns, it should be borne in mind that the majority of them grow naturally in partly decayed vegetable matter, usually of a soft nature; they should therefore be made firm in their pots, but on no account potted hard. A compost of an open sandy nature through which the water will pass readily should be used; a mixture of two parts of sandy loam with one part of leaf mould, one part of fibrous material, and one part of coarse sand will be found to suit most ferns.

Basket ferns should be planted in fibrous material mixed with lumps of peat and pieces of sandstone and charcoal. These composts may be given as possessing all the qualities required by the majority of ferns usually cultivated in gardens. Many of the more delicate ferns, such as some Adiantums, resent too much water over head. A position under a shady verandah suits these best. It is only by experience and constant observation that the best position can be found for the more fastidious ferns. Very often a move of only a few yards makes all the difference between a good and a bad specimen. Windy positions should be avoided and care taken that no manure enters into the potting compost. An occasional application of liquid or artificial manure is beneficial when growth and root action are vigorous, but heavy manuring of maidenhairs should be avoided.

Pans of broken brick and coral rock are very suitable for raising fern spores. The pans should be kept damp, and if moss or the minute algae which appear on damp spots are growing on the rock, so much the better. The fruiting fronds should be taken before the spores are blown away, about the time that the sori become brown, and shaken or left lying on the pan, which is then covered with a glass plate.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in the present number has for its subject the animal pests of cotton, from the points of view of the damage that they do and of the remedies for them. In it, references to the literature on the subject published by the department will be found.

A review of the report on the Botanic Station, etc., St. Lucia, for 1908-9, which has just been issued, will be found on page 277.

Page 277 also contains a suggestion for the use of waste sugar and rice bran in making a food for stock.

Some useful hints on the cultivation of ferns are given on p. 279.

An interesting, illustrated account of the sweet potato weevil, known in Barbados as 'Scarabee' and in Antigua as 'Jacobs', will be found on page 282.

The last of the short series of articles on fungi appears on page 283. The three articles taken together form a simple general account of the life-history of the fungi and of their importance in practical agriculture.

The ways in which Trinidad, Antigua and St. Kitts are represented at the Canadian National Exhibition are detailed on page 285.

Recent work on Bordeaux mixture is noticed on page 286.

Sugar Production in British India.

A reliable estimate of the quantity of sugar produced in British India makes this the largest sugar-producing country in the world. It is placed at about 4 million tons. Of this large amount, practically none is exported to other countries: on the contrary, it is consumed at home, in addition to a considerable amount that is imported.

Deterioration of Butter in Cold Storage.

It is well known that butter frequently undergoes marked changes even when it is stored at very low temperatures. During the past three years, the Dairy Division of the Bureau of Animal Industry, United States Department of Agriculture, has been making investigations for the purpose of discovering the cause of this, and of finding remedies for it. During these, it was found that the acidity of the butter increased with that of the cream from which it was made, but no bacteria were present, either in the cream or the butter, which would account for the deterioration of the latter when it had a high acid content. In addition, heating the ripened cream before it was made into butter did not check the changes in the latter, showing that these were not due to enzymes. Marked undesirable changes of a progressive nature, however, took place in butter produced from pasteurized cream which had been treated with various acids.

The results indicate that the acid developed normally in the cream, by the action of the lactic acid bacteria, subsequently assists in bringing about a slow decomposition of one or more of the substances of which the butter is largely composed, thus causing its deterioration. As a remedy, it is suggested that butter should be made from sweet, pasteurized cream, without the addition of a starter—a process which was found quite feasible on a commercial basis. Such butter has too mild a flavour to suit the average dealer, but can be sold, after storage, as high grade butter.

Methods of Control for Eel Worms.

Information has been given in several numbers of the *Agricultural News* (Vols. III, p. 283, VI, p. 123, VIII, p. 138) in connexion with the nematode worms commonly called eel worms, and remedies for the pest have been suggested. It will be remembered that these parasites are capable of doing much damage to growing crops, and that it is very difficult to eradicate them. A leaflet has been issued by the Board of Agriculture, England, containing particulars as to methods of prevention rather than remedies, and these should be applicable to conditions in the West Indies. They include: (1) the rotation of crops, so that as long an interval as possible will elapse between two successive growings of the susceptible plant: (2) the destruction, as far as possible, of the refuse of infected crops, which can be effected most economically by composting with lime: (3) deep ploughing, with the use of a skim coulter (this is also useful against other insects): (4) suitable manuring and cultivation, so as to produce vigorous plants.

The Action of Heat and Antiseptics on Soils.

Experiments that have been conducted by the Imperial Department of Agriculture have indicated that the treatment of soils with carbon disulphide has a tendency to cause an increase in the growth of plants that are subsequently raised in them—an increase that cannot, of course, be accounted for on the supposition that the carbon disulphide directly adds plant food to the soil. Light appears to be thrown on the subject by some experiments that have been undertaken at the Rothamsted Experiment Station, the purpose of which was to compare the effect of moist heat, and of various antiseptics, such as carbon disulphide, chloroform, benzene, ether and kerosene on the productiveness of soils. It was found that when soils are treated with such antiseptics, chemical changes take place and the amount of soluble organic matter in them is increased, just as is the case when they are heated. Like heated soils, too, they have the effect of preventing germination of seeds in them, to a certain extent. This effect is due to the presence of some definite substance which is probably the same in all cases, and also the same as that formed by heat. The amount of change caused by antiseptics is equivalent to that obtained by heating the soil to about 60°C. or 75°C., and this may be sufficient to account for the increased growth of plants in soils which have been treated with them. When such soils are kept for a few weeks at a summer temperature, some of the organic matter that has been rendered soluble becomes insoluble, and their action in preventing germination is reduced. Heated soils showed a similar decrease in the amount of soluble organic matter, especially when they were repeatedly watered; on the other hand, in ordinary soils its amount is increased.

Agricultural Conditions in Bermuda.

It is stated that the importance of Bermuda as a producer of early vegetables, etc., is decreasing and that it is rapidly attaining increased importance as a tourist resort. The chief reasons for the decline are said to be connected with the depletion of the soil, the increase of fungus diseases, and the changed conditions of competition in the United States. In regard to the last, the area on which crops such as the potato and onion are raised in the latter country is so large, and the transport of the produce so quick, that the small area of arable land in the former cannot hope to continue to compete. An additional disturbing factor is that the system of reporting shipments from Hamilton a week in advance causes the produce to arrive on a falling market instead of on a rising one, as was formerly the case.

On the other hand, the increasing recognition of Bermuda as a resort for the winter months has led to a corresponding increase in the number of tourists arriving there; so much so, that this was nearly four times as great in 1908 as in 1907. This is leading to the erection of new hotels, as well as to the enlargement of those which exist already, and the chief effect on agriculture will be that crops will be raised for home consumption rather than for export.

Washes for Cacao Thrips.

The annual report on the Experiment Plots, St. Lucia, for 1908-9, describes experiments with different washes for the purpose of determining their efficiency in controlling thrips on cacao trees. The trials were conducted with those described in the *West Indian Bulletin*, Vol. IX, pp. 191-2, which are (1) resin wash, (2) kerosene emulsion, (3) emulsion with whale-oil soap, (4) resin and whale-oil soap compound. It is stated that each of these was more or less effective in destroying thrips, but that the resin wash appeared to do the best work, on account of its property of sticking firmly to any surface with which it may come into contact. 'More of this mixture adhered to the leaves than in the case of the other washes, and dead thrips were observed in greater numbers on trees treated with it.'

Some care is necessary, however, in applying this wash, as the trees treated with it dropped their leaves within a few weeks of being sprayed. This circumstance was probably due to the fact that it contains caustic soda.

The Best Conditions for Growing Alfalfa.

The New York State Agricultural Experiment Station has recently carried out more than 100 experiments, in co-operation with farmers, for the purpose of finding out what effect the operations of liming and inoculating land on which alfalfa is to be grown has on the chances of raising a successful crop. The results show that the chances of raising a good crop are as follows: one in five, where neither liming nor inoculation is employed; two in five where lime is applied at the rate of 13½ cwt. to the acre; three in five, where naturally inoculated soil is added at the rate of about 2 cwt. to the acre; four in five, where both liming and inoculation are employed. The trials were made on land poor in nodule-forming organisms, and which was in the receipt of the usual cultural operations.

Germination of Ceara Rubber Seeds.

A rapid method of germinating Ceara rubber seeds is in use at La Zucualpa Botanical Station, Mexico. It consists in placing a layer of fresh horse manure in a box, to the thickness of about 6 inches, spreading the seeds on the surface, and covering with about 1 inch of the same material mixed with a small quantity of sand. The soil should be slightly packed, and the box covered with glass. If put in a warm place or in the sun, germination will take place very quickly. The seedlings should be planted as soon as they are an inch or two high, and some manure added to the soil. After such treatment the seedlings will grow very rapidly. In planting at stakes the holes should be made as large as possible, or at least 4 feet square. The soil should be well watered, and if too sour, some lime should be added before planting.

INSECT NOTES.

THE SWEET POTATO WEEVIL.

Reference to the weevil (*Cryptorhynchus batatae*) which attacks the sweet potato in the field have frequently been made in the *Agricultural News* and the other publications of the Imperial Department of Agriculture. This small insect, which is known in Barbados as the Scarabee, and in the Leeward Islands as the Jacobs, is shown four times the natural size at Fig. 26: the larva, which is a small white grub, is represented, also magnified four times, at Fig. 27; and Fig. 28 shows the pupa, enlarged to the same extent.

FIG. 26.

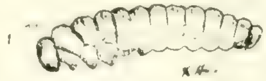

FIG. 27.

FIG. 26. SCARABEE (*Cryptorhynchus batatae*).

FIG. 27. LARVA (GRUB) OF THE SCARABEE.

FIG. 28.

FIG. 28. PUPA (CHRYSALIS) OF SCARABEE.

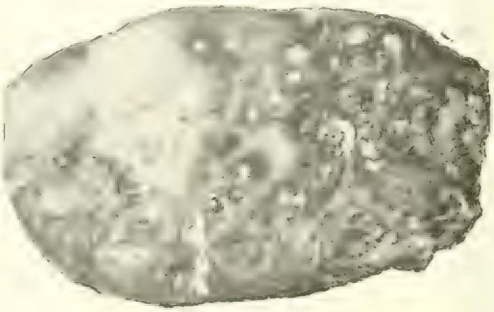

FIG. 29.

FIG. 29. SWEET POTATO ATTACKED BY SCARABEE.

The attacks of this pest have been very severe, in Barbados, for the past four or five years, according to the statements of experienced planters the most severe they have ever known. Barbados has had several years of short rainfall, and the extreme severity of the scarabee attacks is said to be due to this, in large part at least.

The life cycle of the weevil occupies about thirty days, as follows: from the laying of the egg to the time of hatching, five days; the larval period of twenty days, during which the damage to the potato is caused, and during which also practically all the feeding and growing is done by the insect; and the pupal stage of five days, during which the weevil transforms from the grub to the adult, winged insect. Under favourable conditions, the process of egg-laying probably begins very shortly after the emergence of the adults, but it is likely that the adults are capable of surviving long periods of time when the conditions are not favourable, and then laying their eggs.

The usual practice in Barbados is to plant potatoes in rotation with cane, cotton or other crops, so that the first attack is by beetles which come from outside of the field. The eggs are laid in the first instance in the swollen part of the stem near the base, or in potatos which are exposed. The resulting brood of insects spreads throughout the field, penetrates deeper into the infested potatos, and attacks others which may be completely covered by the soil. One may often find potatos in the field, especially when the crops have been allowed to remain for some time in the ground after becoming ripe, which show two or three distinct attacks in this way.

Very dry weather favours the growth and development of the scarabee in two ways at least: the dry soil allows air to penetrate more freely to the potatos, and it also allows the adult insect to prosecute the search for the deeply buried potatos more easily.

The practice of keeping potatos in the ground after they are ripe for digging is very favourable for the development of the scarabee, and it is likely that if, for two or three seasons, all potatos could be dug as soon as they are ready, the numbers of the pest would be greatly reduced.

Several experiments have been carried out in Barbados during the past year with the object of devising measures of control for the scarabee, but no very definite results were obtained. In two instances there were no attacks in the field in which the experimental plots were laid out, in two others the owners or managers dug the potatos as soon as scarabee appeared, and in the remainder the plots were all attacked—the control plot and the treated plot alike. These experiments indicate, however, that the practice of growing slips, for planting, in a nursery instead of taking them from the ordinary field is worthy of adoption. Such a nursery can easily be established away from the potato fields, by planting 'pickings' (small bits of roots), which may be collected after a crop of potatos has been harvested. This practice gives strong plants, and there is no chance of transporting the pest to the newly-planted field with the slips if care is taken that the nursery is not infested. Except at times when the scarabee is very abundant, the potatos are not attacked until fairly well grown, and the plants in a nursery would not be kept long enough to attract the weevils in any numbers.

The attack of the scarabee results in the complete loss of every potato in which the grubs of the weevil have lived. Not only do they destroy all the tissues surrounding their tunnels, but they impart such a disagreeable taste and odour to the remainder, even when it appears quite sound, that no use can be made of it, all estate animals refusing to eat such portions. The appearance of an attacked potato is shown in Fig. 29.

The scarabee is quite different from the sweet potato weevil which is a pest in Jamaica and the Southern part of the United States. This insect is *Cylas formicarius.*

FUNGUS NOTES.

The following article is the last of a short series giving an account of the principal points of interest in the life-history of the fungi, and indicating their connexion with practical agriculture. The first two of these appeared in the two most recent numbers of the *Agricultural News*, p. 251 and p. 267.

PART III.

The Fruit Body.

The simplest form of asexual fructification in the fungi is the *conidium*, or simple spore cut off from the tip of a hypha, as described in the first article of this series. In the mould fungi the spores are borne in a receptacle, called a sporangium, which forms a swollen knob at the end of an erect hypha; some of these have a mechanism by means of which the sporangia can be driven to a considerable distance from the plant which forms them. The sporangial wall is sticky, and consequently adheres to any substance it may hit; the gummy substance on the outside then hardens, and keeps it firmly attached to whatever it comes in contact with.

In the next higher group of fungi the spores are borne in an elongated sack-like sporangium known as an *ascus*. Each ascus contains a definite number of spores, usually eight. The asci themselves may be borne in a closed box built up of closely-woven hyphae, or on the upper surface of a more or less flat structure formed, like the box, of closely-woven hyphae. The asci are always borne closely packed together, and frequently large swollen hyphal hairs occur between them.

In the forms with a flat, plate-like fruit-body, the asci open at the top by means of a pore, or a cap-like portion is removed, and the spores are forcibly ejected to some distance, owing to the mutual pressure of the asci on one another. In those forms in which the asci are enclosed, a small opening is formed in the top of the box, and as its contents swell up when the spores are ripe, the latter are extruded through the hole. In some cases the fruit-body remains closed, and the spores are only liberated when it decays. These boxes may occur separately on the surface of the food substance, in which case they are often very minute; or many of them may be borne sunk in a firm, hard tissue built up by the hyphae of the fungus, and known as a stroma. This stroma often forms first a simple kind of free abstricted spore from surface hyphae, and then from more internal tissue produces the more elaborate boxes containing the asci.

All these forms of fruit body may be coloured; red, yellow, white or black are the most usual colours. Hard black patches are often found growing on trees; these are the stromata of a fungus. The fungus causing canker of cacao forms red fruiting bodies, and one of the forms parasitic on scale insects is greyish white and built up of a number of nearly spherical lumps, or boxes. The rind disease of the sugar-cane usually appears as a number of small black dots, often extruding a black ribbon consisting of millions of spores held together by mucilage.

The group of fungi mentioned above are known as the Ascomycetes on account of the presence of the usually eight-spored ascus.

Another group of fungi known as the Rusts or Uredineae form four kinds of spores. Two of these are produced in pustules or sori. The pustules originate under the skin of the leaves and the stems of the host plant, for all these fungi are parasites, and eventually break through, forming short rusty or blackish streaks on the leaves. Another form of spore is borne in small round cups often surrounded by the torn skin of the host plant, for like the other spore-forms the cups originate under the skin.

The fructifications of the next group of fungi are almost too well known to need much description; these are the toadstools, puff balls and bracket fungi, all of which are included in the group known as the Basidiomycetes. Here there are usually four, sometimes two, spores borne at the end of small knobs which project from a swollen cell known as the *basidium*. In the toadstool these swollen cells are arranged in a row along the sharp edge of the gills, and the spores hang downwards. In the puff-balls all the internal structure breaks down as the fructification ripens, and finally there is only a case left filled with a fine powder of ripe spores.

There is also a very large number of fungi in which only one stage in the life-history is known. These are grouped together as imperfect forms, and include: the cotton anthracnose, the brown rot fungus of cacao pods, the *Lasiodiplodia* disease of cacao, and many other forms. In some of these fungi, the spores are borne, as in the Ascomycetes, in a closed box, often black, sometimes red or yellow, and it is believed that they are usually stages in the life-history of an Ascomycete. In other forms, the spores are cut off from hyphae which are massed together into a pustule, often slightly coloured. Such pustules occur in the shrunken and discoloured patches on cotton bolls attacked by Anthracnose. Some forms cause leaf spots; and some are only known as a loose, white mould on leaves, fruit, or decaying matter.

Besides their characteristic fruiting bodies, the parasitic fungi often produce some typical appearance in the host plant, by which their presence may be recognized. Root diseases always cause yellowing and drooping of the leaves of the host—symptoms similar to those shown when the host is suffering from drought and due to the same cause, namely want of water. On stems and branches, canker areas are often produced, as for example, the canker of cacao; other fungi cause swellings or the appearance known as 'Witches' Brooms', that is an excessive number of small twigs borne from about the same point on a branch. In some cases, when a diseased stem is cut down, the wood is discoloured, looking greyish or brown, or it may appear soft and rotten. Green stems show discoloured and, frequently, sunken and hardened patches which often spread in all directions round the stem, and eventually the host plant is killed. Fruits show similar symptoms, or they may become soft and rotten instead of hard; usually the fructifications of the fungus do not appear until the fruit is nearly killed, and the same is true of other parts of the host plant. A few fungi are known which never produce anything but mycelium.

Leaves, when attacked by a parasite, usually become discoloured in spots which vary in shape but are often characteristic of the disease; a good example is the angular leaf spot of cotton caused by a bacterium. Sometimes holes are formed in the leaf, or the leaf is rusted, or covered with a white mould. In short, the manifestations of disease in all parts of the host are varied and numerous, but frequently characteristic.

It is hoped that what has been said in these articles will prove useful to any one on the lookout for disease in his crops, and will enable him, with the assistance of the information given in the various publications of the Department, to form some idea of the method of treatment likely to be successful in any given case, and of the reasons for that treatment.

GLEANINGS.

An Ordinance for the purpose of lessening the prevalence of the disease known as ankylostomiasis, or miners' anaemia, is to be introduced into the Legislative Council of Trinidad.

The number of cotton mills proposed to be built or actually under construction in the United States during the first six months of the present year was 100. Most of these will be situated in the cotton-growing areas.

Experience at the Botanic Station, Montserrat, has shown that in planting a logwood hedge, an application of fine manure to the seeds has greatly increased the number that germinated successfully.

The recently formed Agricultural Board in Grenada has decided to continue all the prize-holding competitions in that island during this year, and peasant proprietors have been notified to this effect.

The amounts of sugar and molasses manufactured in Barbados and exported during the present year, to August 26, are 12,327 tons and 67,278 puncheons, respectively. Last year, the quantities for a similar period were 31,631 tons of sugar and 53,125 puncheons of molasses.

The area under cotton cultivation this year in the Russian Provinces of Central Asia is stated to be about 500,000 acres, which is an increase of 30,000 acres over the area under cotton last season. There are indications that the crop will be a good one.

Experiments carried out in Cape Colony have shown that the use of poisoned bait composed of sugar and arsenate of lead dissolved in water is almost completely successful in controlling a fruit fly (*Ceratitis capitata*), which has caused much damage there in the past.

The idea has largely prevailed that sisal plants yield the best fibre when they are grown in uncultivated places. The Hawaiian Sisal Company is making trial of a method of growing them on cultivated land, and the results of the experiment are awaited with much interest.

During the months of June and July of the present year, there were exported from Demerara 7,883 and 8,194 tons of sugar, respectively. The amount for July 1908 was 4,762 tons. The total export of sugar for the present year, until the end of July, was 48,961 tons, as against 40,584 tons for the corresponding period of last year.

The Grenada Agricultural Society has given instructions that the information concerning 'black blight', which has been collected by that Society generally and by its Agricultural Experiments Committee, shall be collated and forwarded to the Board of Agriculture of that colony with a view to some definite action being taken to arrest the spread of the disease.

The exports of sunn hemp (the fibre of *Crotalaria juncea*) and sisal hemp from Madras for the year 1908 were respectively 30,407 cwt. and 6,919 cwt., compared with 38,599 cwt. and 30,182 cwt., similarly, in 1907. The decrease is due to the fact that the lower prices prevailing in 1908 rendered the fibre from Madras incapable of competing in the European market owing to the fact that it is mostly prepared by hand.

Worms in fowls, though they do not often cause death, tend to produce exhaustion and to reduce the supply of eggs. *Farm Life* gives the following treatment for them : Give 10 to 15 drops of turpentine in a tablespoonful of sweet oil, night and morning for three days. Another remedy is ½ oz. powdered areca nut, given every third morning before feeding, followed by a tablespoonful of sweet oil two hours afterwards.

An article by the late Commissioner of the Virgin Islands, in the *West India Committee Circular* for August 3, 1909, states, in connexion with the cotton industry there : 'If no further fall in prices occur, and if the enthusiastic peasantry can be taught the importance of keeping the usual pests under control and of taking due care of the crops, cotton will probably for years to come be one of the chief exports of these islands'.

A report from Thomas Nash, fruit importer, Plymouth, states that there should be a ready sale for limes in England during this month and the next if the weather is hot. Satisfactory prices for oranges will be obtained until January, when the market is depressed by the arrival of Spanish produce. Consignments of pine-apples and bananas are recommended immediately ; the latter are now selling at 14*s.* to 15*s.* per cwt., green.

The importance of the Argentine Republic as a stock raising country is illustrated by a recent census which discloses the fact that there were in that State, at the time at which it was taken, over 7 million horses, 750 thousand mules and asses, nearly 30 million cattle and 67 million small stock (chiefly sheep, then goats and pigs). The returns, when compared with those of 1905, show an increase in the number of cattle and horses and a decrease in that of sheep.

A reward of £5,000 has been offered by the Government of the Straits Settlements and the Federated Malay Straits, together with the Planters' Association of Malaya for a scheme for the extermination of white ants. The scheme must have especial reference to the destruction of *Termes Gestroi* in rubber plantations, and should not be a mere poison (such as arsenic, corrosive sublimate, or nicotine), which will destroy any insects which may happen to be touched by it. The sole difficulty in exterminating this species of white ant is the fact that the nest is hidden underground, and therefore the method must be one which will lead to a solution of this.

STUDENTS' CORNER.

SEPTEMBER.

FIRST PERIOD.

Seasonal Notes.

The young cotton crop has now reached the stage at which it is well established, and regular weeding should be done in order to relieve it from the competition of other plants, to prevent undue loss of water from the soil by transpiration from them, and to form a dust mulch which will conserve the soil moisture. The two last considerations are especially important in places where the rainfall is small. A careful watch should be kept for signs that pests are present, especially in regard to the cotton worm, the leaf-blister mite and, in some places, grasshoppers ; these are the ones that are most likely to be present at this time. Read the editorial in the current issue of the *Agricultural News*, and look up the references made in it, as far as possible, with the special object of gaining information as to the damage done by each pest, and the remedial measures to be employed for it. Keep a close lookout for flaring bracts and dropped flower-buds, and examine buds from time to time for the grub of the flower-bud maggot. If signs of its presence are found, the matter should be immediately reported to one of the local officers of the Department.

Continue to make observations on plants which are being grown for green dressings. Note should be made of any pests attacking them, and the nature and extent of the damage done. If caterpillars are troublesome, try experiments on small areas with Paris green and lime, in the proportion of 1 part of the poison to 20 parts of the lime, paying attention to the effect on the leaves. Why is such a mixture used against caterpillars or grasshoppers, but not against scale insects and cotton stainers ?

Where onions are grown the seed will now be sown. This will be best done in nurseries, containing well manured soil in order that vigorous plants may be obtained. Ants are likely to carry away the seed ; to prevent this, add two or three teaspoonfuls of kerosene to a watering can nearly full of water, keep the mixture well shaken, and sprinkle the plot with it. If this is done every time that ants appear in any number, few seeds will be lost. The seedlings may be planted out when they have three or four leaves, in holes about 6 inches apart ; a time of wet weather should be chosen for this, if possible ; otherwise, unless the soil is already moist, artificial watering will be necessary if anything like a good stand is to be obtained. Onions thrive best in fairly light soils containing some clay, and manured with natural nitrogenous manures.

Where heavy rains have fallen cacao and lime plants will show a tendency to form 'suckers'; that is young, sappy branches on the older parts of the stem. As the growth of these entails a serious strain on the vitality of the plant, they should be systematically removed as soon as they appear. On cacao trees the parasite mistletoe ('Captain Bois' of some islands) will be likely to appear. Search for this, prior to removal, has to be conducted carefully on account of the fact that the trees are very leafy at this time of the year. The moist atmosphere which obtains at present is very favourable to the growth of fungi. These are most generally found on the pods, and, in some cases where serious damage is being done, are often an indication of adverse soil conditions.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Does a vegetable mulch, or surface cultivation, better conserve soil moisture ?

(2) What measures would you adopt to deal with an outbreak of (a) leaf-blister mite, (b) black scale ?

(3) In what ways may a soil which has become exhausted be restored to fertility ?

INTERMEDIATE QUESTIONS.

(1) Give a short account of a method of curing cacao.

(2) What cultivation should be given to ratoon canes ? State at what stages of growth the operation should be performed, and how deep in the soil the tools should penetrate.

(3) What is Paris green ? What qualities should it possess, and how is it prepared for use with cotton ? Compare Paris green with London purple.

TRINIDAD, ANTIGUA AND ST. KITTS AT THE CANADIAN NATIONAL EXHIBITION, 1909.

Information has been received as to the nature of the exhibits that have been sent from Trinidad, Antigua, and St. Kitts to the Canadian National Exhibition, Toronto, to be held from August 30 to September 13, 1909. Particulars of those sent from Barbados were given in No. 189 of the current volume of the *Agricultural News*, p. 233.

The exhibits from Trinidad include samples in the raw (where possible), and manufactured, of the following :— cacao and cacao products ; sugar and molasses ; rum, bitters, and liqueurs ; cocoa-nuts and cocoa-nut products ; rubber and gums ; coffee ; native woods ; fibres and fibre products (including bamboo, cocoa-nut, sisal, and megass); native pottery ; preserves, condiments, spices, etc.; apiary products ; miscellaneous agricultural products ; miscellaneous manufactured products ; mineral products ; fruit and vegetables ; press exhibits ; advertising exhibits ; guide books ; maps, etc. In addition, a pamphlet containing particulars of the exhibits and descriptions of the photographs sent has been furnished by the Permanent Exhibition Committee for distribution.

The Acting Chairman of the Permanent Exhibition Committee Antigua (Mr. H. A. Tempany, B. Sc.), states that 125 exhibits, all commercial in character, together with a quantity of decorative material, were sent forward on August 4. This was followed on August 17, by a further shipment consisting of perishable produce and additional decorative material. The exhibits were accompanied by a pamphlet for distribution, prepared and printed in Antigua and containing a description of that island and of its resources.

In regard to the products sent from St. Kitts, the Honorary Secretary of the Permanent Exhibition Committee in that island (Mr. F. R. Shepherd) states that the total number of exhibits is 100. These comprise samples of sugar, molasses, rum, cotton lint, seed-cotton, cotton seed, cotton seed cake, cotton seed meal, cotton seed oil, starches, meals, ground nuts, and native preserves of various kinds. Views of the island and decorative material were also sent. The latter included a sugar-cane plant, and a pine-apple plant in fruit each growing in a tub.

BORDEAUX MIXTURE FOR SPRAYING.

At the Agricultural Experiment Station of the University of Illinois, an exhaustive enquiry into the properties of Bordeaux mixture has been carried out. The results of this are published in Bulletin No. 135 of that Station, issued in May 1909, and the chief conclusions that are reached are given below. They are interesting apart from their connexion with the use of this fungicide for spraying alone:—

1. Injury to foliage of trees following applications of Bordeaux mixture is of common occurrence. Much of the injury reported or observed is preventable. The principal sources of injury as determined by observations are:

(*a*) Use of impure or improper materials.

(*b*) Carelessness in making the mixture.

(*c*) Improper and ineffective application.

But when all precautions have been taken, injury sometimes results. These non-preventable injuries are associated with unfortunate weather conditions, and particularly with the action of rain and dew.

2. The chemical changes occurring in making Bordeaux mixture are still involved in some obscurity. That the copper is deposited in the form of copper hydroxide, as has been generally accepted, is denied by Professor Pickering, Director of the Woburn Experiment Station.

3. The adhesiveness of Bordeaux mixture depends very much upon the manner of making, and upon the character of, the lime used. With lime of good quality, a close approximation of equal parts of copper sulphate and lime gives greatest adhesiveness.

4. No definite experiments regarding the accumulation of copper in the soil under sprayed trees have been conducted, but from results reported of experiments by others it does not appear that there is danger from this source.

5. Leaf injuries are common and most serious in neglected orchards. Much of the injury following spraying is attributable to abrasions of the epidermis made by insects, and to infection by fungi preceding spraying.

6. The ideal spray compound that is perfectly effective and at the same time perfectly harmless on all occasions and under all conditions has not yet been discovered. Bordeaux mixture most nearly approximates to the ideal, but its harmlessness can not be absolutely depended upon.

7. Injuries to foliage do sometimes follow applications of Bordeaux mixture and appear to be unavoidable. The carbon dioxide contained in the air and in rain-water is accepted as an active agent in rendering soluble the copper of Bordeaux mixture, and it is believed that the ammonium compounds brought down by rain may also exert a solvent action on the copper.

8. Laboratory experiments gave results showing that the copper of Bordeaux mixture remained insoluble for long periods. Field experiments, however, directly contradict the laboratory results and show conclusively that, under orchard conditions, copper, in small quantity, becomes soluble very soon after deposition, and continues to appear as long as any of the mixture remains upon the leaves. The presence of lime in excess does not prevent solution of the copper.

9. No evidence has been obtained in support of the suggestions of authors that solution of copper occurs through the agency of germinating spores, or through secretions from leaf surfaces.

10. Actual demonstration of the presence of copper in dead leaf cells has not been made, but the theory of penetration, and of death of cell protoplasm, by direct contact with copper is regarded as more probable than the theory of transmission of toxic effect without penetration, as advanced by Rumm.

11. The value of Bordeaux mixture as a fungicide depends upon the contained copper. The action is preventive and not curative.

12. Spores of different fungi resist the action of copper in varying degrees.

13. The experiments made do not establish any direct and positive connexion between spraying with well-made Bordeaux mixture and yellowing of leaves, but do show that improperly made mixtures may cause yellowing, and that yellowing results from use of simple solutions of copper sulphate.

14. Healthy bark of apple trees is impermeable to Bordeaux mixture and solutions of copper sulphate. Copper sulphate solutions are absorbed through wounds and promptly kill the leaves, which then become brown.

15. The importance of rain and dew as agents causing brown-spotting of foliage following applications of Bordeaux mixture is well attested by the uniform results obtained from experiments with covered and uncovered trees.

16. Milk of lime does not cause brown spots even when applied in large quantity, but burning quickly follows applications of copper sulphate solutions even when the solutions are very dilute. It is therefore concluded that copper in solution is the active agent responsible for the burning of foliage.

17. From comparisons between leaves sprayed with Bordeaux mixture and milk of lime, with Bordeaux mixture only, with milk of lime only, and leaves that had not been sprayed, it was found that all leaves on which lime had been used were distinctly larger than those receiving no milk of lime. This suggests a stimulating action on the part of the lime—whether by direct action on the leaves or by reason of the protective covering afforded has not been determined.

18. Bordeaux mixture has a decided influence upon the colour of leaves. Leaves coated with lime become in some degree darker in colour than untreated leaves, but the shade is not so deep as is assumed under a coating of Bordeaux mixture.

19. There appears to be no correlation between the character of a storm and the rate of the solubility or the amount of copper found in solution in the waters collected from sprayed trees. Neither is there any evidence that electrical storms increase the amounts of copper in solution.

THE OBJECTS OF SCHOOL GARDENING.

A circular for teachers, containing information in connexion with school gardens, has been recently issued by the Superintendent of School Gardens in Ceylon. This information includes particulars of the objects of school gardens, which are given below as they should be of general interest:—

(1) To brighten the surroundings of the school, and make it what it ought to be, namely, a pleasant resort for the boys and not a bare and unattractive building.

(2) To lighten the routine of class work by varying it with outdoor work of a recreative nature.

(3) To exemplify order, form, neatness and good taste in the laying out of the premises.

(4) To furnish a field for nature study, i.e., the study of natural objects in their natural surroundings.

(5) To serve as object-lessons in horticulture, i.e., the cultivation of useful and ornamental plants.

(6) To give a practical turn to school life, and provide a training in elementary agricultural science.

(7) To serve as centres for the dissemination of seeds and plants, and of information concerning them.

(8) To be mediums of communication between the agencies that aim at the improvement of agriculture and the cultivating classes.

(9) To induce the cultivator, directly or through the schoolboys, to take up new and improved products, and to adopt better methods of cultivation.

(10) To awaken in school children a new interest in the cultivation of plants, and to instil into them a love of nature, and so reconcile them to a country life and to agricultural pursuits.

(11) To encourage school children to establish gardens at their homes.

(12) To make schoolboys take an honest pride in manual labour, and to induce a healthy competition among them as well as between one school and another.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of July :—

The month of July has been an unsatisfactory one for many reasons—first on account of the continued unseasonable conditions of the weather, by the prevalence of low temperatures and much rain, which have had the effect of reducing the demand for such articles as are usually in request in hot weather, and secondly the intervention of the usual stock-taking and holiday seasons, which always have a quietening effect upon the markets. Besides these the unusual length of time occupied in the discussion of the budget in the House of Commons continues to have a deterrent effect on business generally, nevertheless our report, for the month, on West Indian products, will be found to be of a normal character.

GINGER.

This article has excited but comparatively little interest, as the following details will show. At the first spice sale on the 7th. of the month some 175 packages of Jamaica were offered, 54 barrels and 7 bags only being disposed of, good middling realizing from 58*s.* to 58*s.* 6*d.* and small dull 52*s.* Private sales were reported to have been made with washed rough Cochin, at 39*s.* to 41*s.*, and a large quantity of fair limed Japan at from 32*s.* to 32*s.* 6*d.* per cwt. A week later, fifty cases of small and medium cut Cochin were disposed of at 55*s.* per cwt. Washed rough Cochin, and brown rough Calicut, was all bought in, the former at 42*s.* and the latter at 40*s.* to 41*s.* There was no Jamaica offered at this sale. On the 21st. Jamaica, Cochin and Japan were all offered, but there was no demand and all were bought in, Cochin and Japan at slightly advanced rates. At the last auction on the 27th., unsorted native cut Calicut was bought in at 54*s.* to 57*s.* 6*d.* and brown rough at 42*s.* to 45*s.* Small washed rough Cochin was also bought in at 42*s.* No Jamaica was offered.

NUTMEGS, MACE AND PIMENTO.

At the first auction on the 7th. of the month, about 280 packages of West Indian nutmegs were offered, all of which were sold at in advance of ¼*d.* to ½*d.* per lb. over previous rates. On the 21st. there was a good demand at the auction for West Indian, the smaller sizes declining ¼*d.* per lb. and the larger sizes advancing. For mace there was a fair demand during the month. At the first auction on the 7th. 62 packages of West Indian were sold at the following rates : good pale 1*s.* 9*d.*, pale and reddish 1*s.* 7*d.* to 1*s.* 8*d.*, fair to good red 1*s.* 5*d.* to 1*s.* 7*d.*, dark red and broken 1*s.* to 1*s.* 4*d.* On the 21st. a good supply of West Indian was offered and disposed of at slightly varying rates, 1*s.* 10*d.* to 2*s.* being paid for fair to good pale, 1*s* 7*d.* to 1*s.* 9*d.* for palish, 1*s.* 4*d.* to 1*s.* 6*d.* for fair, to good red, and 1*s.* to 1*s.* 2*d.* for broken. At the last auction on the 27th. only 16 packages of West Indian were sold, 1*s.* 9*d.* being paid for fair pale, 1*s.* 6*d.* to 1*s.* 7*d.* for ordinary, and 1*s.* 3*d.* for low red and broken.

At the first auction there were no offerings of Pimento but $2\frac{7}{16}$*d.* to 2½*d.* per lb. were the prices quoted. On the 21st., out of 80 bags offered only 12 were sold, bold greyish fetching $2\frac{5}{8}$*d.* per lb.

There has been but little demand for arrowroot during the month : 100 barrels of manufacturing St. Vincent were offered on the 14th. and bought in at 2*d.* per lb.

SARSPARILLA.

At the drug auction on July 1, 54 bales of genuine grey Jamaica were offered, all of which were sold with a brisk demand, 1*s.* 4*d.* per lb. being paid for fair and 1*s.* 3*d.* for dark roughish, and part mouldy. Ten bales of native Jamaica were offered and sold ; good red, and dull red mixed realized 1*s.* per lb. and common greyish and yellow 11*d.* Two bales of deep red fetched 1*s* 1*d.* per lb. and 10 bales of Lima Jamaica—all that was offered—sold at 1*s.* 1*d.* per lb. for fair and 1*s.* for ordinary rough. A fortnight later, namely on the 14th. the offerings consisted of 30 packages of Lima Jamaica, and 12 of native Jamaica, but no grey Jamaica, there were also 5 packages of Honduras offered but none sold. Of the 30 packages of Lima Jamaica, 18 were sold at 1*s.* per lb. for slightly rough and dark to fair and 11*d.* for sea damaged. Of native Jamaica, good red fetched 1*s.* 1*d.* per lb. and dull red and yellow mixed 11*d.* At the last drug auction on the 29th. there were heavy offerings of grey Jamaica consisting of 61 packages, besides 29 of native Jamaica and 3 of Guatemala. In consequence of the very large consignment of grey Jamaica, no business was done in this article ; 1*s.* 2*d.* was offered for fair grey, which was not accepted, buyers anticipating lower rates at a future auction or by private sale. Fifteen bales of the 29 offered of native Jamaica, found buyers at 1*s.* 1*d.* for good red, 1*s.* for fair red, and 10*d.* to 11*d.* for dull red and yellow. The 3 bales of Guatemala which was rough and slightly chumpy were disposed of at 8½*d.* per lb.

LIME JUICE, TAMARINDS, CASSIA FISTULA.

Good pale, raw West Indian lime juice was offered on the 21st., but met with very little interest. It was held at 1*s.* 3*d.* to 1*s.* 4*d.* In the middle of the month a single cask of fair pale St. Lucia tamarinds was sold at 14*s.* per cwt. and at the last auction on the 28th. 19 packages of Antigua realized 9*s.* 6*d.* to 12*s.* 6*d.* per cwt. in bond. Cassia Fistula, of which a single bag of ordinary Dominica was offered at the last sale, realized 18*s.*

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, August 3; Messrs. E. A. DE PASS & Co., August 6, 1909.

ARROWROOT—St. Vincent, 1¾*d.* to 3¾*d.*, according to quality.
BALATA—Sheet, 2/5; block, 1/10.
BEES'-WAX—£7 15*s.* for fair to good.
CACAO—Trinidad, 52/- to 63/- per cwt.; Grenada, 49/6 to 54/6 per cwt.; Jamaica, 48/6 to 53.
COFFEE—Depressed; Jamaica, 40/- to 111/.
COPRA—West Indian, £22 10*s.* per ton.
COTTON—St. Vincent, 16*d.*; odd lots from other islands, at 10*d.* to 13*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 45/- to 50/-; low middling to middling, 52/- to 55/-; good bright to fine, 57/- to 65/-.
HONEY—23/6 to 32/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/1 to 1/3 per gallon; concentrated, £18 15*s.* per cask of 108 gallons; distilled oil, 1/8 to 1/9 per lb.; Otto of limes 6/- nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 6/2 to 8/3 per lb.
RUM—Jamaica, 2/11 to 6/; Demerara, no quotations.
SUGAR—Crystals, 14/9 to 17/; Muscovado, no quotations; Syrup, 10/3 to 13/9; Molasses, no quotations.

New York,—Messrs. GILLESPIE, BROS. & Co., August 6, 1909.

CACAO—Caracas, 11¾c. to 12½c.; Grenada, 11¾c. to 12¼c.; Trinidad, 12c. to 12¾c.; Jamaica, 9¾c. to 11c. per lb.; Dominica, 11c. to 11½c.
COCOA-NUTS—Jamaica, select, $23·00 to $24·00; culls, $15·00; Trinidad, select, $21·00 to $22·00; culls, $13·50 to $14·50 per M.
COFFEE—Jamaica, ordinary, 7½c. to 8c.; good ordinary, 8½c.; and washed up to 10½c.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, no quotations; Barbados, 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 47c. to 50c. per lb., dry flint; Antigua, 50c. to 52c.
GRAPE FRUIT—$2·50 tr $3·10 per box.
LIMES—Dominica, $5·50 to $6·50 per barrel.
MACE—27c. to 35c. per lb.
NUTMEGS—110's, 9c. per lb.
ORANGES—$1·30 to $2·25 per box.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 4·05c. to 4·08c. per lb. Muscovados, 89°, 3·55c. to 3·58c.; Molasses, 89°, 3·30c. to 3·33c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., August 21, 1909.

CACAO—Venezuelan, $11·40 per fanega; Trinidad, $11·25 to $11·50.
COCOA-NUT OIL—$1·20 per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 9c. per lb.
COPRA—$3·75 per 100 lb.
DHAL—$4·25 per 2-bushel bag.
ONIONS—$2·15 to $2·25 per 100 lb.
PEAS—SPLIT $5·50 to $5·75 per bag.
POTATOS—English, $1·80 to $1·90 per 100 lb.
RICE—Yellow, $4·70 to $4·80; White, $5·00 to $5·25 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., August 30; Messrs. T. S. GARRAWAY & Co., August 30, 1909.

ARROWROOT—St. Vincent, $3·75 to $4·00 per 100 lb.
CACAO—$11·00 to $12·00 per 100 lb.
COCOA-NUTS—$11·50.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., according to quality—scarce; Venezuelan, $11·00.
HAY—$1·20 to $1·25 per 100 lb.
MANURES—Nitrate of soda, $65·00; Ohlendorff's dissolved guano, $55·00; Cotton manure, $42·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00.
ONIONS—Strings, $2·75 to $3·00 per 100 lb.
PEAS—Split, $6·00 to $6·20 per bag of 210 lb.; Canada, $4·00 per bag of 120 lb.
POTATOS—$2·50 to $3·25 per 160 lb.
RICE—Ballam, Calcutta, no quotations; Patna, $3·80; Rangoon, $3·00 per 100 lb.; Demerara, Ballam, $4·38 to $5·25 per 180 lb.
SUGAR—Dark Crystals, 96°, no quotations; Muscovado, 89° $1·70; Centrifugals, no quotations.

British Guiana.—Messrs. WIETING & RICHTER, August 7: Messrs. SANDBACH, PARKER & Co., August 20, 1909.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·50 to $9·00 per 200 lb.	$8·50 to $9 00 per 200 lb.
BALATA—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	48c. to 50c. per lb.
CACAO—Native	14c. per lb.	12c. per lb.
CASSAVA	60c. to 72c.	
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	
COCOA-NUTS—	$12 to $16 per M	$16 per M, peeled and selected.
COFFEE—Creole	8c. to 13c per lb.	12c to 13c. per lb.
Jamaica and Rio	13½c. per lb.	13½c. per lb.
Liberian	7c. per lb.	7c. per lb.
DHAL	$4·20 to $4·25 per bag of 168 lb.	$4 25 to $4·40 per bag.
Green Dhal	$5·50	
EDDOS	$1·44 per barrel	
MOLASSES—Yellow	21c. to 22c.	——
ONIONS—Teneriffe		2½c. per lb.
Madeira	2¾c per lb.	3c. per lb.
PEAS—Split	$6·00 to $6·30 per bag (210 lb.)	$6·40 per bag. (200 lb.)
Marseilles	$3·00, over stock	$3·00, over stock.
PLANTAINS	20c. to 48c. per bunch	
POTATOS—Nova Scotia	No quotation	$3·75 per barrel.
Lisbon	$2·00 per 100 lb.	$2·25 per 100 lb.
POTATOS—Sweet, Barbados	$1·20 per bag	——
RICE—Ballam	$4·50	$4·75
Creole	$4·40	$4·00 to $4·50
TANNIAS—	$2·64 per bag	
YAMS—White	$3·50 per bag	
Buck	$3·12 per bag	
SUGAR—Dark crystals	$2·17½ to $2·40	
Yellow	$2·90 to $3·00	$3 00
White	$3·60 to $3·80	$3·60 to $3·80
Molasses	$1·90 to $2·00	$2·00 to $2·30
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba Shingles	$3·75 to $5·75 per M	$3·50 to $5·50 per M.
.. Cordwood	$1·80 to $2·00 per ton	

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CONTENTS.

The Blights of Cotton.

THE editorial in the last issue of the *Agricultural News* dealt with the ways in which the cotton plant is likely to suffer from the attacks of animal pests. It was shown that these are especially likely to be in evidence during the time that the plant is in a state of active growth, that is when liberal supplies of food are at hand, and when the tissues have not attained the hardness which is generally a concomitant of maturity. It is well known that attacks of this kind are not made by animals alone, but also by other pests, which are generally termed 'blights'; the consideration of these has been reserved for the present article.

These blights are really forms of plant life which have not the power of absorbing energy from the sun's rays in order to build up food bodies from simple forms of matter provided by the air and the soil. They are therefore dependent on food that has already been formed by life-processes, and, consequently, must obtain this either from living plants or animals, or from their dead remains. In the latter case, if they belong to such forms as can only feed on dead matter, their work is beneficial, and really amounts to a kind of slow combustion, by which waste organic material is prevented from accumulating on the surface of the earth to an indefinite extent. There are, however, forms which can continue to exist on dead matter during the intervals in which their host is not present, only to attack it when it appears once more. With these, the process of the combustion of the dead matter must be carried out by artificial means in such a way that the blight will be destroyed with the organic substances on which it is feeding temporarily. This is one of the reasons why special emphasis is laid on the advisability of burning old cotton plants at the end of the crop.

Blights may be broadly divided into two kinds: those which are fungous, and those which are bacterial in character. Much more is known about the diseased conditions that are caused in plants by the former than those which are due to the latter, partly because the fungi are larger, and also because it is easier to trace the connexion between their presence and the exact nature of the damage, if any, that they are effecting. Attention is drawn to the articles that have appeared on fungi in the last three numbers of the *Agricultural News*; the perusal of these should give a broad view of this division of plants, and will go far to explain why it is that the members of it are able to attack plants in such diverse ways. Little need be said in regard to bacteria, save that they are very similar to fungi, in that most of them require the more complex organic compounds as food; they are readily reproduced vegetatively—are, in fact, rarely reproduced by any other means; and they have the power of forming resistant spores to enable the different species to survive during a period of unfavourable conditions.

In the West Indies, the commonest blights of cotton are those which attack the leaves and those which damage the bolls. Up to the present, the species which may affect adversely the roots and stems have not shown themselves to any great extent. This is not the case in many other parts of the world, where great losses have been experienced through the ravages of such parasites. Considering first the leaf-parasites, there are four which most commonly do damage in these islands: rust, mildew, round spot, and angular spot; of these, the first three are due to fungi and the fourth is bacterial in origin. None of them have done any extensive damage, so far: as a matter of fact, the first and second are generally only found on old leaves which have nearly completed their functions. Nevertheless, it is easy to understand that a careful watch is required in order to prevent them from increasing beyond control (as they have actually done in some cotton-growing countries), that means for their increase must not be provided by permitting old cotton plants to remain in the ground, and that, even if their presence on a plant does not result in much damage to it, the fact that they are interfering to a certain extent with its nutritive functions can only handicap it in any struggle which it may be making against other pests or untoward conditions.

The blights which damage the bolls are known as pink spot, or anthracnose, and black boll, or boll rot; each is due to a different fungus. In the first case the lint is only attacked if the boll is young; in the second its contents are completely destroyed and it fails to open. In anthracnose the attack begins from the outside, and the sunken black spots with pink edges are an unmistakable sign of the presence of the disease. In black boll, the disease starts inside the boll, often near the base, and its contents are gradually changed into a dark-coloured, slimy mass of swollen, partially germinated seeds, or the boll may dry up on the plant and open slightly. Notwithstanding this far-reaching internal change, the exterior of the boll is of a healthy colour, the only external signs of the presence of the disease being that the boll becomes spherical, instead of oval, and tapers quickly to a sharp point, while it is more resistant to pressure than a healthy one. Black boll only affects the fruits, while anthracnose may be communicated from old plants to young ones, attacking the cotyledons and stems of these, and to other old ones where it is found on the dying leaves and injured parts of the stem. Preventive measures are the best for these diseases. They include: the destruction of old cotton, the selection of seed from healthy plants, and the disinfection of this seed before planting.

The shedding of bolls has not been shown to be due to the attack of any blight or blights. It is caused by a physiological condition of the plant, in which an effort is made to throw off bolls which have no chance of becoming mature, in order that the remainder may be given the best opportunity of doing so. This state may arise from injury to the plant, such as root-cutting by deep cultivation; unfavourable environment, as for instance, a caked or weedy soil, exposure, overcrowding, or an excessive stimulus toward vegetative growth; and sudden climatic changes, due either to drought or excessive rainfall. Good drainage and improved cultivation are the only remedies for this.

The careful cotton planter will keep a constant watch for the appearance and spread of these fungous and bacterial diseases, so that, in the event of their assuming serious proportions, he will be ready to combat them. At the end of the crop he will recognize the importance of the destruction of the plants which are no longer a source of profit but rather of danger to him, as well as to others. Finally, in any scheme of selection of seeds, he will see that these are chosen from plants that are healthy and disease-resisting, in order that this property may be handed on in the strain of cotton that he is trying to evolve.

Reference is made, in conclusion, to the publications of the Department that should be consulted in this connexion, namely: the *A B C of Cotton Planting*, (Pamphlet No. 45), the *West Indian Bulletin*, Vol. IV, p. 255; Vol. V, p. 178; Vol. VI, p. 117; Vol. IX, p. 216, and to articles on the subject that have appeared from time to time in the *Agricultural News*. Observations on the plants in the field should be accompanied by a perusal of these; in this way, the ability speedily to discover and identify any of the diseases will be gained. Not only this, but, in the event of a serious spread of them the cultivator will be already in possession of a knowledge which will enable him to deal with it, and no time will be lost in searching for remedies.

SUGAR INDUSTRY.

The Effect of Soluble Manures on Sugar-cane Soils.

From the Experiment Station, Honolulu, there has recently been issued Bulletin No. 29 of the Division of Agriculture and Chemistry, Hawaiian Sugar Planters' Association. It contains an account of work which has been taken up in order to gain a knowledge of the action of soluble manures on soils that are used for growing canes, and the following conclusions, arrived at by the author after twelve years' experience, are given here :—

(1) The profit resulting from the application of fertilizers or manures will depend largely upon other factors than the chemical composition of the soil. Providing certain plant-food deficiencies represent the chief depressive influence on crop yields, the response to appropriate fertilization will be commensurate with the difference between the limitations exerted upon crop production through lack of available plant nutrients and the limitations exercised by the next restraining factor in order of importance after the material has been applied. This latter factor may be physical, biological, or climatic in character.

(2) The relative effects of different combinations of fertilizer materials on the growth of sugar-cane when these materials are added to a given soil will be determined chiefly by :—

(a) The extent to which their several ingredients directly or indirectly lessen the deficiencies of available plant nutrients ;

(b) The extent to which they cause the bacterial flora to approach an optimum balance for the regular production of sufficient nitrates or assimilable nitrogen compounds, and

(c) The degrees and manner in which they produce physical changes in the soil.

(3) Owing to the fact that a definite relationship exists between the efficiency of a fertilizer mixture and the quantities and proportions in which its ingredients are associated, due to biological, chemical, and physical effects which its component parts have in a given soil, variations in the composition of the mixture beyond certain limits may materially influence crop yields.

(4) A more definite knowledge concerning the amounts and proportions of fertilizer salts to use in a mixture for best results would on some soils yield pronounced profits, while a lack of such knowledge may in some cases result in a loss, especially when soluble salts are employed.

(5) The greatest loss from the use of improper mixtures of fertilizers is apt to occur on acid soils, and in such cases considerable risk is involved from the continued application of mixtures containing ammonium sulphate, sulphate of potash, and acid phosphate, when lime dressings are not previously made.

(6) While the chemical and physical analysis of a soil will usually prove of value in indicating the best cultural methods to follow in maintaining or improving its fertility, and may also indicate in a general way certain of the plant food deficiences in given cases, it cannot afford definite information as to the amounts or proportions of ingredients in fertilizer mixtures which will give maximum returns.

(7) It is possible that the data from more extended field experiments with a large variety of soils, when reviewed in connexion with the comparative analysis of the soils, using both weak and strong acids as solvents, may indicate a somewhat definite relationship between the analytical figures and the order of importance which phosphoric acid and potash should assume in cane fertilizers in given cases.

(8) It would appear that analyses of soils, with more special reference to their physical qualities, reaction and content of organic matter, nitrogen, and more readily soluble lime, may, with due consideration of the water supply and climatic conditions, be relied upon to indicate such manurial treatment as will result in a profit, although they will not afford definite information as to the weights and proportions of the ingredients in fertilizer mixtures which will result in maximum efficiency.

(9) Nitrogen is the most important element to be considered in the fertilization of the sugar-cane in the Hawaiian Islands, and when applied in mixed fertilizers some risk of reduced efficiency is entailed if either the potash or phosphoric acid (in the form of soluble salts) is made to exceed the weight of this element.

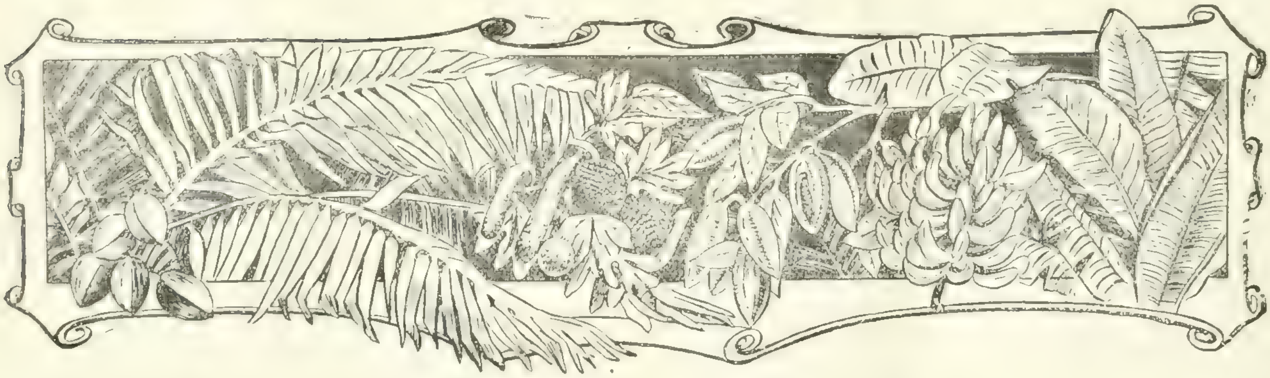
(10) Unless through past local experience or carefully conducted field tests it has been definitely determined that a modified formula may be expected to give greater yields, it is safer, when applying nitrogen, potash and phosphoric acid in the form of soluble salts, to have the mixed fertilizer contain even quantities of these elements, which are not to exceed 60 ℔. per acre in the case of each element.

(11) Field tests with fertilizers whose ingredients are mixed in varying proportions will, if such experiments are accurately and scientifically conducted through a sufficient period give the most reliable information as to the best manurial practice. Such experiments should be laid out in very long, narrow, parallel, and contiguous plots or strips, with the untreated control areas lying immediately adjacent to the fertilized cane.

(12) The great importation of 'resting' fields in rotation on Hawaiian plantations, and growing upon them leguminous crops is very clearly indicated. This applies more particularly to the irrigated plantations, where the supplies of organic matter are, in the majority of cases, becoming greatly reduced through successive tillage operations in a comparatively arid climate, and by the favourable conditions created for bacterial activity through regular irrigations under uniformly high temperatures.

Points of a Good Sow.

The body of a good sow is long, deep and comparatively narrow. It should be remembered that the digestive organs of the brood sow play, perhaps, the most important part in her career. They are called upon to do more work at certain times than the digestive organs of any other animal, and the success of her litters is largely determined by the amount of food which those organs can make ready for conversion into milk. Hence it is, that length and depth in the body are exceedingly important features in a sow for breeding purposes. The next thing to look for is a well-formed udder, free from badly developed patches or calloused parts. The phlegmatic, sleepy sow is to be avoided. Good mothers are generally somewhat nervous, like dairy cows. Milk secretion has been proved to be largely a nervous function, and the dull, somnolent cow is seldom a mother of a high order. A good backline is a useful point. Hollowed backs are not safe ; they should at least be level, and, if slightly arched, so much the better. (*Journal of Agriculture*, Western Australia.)



WEST INDIAN FRUIT.

A COFFEE DISEASE IN DOMINICA.

Some berries of the Arabian coffee (*Coffea arabica*) which had been attacked by a fungus, *Stilbella flavida*, were lately received from Dominica. This fungus causes brown, hardened and sunken areas on the berries, which are slightly greyish in the centre, and bear small, yellow, transparent pin-shaped fructifications scattered over their surface. The fungus also attacks the leaves and twigs.

Serious damage has been caused in Mexico and several of the South American States by this fungus, and it is also reported from Trinidad and Jamaica.

The following preventive measures have been found useful in keeping the disease in check :—

(1) Removal of all infected portions of the coffee plants, and subsequently burning them, or burying them with lime.

(2) Spraying the plants thoroughly with moderately strong Bordeaux mixture, as the fungus is a superficial parasite.

(3) Careful attention to tillage, clean weeding, and manuring with lime from time to time, in addition to the usual manures, as well as care that the attack of the fungus is not aided by the provision of too much shade.

Further, a careful examination of all the plants in the neighbourhood is necessary, as the fungus can attack many other kinds of plants, including grasses, shrubs and trees. All infected plants of this nature should be cut down and burnt, after which their ashes may be used as manure.

SOILS FOR CACAO.

Information in regard to the best soils for cacao is given in the third of a series of articles on cacao by Mr. J. H. Hart, F.L.S., which are appearing in the *West India Committee Circular*. Reference to these articles has already been made in the *Agricultural News*, Vol. VIII, p. 260.

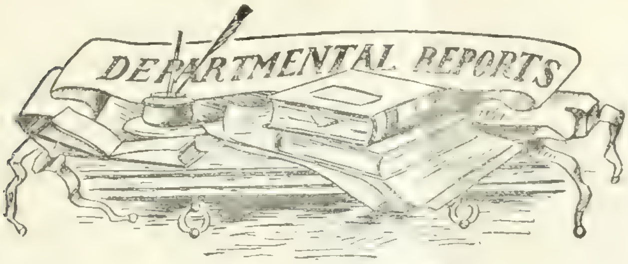
The soil chosen should be one, as Wright puts it, 'having good physical and chemical properties', and he agrees with Jumelle in pointing out that 'the best cacao soils are those which have been uncultivated for many years or not at all, and that abundance of humus, 1 to 2 per cent. of lime, 0·25 per cent. of phosphoric acid, as well as abundant supplies of other ingredients, are necessary before one can hope to obtain the best results'. A shallow soil resting upon hard bed-rock is totally unsuitable, while a moderately shallow soil resting upon a friable rock is often found to grow cacao to perfection. It is generally considered among Trinidad planters that a loose clay, or clay with an admixture of a fair proportion of sand and lime is favourable to the growth of cacao. If the soil is covered with a vegetable deposit, humus, which has accumulated from the falling leaves and branches of the original forest, so much the better. If land can be found on the banks of a stream or river where there is considerable depth of alluvial deposit, such a position, if capable of being well drained, is a sure source of wealth to the cacao planter. Hard, dry, rocky soils, stiff clays, mountain sides where great detrition frequently takes place, shallow sands and boggy ground should be carefully avoided. The aspect of the land should always be carefully considered. A site exposed to trade or prevailing winds, or to strong sea-breezes, should not on any account be chosen for a cacao plantation. Land which has been previously cultivated with other crops may be chosen when it has good depth, is easily drained, and is capable of being improved by the application of suitable manures, but 'thrown out', 'ruinate', or abandoned lands should be taken up with the greatest caution. Worn out sugar lands are dangerous investments for the intending cacao planter as a rule, but an intelligent choice even here, by men who are acquainted with the local character of the soil and the cacao tree and its requirements, will often result in the development of a productive plantation. Salt is inimical to the growth of the cacao tree, and lands liable to be inundated with tidal waters should never be purchased.

The Black Rot of Cacao Pods.

This disease, which is due to a fungus, *Phytophthora omnivora*, is dealt with in Pamphlet No. 54 of the Department, entitled *Fungus Diseases of Cacao and Sanitation of Cacao Orchards*, pp. 34-6. According to the *Bulletin de la Société Royale de Botanique de Belgique*, Vol. XLV, Fasc. 2, this fungus has recently been found to attack the fruits of pear trees in Belgium.

The attacked pears show a rounded, brown spot, on the part which is most exposed to the light. This spot increases in size until it soon covers the greater part of the fruit, which then falls. Such fruits after some time become full of spores, by means of which the fungus is disseminated. The damage was serious ; half of the fruits of the tree on which it was found were destroyed, especially those on the lower branches. Nevertheless, pears which had been bagged did not suffer at all.

The remedies suggested are the destruction of diseased fruits and preventive treatment, by means of Bordeaux mixture, in the spring.



REPORT OF THE SUGAR-CANE EXPERIMENTS COMMITTEE, BOARD OF AGRICULTURE, BRITISH GUIANA, 1908.

This deals with the results of the cultivation of varieties of canes on sugar plantations in British Guiana during the two crops of the year ended December 1908. The information included in the report is obtained from the results placed at the disposal of the Board by thirty-plantations on which variety trials were being made. It has reference to the yields of commercial sugar from the different varieties of cane; the distribution of the varieties between the estates whose results were available, together with a comparison of their yields; the differences in yields resulting from those in soil and meteorological conditions; a comparison of the yields in the earlier and later months of the year; details of the data of results obtained on areas of not less than 20 acres on any estate; similar information to that which has been detailed, for the years 1901 to 1908; opinions as to the milling qualities and the fuel value of the megass of the different varieties; and information in regard to the suitability of different varieties to different soils, as well as to the signs of deterioration that are becoming evident in some cases.

In regard to the results from the thirty-five plantations, it is shown that the Bourbon cane occupies by far the greater acreage, followed by D.625, D.109, and B.208. The returns showing the true average yield of commercial sugar in tons per acre for each variety place B.376 at the head, followed by Green Transparent (Selangor), D.625 and B.208. D.625, Bourbon and D.109 lead easily in the matter of the number of plantations from which reports are made concerning them, and of these D.625 has shown the largest number of instances of highest and second yields. On the different estates, as regards the yields of tons of commercial sugar per acre, D.625 is always among the first three, D.145 among the first five, and D.109, B.147, B.208 and Bourbon among the first six, varieties. D.625 showed least variation in yield under wet and dry conditions, closely followed by D.109.

It is pointed out that the variety D.109, which appears to be rapidly falling off in its general yields, gave the highest one for the year as regards areas of over 20 acres; this was from plant canes. In the same connexion, B.208 (ratoons) and D.625 (ratoons) came next, while the lowest minima were scored by the former of these and by Bourbon (plants). In the details that are given of the means of the figures obtained in the juice analysis of each variety in regard to which report of five or more trials were received, B.147 shows the juice with the highest sucrose content and purity, for plants, and B.208, similarly, for ratoons.

Turning now to the results for the period 1904-8, the largest yields of commercial sugar per acre for that time have been given by D.625, D.145 and B.208 in this order. Similarly, for the period 1901-8, D.625, D.145 and D.109 head the list for plants and for ratoons. Opinions of the planters as to milling qualities and the fuel value of the megass vary greatly as usual, but Bourbon, Green Transparent, B.376 and D.4,399 appear to be best as regards the former, and the first and last mentioned canes, together with B.41, best in respect to the latter, quality. The highest sucrose content and quotient of purity of the juice, for the years 1904-8, have been shown by B.208, D.74 (four years only) and D.95.

The following statements are made toward the conclusion of the report: 'The experiments indicate that many varieties of sugar-cane can be relied upon in British Guiana to give yields of sugar in quantities equal to or greater than those obtained from the Bourbon, and that several varieties possess well-marked ratooning qualities. D.625 and D.145 can be safely recommended for trial on relatively heavy lands, B.208 is especially suited for lighter soils, and B. 376 and D.4,399 appear to be worthy of more extended trials. Certain varieties—the White Transparent and its seedling progeny, D.74, D.95, D.109, D.115, D.116 and D.117—show marked signs of falling off in their yields, especially where grown as ratoon canes, and the Committee feel that their cultivation should not be continued except on lands which have proved very suitable to their growth. D.109 showed on many plantations signs of falling off in its yields, especially where grown as 2nd and as older ratoons, although on some it gave very satisfactory results as plant canes. The falling off in the yields of certain of the varieties noticed in this colony is similar to experience reported from elsewhere with varieties of sugar-cane which have been raised from seed. The Committee recognize that it is a very important factor, and it is receiving their close attention.'

A NEW FIBRE MACHINE.

A description of a new machine for decorticating and scutching is given in the *Natal Agricultural Journal* for June 1909. It has been named the 'World's Decorticator', and is said to be capable of dealing with *Agave* (dagger) *Sansevieria* (bow-string hemp), pine-apple, banana, *Phormium tenax* (New Zealand flax), and other fibres, while it is said that satisfactory trials have been made with ramie and jute.

According to the prospectus, it is a combined crushing and combing machine, and is so simple in its action that any one can attend to, and work it, without previous knowledge of the operation of decorticating. By this system, the leaves and stems have their fibres extracted in one operation, and the combs are automatically and continuously cleaned during the time the machine is working. Up to the present time, a beating action has been employed in nearly all the machines used for separating the fibrous parts of leaves and stems from the pulpy and woody matter in which they are embedded. In carrying out this beating action, blades are employed which have to be set very accurately to work against a plate or cushion, and owing to the fact that this great accuracy is required, it is necessary to have a skilled workman to set and attend to the working of the machine in order to avoid waste, for if the blades are set too closely the fibre is chipped and destroyed, while if the blades are set too far apart, the work of cleaning the fibre is not properly done. Furthermore, it is necessary to have considerable power to drive the machines now on the market, some requiring as much as 60 horse-power. With the hand-power 'World's' machine, it is said, 'two ordinary native labourers can produce upwards of 80 lb. to 100 lb. of clean fibre per day, whereas by the usual hand-beating a native can do only about 3 lb. per day'. The machine is sold by the World's Fibres Machinery Corporation, Ltd., 16, Finsbury Circus, London, E.C.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 30, with reference to the sales of West Indian Sea Island cotton :—

Since our last report only a small business has been passing in West Indian Sea Island cotton and prices continue firm.

The sales consist principally of stains, $6\frac{3}{4}d.$ to $8\frac{3}{4}d.$ with a few bales of Barbados about $14\frac{1}{4}d.$

Latest accounts from America state the Sea Island crop is making satisfactory progress and there is every prospect of a good yield.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ending August 21, is as follows : —

There have been no receipts or sales for the past fortnight, consequently no change in the market.

The unsold stock of 427 bales, composed entirely of planters' crop lots held here and on plantations, is still being held under instructions from the owners at 35c.

COTTON EXPORTS FROM THE WEST INDIES.

The amounts of cotton exported from the British Islands of the Lesser Antilles during the quarter ending June 30, 1909, were as follows :—

Origin.	Number of bales.	Weight, lb.	Estimated value. £	s.	d.
Antigua ...	158	34,460	1,866	11	8
Barbados ...	483	237,799	11,889	19	0
Grenada ...	$858\frac{3}{4}$	257,131	7,354	4	6
Montserrat ...	201	57,818	3,132	0	0
St. Kitts ...	111	32,245	1,746	12	1
Nevis ...	65	15,431	835	16	11
Anguilla ...	138	27,600	1,495	0	0
St. Vincent ...	294	95,719	5,571	17	6
Trinidad / Tobago ...	15	5,125	(none given)		
Virgin Islands	85	18,854	707	0	0
Total	$2,408\frac{3}{4}$	782,182	(31,599	1	8)

All this cotton was sent to the United Kingdom, with the exception of 20 bales (10,078 lb.) of an estimated value of £503 18s., which was shipped from Barbados to the United States. The cotton exported was Sea Island in all cases save the following (which are included in the figures given in the above table) : $827\frac{3}{4}$ bales (248,455 lb.) Marie Galante from Grenada ; 19 bales (4,000 lb.) Marie Galante from Trinidad and Tobago ; 47 bales (10,484 lb.) Native from the Virgin Islands. A certain amount of cotton, not included in the above table, was also sent from St. Lucia.

COTTON SEED IN THE UNITED STATES.

In 1907, there was produced in the United States 5,912,646 tons of cotton seed, of which 3,943,981 tons was crushed. The amounts of oil and meal that were obtained from this crushed seed were 175,724,840 gallons and 1,785,804 tons, respectively. The quantity of oil that was exported was 40,880,304 gallons, the remainder being used for home consumption. Similarly, 670,484 tons of cotton seed meal and cake were shipped, chiefly to Europe, Denmark taking 277,124 tons, Germany 224,064 tons, and Great Britain 90,539 tons. The amounts taken by Denmark and Germany are rapidly increasing, while that consumed by Great Britain shows a considerable falling off, the reason for the latter circumstance being that this country is obtaining greater quantities every year from Egypt and other countries. In Denmark, these products are chiefly used in the dairy industry, while in Germany and England they are employed both as food and for manurial purposes.

It has been found that draft horses will do well on a ration which includes 2 lb. of cotton seed meal. Over half a million cattle, as well as large numbers of sheep, are fattened every year at the oil factories of the Southern States. The method employed is to make the ration for cattle include, at first, 3 or 4 lb. of the meal, which is gradually increased to 6 or 8 lb., or even 10 lb. per head, the length of the feeding period being from 90 to 120 days. It is found that the fat of such animals has a higher melting point than that obtained from those fed on corn. Trials made at many of the experiment stations show that the inclusion of cotton seed meal in the food of dairy cows increases the flow of milk, the most satisfactory amounts being 5 or 6 lb. daily for short, and 3 or 4 lb. daily for long, periods. The effect on the butter produced from the milk of animals fed in this way is to raise the melting-point and to lighten the colour, while excessive amounts of the meal in the ration give a butter of poor flavour and low value.

Cotton seed hulls were formerly used entirely for fuel at the factories. They have now, however, been recognized as a useful adjunct to the ordinary cattle food, especially in the neighbourhood of the factories. As is well known, the feeding of the seed to calves and pigs generally brings about a fatal result if persisted in. In such cases it has been found that, although the oil pressed from the seed has no poisonous properties, the seed has caused intense inflammation to arise in the digestive tract.

OVERHEAD TRANSPORT FOR AGRICULTURAL PRODUCTS.

It has been suggested in *Tropical Life* that the system of carrying agricultural produce in the tropics by means of overhead ropeways should be more generally adopted. At the same time, an account of the working of these in Jamaica and Ceylon was given:—

An endless rope is supported on wooden trestles, and is provided with carriers, which are firmly fixed to it, and which therefore move with it. For comparatively light loads, such as bunches of bananas, the rope need not be more than ¾-inch in diameter. The carriers are usually in the form of a cradle, and are provided with a catch, so that when this is released, they discharge their contents; loading and unloading can be done while the rope is in motion. For the purpose of tightening the rope, which naturally sags after use, a long screw and a powerful steel spring in compression are provided.

A ropeway which has been erected in Jamaica deals with 100 bunches of bananas per hour, the weight of each of these being, on an average, 90 tb. The rope travels at the rate of about 2 miles an hour and is driven by means of a 3 horse-power oil engine. The length of the line is a little under a mile, and it includes a number of very steep gradients.

It would seem that such a system might be adopted for the transport of agricultural products which would entail the carrying of greater weights than those which have to be dealt with in the carriage of tea and bananas, and that it would be specially useful in meeting the difficulty of taking such produce over steep gradients.

FORESTRY IN FRANCE AND THE SOUTHERN UNITED STATES.

From her State forests France derives an annual income of approximately one million pounds sterling, or 7*s.* per acre. Eighteen per cent. of the entire area of the country, or 23,500,000 acres is forest land. Approximately 6 million acres are managed by the state, the annual cost of management being about 4*s.* per acre. The great achievement of France in forestry has been the establishment of protective forests where much destruction has been caused by floods. Toward the close of the eighteenth century about 2,500,000 acres comprised in the Department of the Landes was little more than shifting sand dunes and disease-breeding marshes. This section is now one of the richest, most productive and healthful in France. This change has been brought about by the intelligent cultivation of pine forests. Immense forests now cover the country, the sand dunes and marshes have long since disappeared, and the wood, charcoal, turpentine, rosin and kindred industries have brought prosperity to the Department which was formerly the most barren and miasmatic in France. The climate is now mild and balmy, the great change being wrought by the forests. The thin layer of clay beneath the sandy surface, formerly impervious to water, has been so pierced by the roots of the pine that there is now thorough drainage to the spongy earth below. The manufacture of rosin, tar, turpentine, pitch, pyroligneous acid and wood vinegar is conducted in much the same way as in Georgia and the Carolinas. The trees destined for 'short life' are bled as soon as they are big enough to stand bleeding, when they have a circumference of 1 foot or 15 inches, the sapping of young trees being the only production of a new forest for a time, and when the 'thinning out' time comes they are 'bled to death', and the timber is used largely for pit props, the English demand guaranteeing a steady and profitable market. The 'standing trees'—those giving promise of most vigour—are never tapped until they are about 3 feet in circumference. When these have reached the age of fifty or sixty years they are cut down, and utilized for telegraph poles and railway ties. To prevent the spread of forest fires, wide trenches are dug about limited areas, and the space kept clear.

The Southern United States, with 27 per cent. of the total area of that country, contains about 42 per cent. of its total forest area. The forest area by States is as follows: Alabama, 20 million acres; Arkansas, 24 million; Florida, 20 million; Georgia, 22,300,000; Kentucky, 10 million; Louisiana, 16,500,000; Maryland 2,200,000; Mississippi, 17,500,000; North Carolina, 19,600,000; South Carolina, 12 million; Tennessee, 15 million; Texas, 30 million; Virginia, 14 million, and West Virginia, 9,100,000. The south, it will be seen, has still much of the virgin forest of the country. This forest must be used, of course, in order to meet the steadily expanding wants of this section. It must be used in such a manner, however, that the very most may be made from its annual cut, while at the same time, this cut is being replaced by new growth. In this way its timber will remain a source of perpetual wealth. The importance of forest conservaton to southern interests is clearly understood by the people of the south. The future of the south is more nearly bound up in the plan of forest preservation, with its accompanying protection to water-sheds, power-streams, and wood-working industries, than is anything now before the people of this part of the country. Not only is the protection of the watersheds, which will some day furnish the power to run all manufacturing establishments in the entire south, an important matter to the south, but the industries depending upon the forest products will also be benefited by the protection thrown about the remaining timber area. (*Science*, July 30; August 20; 1909.)

FEEDING VALUES OF COTTON AND LINSEED CAKES.

The following experiment was recently carried out, under the direction of the College of Agriculture at Bangor, for the purpose of comparing the feeding value of these two products, from the point of view of economy:—

Each of two evenly matched lots of bullocks received per day 3 tb. maize meal, 70 tb. swedes, and 7½ tb. hay and straw, the one lot getting in addition 3 tb. decorticated cotton cake, and the other lot 3 tb. of a mixture of linseed and undecorticated cotton cake in equal parts, the allowances being increased slightly as the fattening process progressed. The results, from an economical point of view, were in favour of the decorticated cotton cake. The lot of bullocks receiving it throve exceedingly well, gaining in weight an average of 16 tb. more than the lot getting the mixture of linseed and undecorticated cotton cake. After making allowance for the difference in the cost of the food, this gain represents 1*s.* 9*d.* for each bullock, and is equal to 14*s.* 6*d.* per ton of the cake used. Another consideration in favour of the cotton cake is that its residual manurial value is greater than that of linseed cake. It is reported that similar results were obtained in experiments on the same lines with sheep. In this case the gain from decorticated cotton cake over the gain from the mixture of linseed and undecorticated cotton cake represented 1*s.* 5*d.* per head, equal to 11*s.* 9*d.* per ton of cake consumed.

EDITORIAL NOTICES.

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Agricultural News

Vol. VIII. SATURDAY, SEPTEMBER 18, 1909. No. 193.

NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial, the subject of the enemies of cotton, which was begun in the last number, has been followed up by an article on the chief blights which attack that plant in the West Indies.

The conclusions as to the effect of soluble manures on sugar-cane soils which have been reached at the Hawaii Experiment Station are of interest. They are given on page 291.

Information is given on page 292 in connexion with a coffee disease which has appeared in Dominica, and remedies for it are suggested.

A review of the report for 1908 of the Sugar-cane Experiments Committee, Board of Agriculture, British Guiana, will be found on page 293.

Statistics in connexion with the export of cotton from the West Indies are given on page 294.

The Insect Notes, on page 298, appear in the form of an illustrated article on the transportation of 'millions'.

Interesting and useful information appears in the Fungus Notes on page 299. It deals with the parasitic fungi of scale insects in the West Indies.

An article on page 303 gives an account of the ways in which a plant of great commercial value (the West African oil palm) may be used as a shade tree, especially, under certain conditions, for cacao.

Breeds of Fowls and Egg Production.

Experience in the United States of America has shown that greatly increased egg production in the larger breeds of fowls, such as barred and white Plymouth Rocks, is accompanied by a decrease in the percentage of fertility in the eggs. At the same time, the number of chickens that fail to hatch properly increases. With the smaller breeds, such as brown Leghorns and black Minorcas, this is not the case, while white Wyandottes are intermediate in this respect.

A New Parasite on Mosquitos.

It has been observed by Dr. Allhusen that a fly which is common in Hong Kong feeds on the larvae of mosquitos. This insect probably belongs to the family Dolichopodidae, or long legged flies, the members of which are of small or medium size and generally bright metallic green in colour. The larvae are long, slender and round, and live in earth or decomposing matter. It is the perfect insect, or imago, that is said to be useful in the connexion named, however. This is predaceous and hunts for small soft-bodied insects, being generally found in damp places covered with rank vegetation, on the leaves of aquatic plants, or on water, over the surface of which it is able to run. It is thus very likely that some of the last-mentioned forms are able to attack mosquito larvae which have risen to the surface of the water to breathe, and, if this is so, the existence of such a fly should have an important bearing on the prophylaxis of tropical disease.

Green Manuring.

This subject, it will be remembered, was discussed in the editorials of Nos. 189 and 190 of the *Agricultural News.* In these, the effect of raising the plants for green dressings in a soil badly supplied with water was mentioned, and attention was drawn to the fact that the removal from such a soil of the water required for the growth of the green dressing plants may cause it to become so dry as to render inoperative any benefit that may have accrued to subsequent crops by the turning in of the green manure. Consideration of the matter naturally leads to the question of the advisability, in such a case, of using fresh, green plants that have been grown elsewhere for the purpose. An attempt has been made at the Rome Experiment Station, to arrive at a decision in a practical way. A large number of experiments was devised to this end, and the conclusions have been arrived at: that the green manure grown elsewhere is more effective than that grown on the field itself; that this greater effectiveness varies with climatic conditions, with the nature of the soil and the kinds of plants used; and that it is due to the fact that the water taken off by the green dressing while growing is saved for the soil which is manured. The importance of these conclusions in dry regions, or in periods of drought, is evident.

The Preservation of Copra.

Experiments have been conducted at the Paris Colonial Gardens for the purpose of investigating the value of sulphur dioxide for the preservation of copra. Samples treated with the gas in 1905 still show no signs of deterioration. Another trial has recently been made on a large scale with a consignment of 3,000 cocoa-nuts received from the Malay Archipelago. In the process, the nuts are cut in two and then exposed to the action of the sulphur dioxide, and it has been found that its influence is to preserve the copra in its original condition. Other methods for the attainment of the same end have been found successful at the Chemical and Physical Laboratories, Little Ilford, Essex. The former of these consists in impregnating the copra and the packages containing it with oil of thyme, which is applied in a fine spray, about half a fluid ounce of the oil being used for each hundredweight of copra. The second consists in washing, soaking or spraying the copra well with a warm, saturated solution of boric acid, sun-drying the product before it is packed and then dusting the top layers with a little of the finely-powdered acid. This application has the merit of being odourless.

Bacteria and Soil Nitrification.

Recent experiments conducted in Germany have shown that the nitrifying bacteria are most abundant in the top soil to a depth of 4 inches, but the absence of humus and oxygen causes them to be rare at a depth of 20 inches. The addition of atmospheric nitrogen to soils through the agency of bacteria (nitrification) takes place best at temperatures about 25° to 27°C. (77° to 81°F.). Nitrification is not delayed by the presence of small amounts of soluble organic substances; it is probably accelerated by this, as it has been found that the addition of 1 per cent. of certain sugars increases the activity of the bacteria. If, however, they are present in greater quantity, the rate of nitrification decreases greatly.

The upper layers of the soil also contain denitrifying bacteria in large numbers. These occur irregularly in the lower layers but are often found abundantly at a depth of 3 feet. The temperatures at which these bacteria grow best are almost the same as those for the nitrifying bacteria.

Iron Content and Colour of Soils.

A paper read at the fortieth general meeting of the American Chemical Society states that a chemical examination of twenty typical red and yellow soils showed that their inorganic colouring matter consisted chiefly of iron oxide; manganese compounds were present in amounts too small to have an effect on the colour. It is argued that the comparatively small difference in soil temperature in any two localities where the tints are different is insufficient to uphold the explanation that variations in colouration are due to the presence of iron oxide in various states of hydration. The different shades are, on the contrary, held to be due to the extent to which the film of oxide has been deposited on the soil particles; thin films give yellow, and thicker ones red, soils. Experiments in which films of iron oxide were precipitated on sands and grains of quartz flour of different sizes, the percentage of iron being kept constant so that deposits of different thicknesses were obtained, afforded confirmation of this view.

How 'Marasmius' is Spread.

The ways in which the root disease of sugar-cane (*Marasmius sacchari*) may be disseminated are considered in Bulletin No. 6 of the Experiment Station of the Hawaiian Sugar Planters' Association, entitled *Fungus Maladies of the Sugar-cane.* It is stated that it appears to spread largely through the agency of the mycelium. Its spores do not appear to be long lived, nor to have any special means for their distribution. They are not taken up by insects and at one stroke, as it were, spread far and wide over the plantation. It is doubtful whether air currents play any very important part in the distribution of the spores of *Marasmius.* Irrigation and rain-water undoubtedly are most efficient means for their distribution. So are the various agencies used in the culture and harvesting of cane. Machinery, men and animals at work in the cane fields are no doubt often agencies in the spread of both the spores and the mycelium.

In the case of *Ithyphallus, Clathrus,* and *Dictyophora,* which are found in Hawaiian cane fields, insects have been proved to be instrumental in spreading the first two, and from the fact that the odour and appearance of *Dictyophora* are similar to those of fungi whose spores are carried by insects, it is concluded that this is also disseminated by them.

Brazilian Cacao in the United Kingdom.

The *Monthly Trade and Consular Reports* for August 1908 states that the decision of the largest importers of cacao in the United Kingdom to employ no more of the product from San Thomé, Portuguese West Africa, will extend the industry in Brazil.

As the United States takes a large part of the exports of Brazilian cacao, the matter of possibly large increases of the British imports thereof is of interest. In 1907 and 1908 the value of the exports of cacao from Brazil was £2,036,128 and £2,008,322 respectively, of which £607,576 and £486,265 worth went to the United States.

In 1908 the exports of cacao from Brazil and San Thomé amounted to 31,068 metric tons and 28,765 metric tons, respectively. Although the cacao industry in Brazil consists of little more than gathering the beans from the wild trees, instead of being a developed one, it is becoming one of the dependable resources of the country in its export trade. The production of cacao is increasing at the rate of 2,000,000 lb. per annum, and it might be added to almost without limit.

INSECT NOTES.

TRANSPORTATION OF MILLIONS.

Great interest is being taken in this fish in many parts of the world, in consequence of the fact that it feeds on, and thus destroys, mosquito larvae. In order to facilitate its distribution, a consignment of the fish has been sent by the Commissioner of Agriculture to the Zoological Gardens, London, and the following hints in regard to its transport have been embodied in a leaflet by Mr. H. A. Ballou, M.Sc., Entomologist to the Department:—

Millions (*Girardinus poeciloides*, De Filippi) have been sent from Barbados to other West Indian Islands and to such distant points as Guayaquil and British Guiana, Jamaica, Bolivar, England and West Africa, with good success. A consignment has also been sent forward for the Federated Malay States, but no report has been received as to the condition in which these fish arrived at their destination.

It has been found that kerosene tins are very suitable containers for millions during transportation. Each tin is fixed in a wooden case, which allows for 2 inches of sawdust on all sides and at the bottom. This will prevent sudden changes of temperature in the water. The open top is protected by a cover, in the event of cold weather being experienced. A piece of mesh wire (about 8 or 10 mesh) is fixed inside the tin above the water in such a way as to prevent the fish from being thrown out if the water splashes when the tins are being handled, or if the ship rolls violently.

Millions are very general feeders; they will attack mosquito larvae, small crustaceans and many other forms of minute aquatic life. They will eat, in captivity, plant lice, bits of meat, bread, biscuit, cornmeal, and of hard-boiled eggs.

Millions in captivity are fairly hardy, and do not suffer so much from lack of attention as do many other kinds of fish. They thrive so much better with good care, however, that it pays to keep the water clean and fresh, and free, as far as possible, from bits of food and other organic matter which will decay and foul the water. While in transit, a careful cleaning of the tins once a week should be sufficient. Each tin of 5 gallons capacity should contain not over 3 gallons of water, which should be sufficient for from 200 to 300 fish. In cleaning the tins, about 1 gallon of water should be taken out with a siphon, and at the same time all sediment should be removed, and any dead fish as well. Fresh water should be added to make up for that removed, and this should be at the same temperature as that in the tin. If the water to be added is suspected of being exceptionally hard or alkaline, it will be best to test it before putting it into the tins. A few fish should be taken from one of the tins and kept for a few hours in the water under trial. It can soon be seen whether the water is suitable for the purpose.

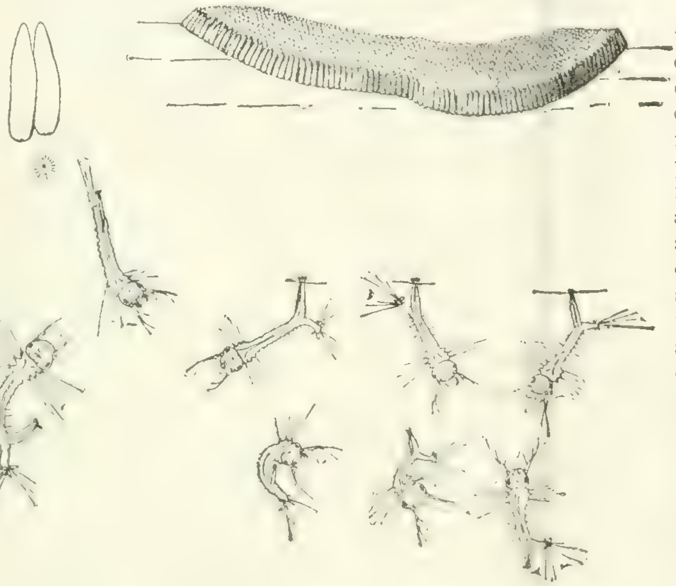


FIG. 30. EGGS AND LARVAE OF MOSQUITO.
(U. S. Department of Agriculture.)

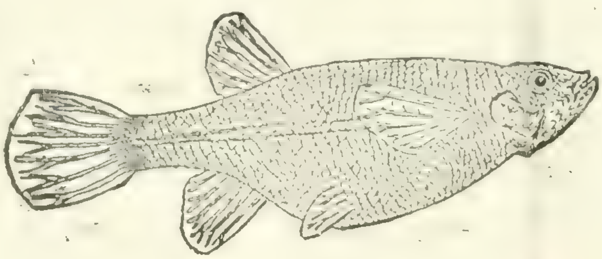


FIG. 31. '*GIRARDINUS POECILOIDES*', DE FILIPPI.
(About twice natural size.)

The tins containing the fish should be placed in some convenient, sheltered spot on deck in charge of some one on board. It should be remembered that low temperatures are fatal to these fish, and that if cold nights are experienced, the tins should be screened with the cover provided, and if necessary, should be moved to warmer quarters. The fish should be fed on very finely-chopped raw beef, or hard-boiled egg similarly treated, varied with a small amount of cornmeal or bread crumbs. About half a teaspoonful at each time will be sufficient and no more should be given. The fish should be fed only once in two days. It will not be necessary to remove the wire for the purpose of feeding them.

A consignment of millions recently taken from Barbados in March last, intended for use in Southern Nigeria, is reported to have suffered severely from the cold on approaching England. Many of them, it is also reported, died as a consequence of the jarring and shaking which they experienced on the railway journey from Southampton to London, where the survivors were cared for at the Zoological Gardens, and again on the return from London to the point of embarkation for West Africa. The rough handling which the containers received in the surf boats at Lagos caused the death of the remainder, and none were landed alive.

On arrival at their destination, millions should at once be placed in a good-sized tank with fresh water, and they should be fed with all they will eat for a few days. The action of green algae and water weed in the tank in aerating and purifying the water is very beneficial.

It may be added that a fish called 'toddo-birre' (*G. Guppii*), which is closely related to millions, is being used for mosquito destruction in Suriname.

THE PARASITIC FUNGI OF SCALE INSECTS IN THE WEST INDIES.

The following is a short account of the parasitic fungi which have been found on scale insects in the West Indies up to the present time. The presence of some of these forms has been recognized for several years, but the careful work of the Staff at the Florida State Agricultural Experiment Station has recently brought their economic importance into considerable prominence and has stimulated investigations on the subject in several countries.

As at present known, there are four species of fungi parasitic on scale insects in these islands, namely, the red headed, the white headed, and the black fungi, with a species on shield scales. Reference has been made to these from time to time in the *Agricultural News*, but it is thought that a short summary of the subject, with a description of the superficial appearance of these fungi, an account of their distribution and the methods that can be employed to spread them, may not be out of place.

THE RED HEADED FUNGUS (*Sphaerostilbe coccophila*). This fungus has long been known as a parasite on many forms of scale insects, and on white fly. Its delicate white mycelium attacks and kills the insect, leaving it dry in appearance and, usually, easily detachable from the leaf or stem on which it was growing. The fungus then forms a very small red outgrowth from one end of the insect; the outgrowth is usually more or less elongated and bears on its upper surface numerous sickle-shaped, hyaline, quadricellular spores. This is the conidial stage of the fungus. Later, it becomes darker in colour and produces on a red stroma numerous small hemispherical boxes or perithecia in which the ascospores are borne. The ascospores are oval, hyaline and bicellular.

The fungus has up to the present been found in Dominica, St. Lucia and Grenada on the white snow scale (*Chionaspis citri*), on limes; on the black line scale (*Ischnaspis filiformis*), on *Ficus* sp.; and on the purple scale (*Mytilaspis citricola*), on limes. It is stated that in Florida this fungus can do a large amount of damage to scale insects without being visible to the naked eye, and it seems probable that the same is the case in these islands.

THE WHITE HEADED FUNGUS (*Ophionectria coccicola*). This fungus forms a white, knobbed outgrowth from the dead scale, and bears on the surface of the knob very numerous quadricellular spores, three of which are usually united together at the base on a common stalk cell. The later stage consists of numerous, slightly brownish boxes of perthecia, similar in shape to those of the red headed fungus, borne on a brownish stroma and containing the multicellular ascospores. It has so far only been found in Dominica on the purple scale on the leaves of a citrus plant. It is, however, found frequently in Florida and its distribution is probably more general in the West Indies.

THE BLACK FUNGUS (*Myriangium Duriaei*). This fungus forms black crusts on branches of trees, more especially lime trees infested with the white snow scale and the purple scale, and has been found in St. Lucia and Barbados. The black crust, or stroma, grows out from the scale and contains in its substance softer areas of colourless cells in which the asci are sunk. These are more or less spherical and contain eight multicellular brown spores. The fungus must not be confused with black blight, from which it is easily distinguished by its limited extent, and thicker, more definite appearance.

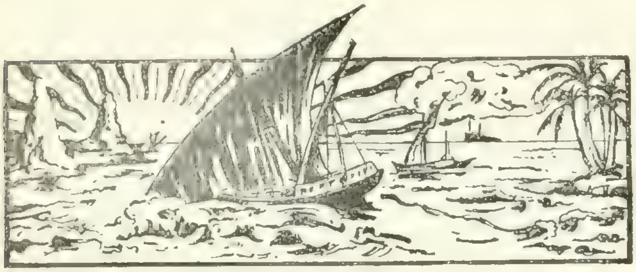
THE SHIELD SCALE FUNGUS. This forms a slightly buff-coloured fringe round several species of shield scales (*Lecanium*), including the brown shield scale (*L. hemisphericum*), the mango shield scale (*L. mangiferae*), the soft shield scale (*L. hesperidum*), the green scale (*L. viride*). The scales become dry and papery, and are eventually covered with a buff-coloured growth of this fungus and its spores, in addition to the fringe that spreads out all round the scale, from underneath it. The appearance is characteristic, and when once seen, not easily mistaken. It has so far been found in Barbados, St. Vincent and Grenada.

These are the main species found up to the present; but it seems probable that further investigations will reveal the presence of one or two more forms, as well as the more general distribution of those already observed. Most of them, with the possible exception of the last, prefer fairly moist conditions, and it is probable that the growing of Bengal beans as a shade for limes in Montserrat has favoured the development of the red headed fungus. (See *Agricultural News*, Vol. VIII, p. 154.) Where these useful parasites are known to exist, an occasional spraying with clean water, of the tree on which they are growing, would help them to tide over a dry season and enable them to establish themselves more vigorously on the scale insects as the number of these increases. The fungi may be spread very simply. If a tree is known to contain them, branches showing the fungi may be cut off and tied into the upper branches of those which it is desired to infect; the spores will then be carried by rain, wind or insects to the scales on neighbouring branches and, when once established under satisfactory conditions, the fungus will keep the scale well in check.

For the purpose of aiding in distribution, also, experiments are in progress at the Head Office of the Department for the purpose of obtaining cultures of these fungi on various nutrient media, for distribution to the Botanic Stations. The fungi can be washed off the medium into about a quart of water, and the spores and portions of mycelium sprayed on to the trees infected with scale insects by means of a clean sprayer. When once established, the fungi can be further spread by means of the tying method already described.

From what has been said, it will be evident that the fungi are doing much useful work in keeping these insect parasites in check, and it is hoped that they may be turned to even better account in the future. In connexion with this, another result of some importance which might be expected to follow the reduction of the numbers of scale insects is a perceptible diminution in the amount of black blight. This fungus (*Capnodium* sp.) follows the scale insects and, according to the generally accepted account, lives on the 'honey dew' secreted by them. (See *Agricultural News*, Vol. VII, p. 161.)

Any information with regard to the distribution and hosts of any of the species of fungi described above, or the possible presence of new species would be acceptable, and should be communicated to the local officers of the Department. In the *Agricultural News*, Vol. II, p. 32, there is a report of the presence of the red headed fungus and an unidentified form, probably *Sporotrichum*, in Dominica, on the white snow and purple scales; and on p. 216, of what is probably *Sporotrichum* on the brown and mango shield scales in Antigua. Vol. X, p. 42, of the same publication contains a reference to the presence of red headed fungus, and probably *Sporotrichum*, on white snow and purple scales in Dominica. In Vol. VIII, pp. 186 and 202, several details and a complete account of the methods of spreading the fungi are given.



GLEANINGS.

The loss in weight of an ordinary fowl by bleeding and plucking amounts to about 12½ per cent. of the live weight.

In Japan (not including Formosa) the cane crop for 1908 was nearly 495,000 tons. From this, about 45,000 tons of sugar was obtained, which gives a yield of 9·5 per cent.

The Queensland sugar crop for 1908 was 151,098 tons, which is the smallest yield for four years. The number of sugar factories in the State is fifty-three, of which forty-eight produce raw sugar.

For the cotton crop of 1908 in the Virgin Islands, 3,600 lb. of selected Sea Island cotton seed was distributed. Most of this was given out free, and a small portion was sold at 2½*d*. per lb.

It has been found at the St. Lucia Botanic Station that the percentage germination of seeds of the Maniçoba rubbers (*Manihot dichotoma* and *M. piauhyensis*) may be increased by slightly filing them at the end nearest the radicle.

A plot of improved Indian corn is kept at the Grenada Botanic Station, and from it a good type of twelve-week corn has been obtained by constant selection. The seed of this is regularly distributed to peasants in the island.

A company called the Sugar Beet Syndicate has been formed in England recently. In connexion with its operations, a site for a beet sugar factory, which will be capable of dealing with the produce from 3,000 acres of beet, has been chosen.

The *Nord-Australische Zeitung* states that wild wheat from which the cultivated varieties have been probably derived, has been found growing in Upper Galilee, in the mountains of Naphthali. It is said to thrive in a shallow soil, on stony ground.

The area of land in Hawaii now occupied by forest reserves is 545,761 acres, of which 357,180 is government land. The principle on which the land is chosen for these is to reserve that which is not to be put to direct use, and to employ what is suitable among it for forest.

Experience at the Botanic Station, Antigua, has shown that the yield of broom corn depends to a great extent on the supply of water during the first month or six weeks after sowing the seed. At this period, the growth is comparatively slow, and a fair rainfall during it generally leads to good returns.

The report by the British Vice-Consul at Zanzibar on the trade of that Protectorate in 1908 states that, from the planting of young Ceara rubber trees in the Government plantations and the distribution of seed to native cultivators by the Agricultural Department, there should be a total of 400,000 young trees now growing in Zanzibar and Pemba.

The quantity of cacao shipped from Trinidad from the beginning of the present year to the end of last month was 39,907,499 lb., as compared with 34,763,102 lb. for a similar period last year. Of this, 2,057,666 lb. was exported during August, as follows: to the United States, 1,005,249 lb.; to the United Kingdom 245,124 lb.; to other countries, 807,293 lb.

The value of the exports from the Protectorate of Uganda for the two months ending May 31, 1909, were: food, drink and tobacco, £1,735; raw materials, £18,256; manufactured material, £106; making a total of £20,097, as compared with £27,109 for a similar period in 1908. Of the value of the raw material exported in the former period, £6,017 was that of ginned and unginned cotton.

An account was given in the *Agricultural News*, Vol. VIII, p. 107, of the Chinese tallow tree (*Sapium sebiferum*), and it was stated that it was hoped to obtain cuttings or seeds of it for propagation in the Botanic Gardens of the British West Indies. Seeds of the plant have recently been obtained from Kew by the Commissioner of Agriculture, and are being distributed among the Botanic Stations in the Windward and Leeward Islands.

The revised figures of the cotton crop of the United States for 1908 show that 13,537,306 bales of 500 lb. each were produced. This is nearly one million bales larger than the average crop of the last five years. In spite of this yield, the demand for cotton in that country is increasing faster than the supply, and there are indications that, before many years have passed, there will be no raw cotton for export from the United States. (*Hawaiian Planters' Monthly*, July 1909.)

Experiments that have been conducted at the Florida Agricultural Experiment Station show that the juice of the guava contains more than 90 per cent. of water, together with a small percentage of pectin, acid and colouring matters. The pure jelly usually consists of about 75 per cent. of sugars and 20 per cent. of water, the rest being made up of pectin, acid, etc. As the result of trials it is suggested that, in order to obtain a uniform product, the same proportions of water and sugar to juice should always be taken, and the mixture should always be boiled to 235° F.

STUDENTS' CORNER.

SEPTEMBER.

SECOND PERIOD.

Seasonal Notes.

By this time the sugar-cane will have reached a stage at which its growth will give indications of the soil conditions beneath it. The first of these is always that which has relation to the supply of water, as plants are more quickly and seriously affected by a lack of this than of any of the other substances which they take in. If the weather has been somewhat dry, a good opportunity will be afforded to take note of the difference between canes which have been mulched either with a dust mulch or with vegetable matter (trash) and those growing in soil which has not been mulched at all. Why is it that water does not rise through a mulch to any great extent ? What effects on soils, beside that of assisting to conserve water in them, are due to the presence of a vegetable mulch ? Where some fields of cane have been green dressed with leguminous plants, while others have had a dressing which is non-leguminous, note if there is any difference in the appearance of the plants in the two cases. If there is, to what may the difference be due ?

Under the wet conditions of this time of the year, fungi will be prone to increase, especially on those plants which are most susceptible to their attacks, that is cultivated plants. A consideration of the question why plants which are raised in any quantity, and with a view to obtaining a product which is superior to the forms of it found in nature, are most likely to be damaged by pests should lead to some useful conclusions. Read the editorial in the present issue of the *Agricultural News*, and look up the references there cited, as far as possible. Although it deals more particularly with cotton blights, much that is said in it is of general application. Remember that the control of fungus and bacterial pests (as well as of many insect pests) is far more a matter of prevention than of remedies after the disease has appeared to a dangerous extent. This is important, for there are generally several measures which will help greatly in the matter of prevention, while there are only one or two remedies (which are none the less important when disease has been allowed to break out severely) that can be applied economically, and even then, not always with perfect confidence in their effectiveness. In relation to preventive measures we may consider separately the soil and the plant. With regard to the former, good cultural operations will make it of less use in harbouring pests until a host plant is provided, and will produce a condition which will lead to the growth in it of good, healthy plants that are well able to resist disease ; while rotation of crops will starve such pests out. As far as the plant is concerned, it will be greatly aided by the provision of good, healthy propagating material (such as seeds and cuttings), which has been raised if possible from disease-resistant varieties. Care in this respect is especially necessary if the material is being introduced from another island, as the bringing of a pest to a place where its natural parasites are either absent or in partial abeyance is bound, in the end, to lead to serious damage.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the benefits to be derived by the soil from (a) surface cultivation, (b) thorough cultivation ? When should these processes be performed ?

(2) What is the function of the root-hairs of plants, and the connexion between them and the 'film-water' of the soil ?

(3) What are the chief systems of bones in the legs of a horse ? The metacarpus of draft horses has a carrying strength that is more than 31 per cent. greater than that of the same bone in carriage horses. Why is this ?

INTERMEDIATE QUESTIONS.

(1) What is a fungus ? Give a general account of the characters and life-history of a fungus.

(2) Give general information in regard to soil and cultivation in the case of maize.

(3) Briefly discuss the effects of soil on climate, and of climate on plants.

The Effect of Moisture on Stored Sugar.

The following information regarding the deterioration of sugars is given in Bulletin 9, Division of Physiology and Plant Pathology, Hawaii :—

In a bulletin published by the Division of Agriculture and Chemistry about a year ago on the deterioration of sugars on storage, an experiment was described which was undertaken 'to determine the percentage of water which it is safe to leave in sugars '. Separate portions of a sample of moist sugar containing fermenting organisms were dried in a vacuum so as to contain decreasing amounts of moisture from 1·86 to 0·29 per cent.

The samples were polarized and put into tightly stoppered bottles. At the end of one and two months they were polarized again, and it was found that, in those samples containing more than 1 per cent. of moisture, the polarizations were lower than originally.

These samples have been recently polarized again after standing twelve months, and the results further confirm the original conclusion that raw sugars containing 1 per cent. or more moisture are liable to deteriorate on storage. The original table with the further polarizations added is given below :—

Moisture Per cent.	Polarization. Initial.	After 1 month.	After 2 months.	After 12 months.
0·29	96·8	96·7	96·7	96·5
0·40	96·6	96·6	96·6	96·5
0·47	96·8	96·6	96·6	96·2
0·59	96·8	96·6	96·7	96·4
0·65	96·4	96·4	96·6	96·2
0·74	96·4	96·4	96·5	96·2
0·96	96·1	96·0	96·0	95·7
1·04	96·0	95·9	95·7	95·1
1·18	96·0	95·2	95·2	94·6
1 28	95·8	95·0	95·0	94·2
1·36	95·8	95·0	94·7	94·4
1·51	95·5	94·7	94·5	93·8
1·67	95·6	94·2	94·1	93·4
1·80	95·3	93·8	94·0	92·7
1·86	95·15	94·4	94·0	93·1

Notwithstanding that the bottles were closed with rubber stoppers, the sugar was so hygroscopic that the samples had nearly all increased slightly in moisture during the year, which accounts for the lower polarizations of those containing less than 1 per cent. of moisture.

COMPARISON OF CORN AND OATS AS A FOOD FOR HORSES.

An account of experiments which have been conducted for the purpose of making a comparison of corn and oats as food for horses engaged in farm work is given in Bulletin No. 25 of the Ohio Experiment Station. The horses used in the trials were similar to those engaged in ordinary farm work in that State. The following are the conclusions given in the bulletin to which reference is made :—

While the work reported in this bulletin has not been conducted for a sufficient length of time nor with enough animals to justify any very comprehensive statements, yet it seems that some facts have been pretty well established. The work is being continued and it is hoped that the cumulative effects, if any result, of the long continued use of grain rations made up exclusively of corn and of oats may be determined. The following statements, based upon the work done thus far, seem to be warranted by the data presented heretofore. It must be understood that the horses were mature geldings, and that mixed clover and timothy hay were fed.

The corn-fed horses endured hard work during hot weather, as well as did the oats-fed horses.

The use of corn to the exclusion of other grain for a period of forty-eight weeks was not detrimental to the health of work horses.

The use of corn for work horses did not induce laziness and lack of endurance. Neither did the use of oats induce increased spirit and endurance.

When mixed (clover and timothy) hay was fed to mature geldings at general farm work, ear-corn was practically as efficient, pound for pound, as oats.

On the basis of the results of this experiment and statistical records of farm values of grain, corn has, since 1866, been cheaper than oats as a grain feed for work horses.

The drop in weight of the corn-fed horses, coincident with the beginning of the use of shelled corn, indicates that ear-corn is to be preferred above shelled corn for work horses.

Farm animals should be fed according to their needs. Their needs depend, of course, upon the product that they yield. Work horses are kept for applying energy and should be supplied with food that will furnish the required energy at the least possible cost, all things considered.

There is a wide difference in the efficiency of horses in utilizing food. This is well illustrated by the record of a horse used in this experiment. There is an individuality in work horses as well as in other farm animals. Horses that are notably hard to keep in good condition should be replaced by ones that may be maintained at less cost.

The data presented do not prove that, for use with pure timothy hay, ear-corn is as efficient, pound for pound, as oats. Neither is any evidence at hand to indicate that a grain ration made up exclusively of corn is suitable for brood mares with foal or in milk, or for young, growing horses.

When the weights of the horses for the year previous to the experiment are compared with the weights secured during the experiment, it is seen that the exclusive use of either corn or oats has not had any bad effect upon the horses. There is no positive proof, however, that a mixed ration would not be more efficient than one made up exclusively of corn or of oats. This experiment does show, nevertheless, that corn is a valuable feed for work horses and should be given a large place in their rations, whenever market conditions warrant its use.

It is obvious that feeds for work horses should be palatable, efficient and economical. As far as palatability is concerned, corn seems, in the experience of this station, to have a slight advantage over oats, although this will depend to a considerable extent upon the individual appetite. The results obtained thus far in the experiment reported in the bulletin indicate that corn is an efficient food for work horses. The bulk of an amount of ear-corn equal in feeding value to the usual amount of oats is small—so small that a casual observation might lead one to believe that too little corn was being used. As regards economy, ear-corn is usually cheaper per pound than oats, while this experiment indicates that ear-corn and oats are worth approximately the same per pound for feeding under the conditions stated previously.

Further work along this line, with additional horses, is now under way, and will be reported later.

ANTIGUA AGRICULTURAL AND COMMERCIAL SOCIETY.

A general meeting of this Society was held on August 6. The chief subjects for discussion were the improvement of stock in the island, and the adoption of a system for the interchange of material for planting, especially cane-cuttings.

The report of the Stock Committee on the question of the introduction into Antigua of pedigree animals was read and unanimously adopted. Its chief recommendations were : that, as regards large stock, the pedigree animals most urgently required in Antigua were for the improvement of horses, donkeys, and cattle, and in that order : that enquiries should be made, in connexion with the last, as to the capabilities, suitability, etc., of Gujerat cattle and the water buffalo ; that, as regards the smaller stock (goats, sheep, and pigs), means of improvement were required : that the granting of bonuses to importers would encourage the purchase of pedigree stock, and that these should be a high percentage of the value of the animal, in view of the consequent encouragement to get the best animals : and, finally, that the receiver of such a bonus shall not charge more than a certain definite amount in respect of services by the imported animal, and that he should not be compelled to grant more than a reasonable number of services for that price.

In respect to the subject of the distribution of planting material, the following motion was brought before the Society and, after favourable discussion, carried unanimously :—

'That, in the opinion of the Society, it is very desirable that the practice of exchanging cane-cuttings for planting be encouraged among estate owners and managers.

'That, in order to facilitate this, a notice board be kept in the Society's room, on which members should have the privilege of posting notices with regard to the exchange, sale or purchase of cane-cuttings, seeds, etc.'

THE WEST AFRICAN OIL PALM AS A SHADE TREE.

Information in connexion with the West African oil palm (*Elaeis guineensis*) has been given from time to time in the *Agricultural News* (Vol. V, p. 366; Vol. VI, p. 206; Vol. VII, p. 373). In addition to the uses there mentioned, it is stated in the *Journal d'Agriculture Tropicale*, Nos. 23 and 46 (from which some of the following facts are taken) that it is employed in some parts of West Africa as a shade tree for cacao, and that it has been suggested in the same connexion for vanilla. In addition, it is sometimes used there to provide shade for leguminous plants, and in the nursery and kitchen garden.

Among the chief requisites of a shade tree are that it should be of quick growth and yet not capable of attaining such a height as to be no longer of use in intercepting the rays of the sun. It should not draw extensively on the plant food in the soil, and should be able to flourish under very different conditions of this. The shade provided by it must not be so deep as to prevent the plants beneath it from getting sufficient light. As it will most probably have to resist the force of high winds, the fibres in the stem must not be brittle. In special cases, too, the leaves must persist during dry seasons and the plant must be of a kind which will not suffer by the removal of branches or leaves for the purpose of regulating artificially the amount of shade. Finally, it is an advantage if such a tree is capable of yielding a product of commercial value.

The oil palm has been found in West Africa to fulfil all these conditions, although as regards the first, some inconvenience is caused by the fact that it takes three years for the bunch of leaves that it forms near the level of the ground to leave a clear space of 6 feet above it. Its height does not often exceed 36 feet. As far as soil conditions are concerned, it is not exacting, growing almost equally well in dry or wet land, and in rich alluvial or poor soils; in addition, it does not injure that which is occupied by neighbouring plants. The large leaves, which are 12 feet and more in length, stretch out in every direction and at all angles, forming a shifting shade that is never too dense. The resistance which it offers to the wind is due both to the density of its root system and to the ease with which it bends, and is said to be only equalled by that of the cocoa-nut palm. No injury to the sheltered plants is to be apprehended from the falling leaves, for, like those of all palms, they are persistent at the base, so that if they are broken by the wind or withered by age, they hang vertically as they dry up and then, when they finally part from the tree, slide gently to the ground, close to the trunk. An additional advantage is derived from the fact that, as the part which provides the shade is borne at the top of the stem, at a distance from the ground, the air is allowed to circulate freely among the plants beneath it.

The conditions are also fulfilled by this palm, as a shade tree, in the special cases where continual shelter from the sun is required, and where the amount of this must be capable of being regulated. Owing to its very nature, it always possesses leaves, whether the season is wet or dry. From the same cause, too, it has no woody branches which have to be removed when it is desired to lessen the amount of shade, so there is no risk of injury in doing this. On the contrary, it is only a matter of the reduction of the number of leaves—a process which is at once easy and safe. Then, when the time of year arrives at which more shade is required, the spaces are speedily filled up by the quick growth of new leaves.

The utilization of the oil palm as a shade tree for cacao is simple where, as in many parts of West Africa, this plant is already present in large numbers—to such an extent, indeed, that it is often necessary to reduce them by thinning out, before it can be employed for the purpose. In such cases, the cacao can be raised directly under the shade already provided for it. It is a different matter when the palms have to be raised for the special purpose. The chief difficulty arises from the fact that, for about three years from the time of planting the seed of the palm, it would not be possible to place the cacao where it was required to grow. There are two reasons for this. In the first year, the few rudimentary leaves do not supply sufficient shade; in the second and the third, the large leaves that would be produced would stretch out near the ground, providing little shade, and injuring many young plants near them. In this way, time is lost. It may, however, be possible to effect a saving of this by utilizing the time that elapses before the cacao is planted out, in growing the palm where it would be required; but this is a matter for practical trial under the special conditions of any given country.

In making new plantations of the palm in countries where it grows in a wild state, the young plants are simply taken from where they have sprung up near the old ones. Where it does not grow in any quantity, it is necessary to raise them in nurseries and then to plant them out. The best time for transplantation is at least one year from the sowing of the seed. At this period, if it is set out during wet weather, the young plant easily survives any injury that it may have received, and has the best chance of attaining the required development by the end of the third year.

Reference to the articles in the *Agricultural News* that have already been cited will show that this plant amply fulfils the condition where it is desired to employ a shade tree that yields a product of commercial value. In countries, however, where it grows in large numbers, it is not only esteemed for the valuable oil that is obtained from the fruit. By various methods of bleeding the trunk, a fermentable liquid is obtained from it, and, like the cocoa-nut palm, it is made to provide fences, food, shelter, clothing and fuel.

RICE IN BRITISH GUIANA.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated September 4, 1909, gives information as follows:—

The weather during the past fortnight has been favourable on the whole, though high winds accompanied by heavy showers of rain have done some little damage to the ripening rice. Although the weather was favourable for milling, very little has been done, as there is no paddy in millers' hands, stocks being about exhausted.

The local demand continues brisk, and prices have been well maintained, several small lots having changed hands at the equivalent of 18*s*. 9*d*. per bag of 180 lb., f.o.b.

The large millers are endeavouring to complete deliveries on account of contracts made some time ago, and all stocks will, we expect, be cleared before the end of this month. New crop rice may be expected on the market about mid-October, but the bulk of the crop will not be reaped until end of October or early November.

We quote to-day, f.o.b. Demerara, for good export quality:—

18*s*. 9*d*. to 19*s*. 9*d*. per bag of 180 lb. gross.
17*s*. 3*d*. to 18*s*. 3*d*. „ „ 164 „ „

We have, however, no stock to offer for export.

MARKET REPORTS.

London,—The West India Committee Circular, August 31; Messrs. E. A. de Pass & Co., August 20, 1909.

Arrowroot—St. Vincent, 1¾*d.* to 3¾*d.*, according to quality.
Balata—Sheet, 2/5; block, 1/11.
Bees'-wax—£7 15*s.* to £8 for fair to good.
Cacao—Trinidad, 52/- to 63/- per cwt.; Grenada, 49/6 to 54/6 per cwt.; Jamaica, 48/- to 53.
Coffee—Depressed; Jamaica, 40/6 to 100/.
Copra—West Indian, £22 10*s.* per ton.
Cotton—Barbados, 14¼*d.*; stains, 6¾*d.* to 8¾*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 45/- to 50/-; low middling to middling, 51/- to 55/-; good bright to fine, 57/- to 65/-.
Honey—23/6 to 30/.
Isinglass—No quotations.
Lime Juice—Raw, 1/1 to 1/3 per gallon; concentrated, £18 to £18 15*s.* per cask of 108 gallons; Otto of limes 5/6, nominal.
Logwood—No quotations.
Mace—1/3 to 1/9.
Nutmegs—Steady.
Pimento—Common, 2⅛*d.* per lb.; fair, 2¼*d.*; good, 2⅜*d.*
Rubber—Para, fine hard, 8/2½ per lb., fine soft, 7/1; fine Peru, 8/2; Negroheads, Manaos 4/10½*d*; Islands, 3/2; Cameta, 3/7½; Peruvian, 4/4.
Rum—Jamaica, 2/11 to 7/-; Demerara, no quotations.
Sugar—Crystals, 14/6 to 17/-; Muscovado, 12/- to 15/- per cwt.; Syrup, 13/6; Molasses, no quotations.

New York,—Messrs. Gillespie, Bros. & Co., September 3, 1909.

Cacao—Caracas, 11¾c. to 12½c.; Grenada, 11¾c. to 12¼c.; Trinidad, 11c. to 12c.; Jamaica, 9¾c. to 11c. per lb.; Dominica, 11c. to 11½c.
Cocoa-nuts—Jamaica, select, $28·00; culls, $18·00; Trinidad, select, $27·00 to $28·00; culls, $17·00 to $18·00 per M.
Coffee—Jamaica, ordinary, 7½c. to 7¾c.; good ordinary, 8c. to 8¼c.; and washed 9½c. to 10c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, no quotations; Barbados, 50c. to 53c.; St. Thomas, St. Croix, St. Kitts, 47c. to 50c. per lb., dry flint; Antigua, 48c. to 50c. per lb.; Caburettas from 35c. to 40c. per skin.
Grape Fruit—$2·75 to $3·25 per box.
Limes—Dominica, $4·75 to $5·50 per barrel.
Mace—28c. to 34c. per lb.
Nutmegs—110's, 9½c. per lb.
Oranges—Porto Rico, $1·05 to $1·50 per box.
Pimento—4⅝c. to 4¾c. per lb.
Sugar—Centrifugals, 96°, 4·17c. per lb. Muscovados, 89°, 3·67c.; Molasses, 89°, 3·42c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., September 1, 1909.

Cacao—Venezuelan, $11·50 per fanega; Trinidad, $11·25 to $11·50.
Cocoa-nut Oil—$1·00 per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—$3·75 per 100 lb.
Dhal—$4·00 per 2-bushel bag.
Onions—$2·25 to $2·50 per 100 lb.
Peas—Split $5·50 to $5·75 per bag.
Potatos—English, $1·25 to $1·50 per 100 lb.
Rice—Yellow, $4·70 to $4·80; White, $5·00 to $5·25 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., September 11; Messrs. T. S. Garraway & Co., September 13; 1909.

Arrowroot—St. Vincent, $3·75 to $4·00 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Cocoa-nuts—$14·00.
Coffee—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., according to quality—scarce; Venezuelan, $11·00.
Hay—$1·20 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00.
Onions—Strings, $3·00 per 100 lb.
Peas—Split, $6·20 per bag of 210 lb.; Canada, $4·10 per bag of 120 lb.
Potatos—$2·50 to $3·25 per 160 lb.
Rice—Ballam, Calcutta, no quotations; Patna, $3·80; Rangoon, $3·00 per 100 lb.; Demerara, Ballam, $4·78 to $5·25 per 180 lb.
Sugar—Dark Crystals, 96°, no quotations; Muscovado, 89°, no quotations; Centrifugals, no quotations.

British Guiana.—Messrs. Wieting & Richter, August 7; Messrs. Sandbach, Parker & Co., September 3; 1909.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 to $9·00 per 200 lb.	$8·50 to $9·00 per 200 lb.
Balata—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	48c. to 50c. per lb.
Cacao—Native	14c. per lb.	12c. per lb.
Cassava—	60c. to 72c.	——
Cassava Starch—	$6·00 per barrel of 196 lb.	——
Cocoa-nuts—	$12 to $16 per M	$16 per M, peeled and selected.
Coffee—Creole	8c. to 13c per lb.	12c to 13c. per lb.
Jamaica and Rio	13½c. per lb.	13½c. per lb.
Liberian	7c. per lb.	7c. per lb.
Dhal—	$4·20 to $4·25 per bag of 168 lb.	$4·20 to $4·40 per bag.
Green Dhal	$5·50	——
Eddos—	$1·44 per barrel	——
Molasses—Yellow	21c. to 22c.	
Onions—Teneriffe	——	No quotation
Madeira	2¾c. per lb.	2¾c. to 3c. per lb.
Peas—Split	$6·00 to $6·30 per bag (210 lb.)	$6·40 to $6·55 per bag (200 lb.)
Marseilles	$3·00, over stock	$3·00, over stock.
Plantains—	20c. to 48c. per bunch	
Potatos—Nova Scotia	No quotation	$3·25 per barrel.
Lisbon	$2·00 per 100 lb.	No quotation
Potatos—Sweet, Barbados	$1·20 per bag	
Rice—Ballam	$4·50	$4·75
Creole	$4·40	$4·00 to $4·50
Tannias—	$2·64 per bag	—
Yams—White	$3·50 per bag	——
Buck	$3·12 per bag	——
Sugar—Dark crystals	$2·17½ to $2·40	—
Yellow	$2·90 to $3·00	$3·00
White	$3·60 to $3·80	$3·60 to $3·80
Molasses	$1·90 to $2·00	$2·00 to $2·30
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba Shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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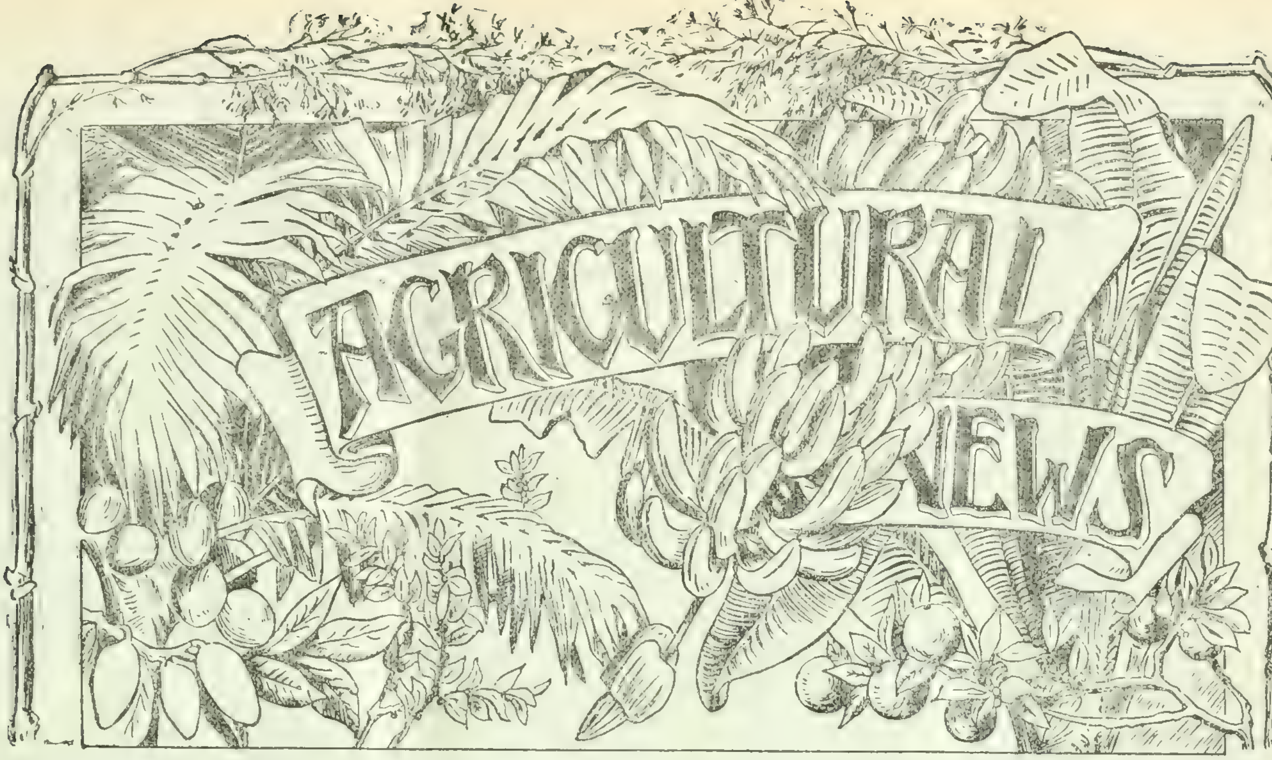
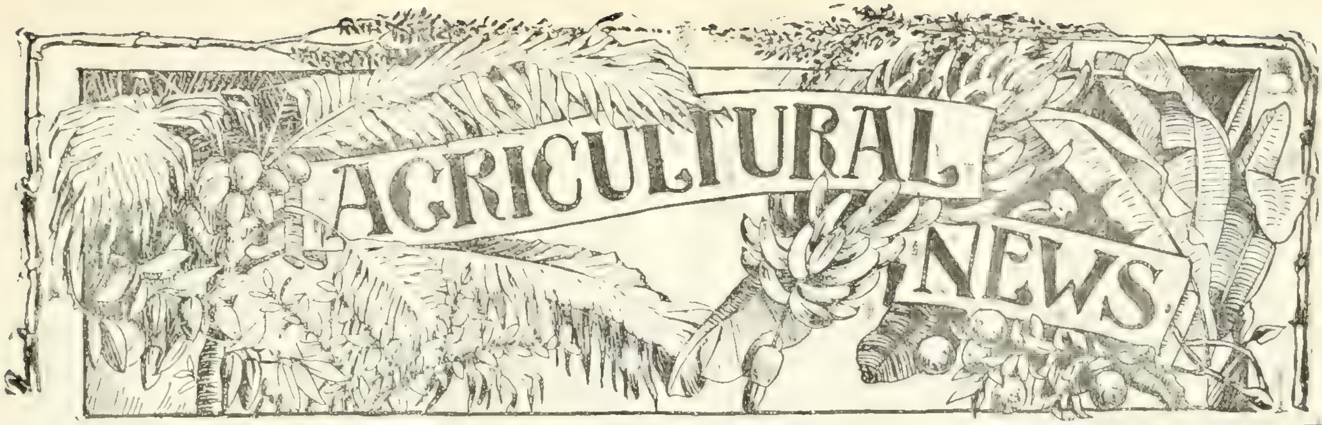


Vol. VIII. No. 194.] SATURDAY, OCTOBER 2, 1909. [One penny.



A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

Vol. VIII. No. 194. BARBADOS, OCTOBER 2, 1909. Price 1*d*.

CONTENTS.

Selection in the Breeding of Estate Animals.

At the present time, much is being written about the beneficial results of careful selection in the production of better strains of plants, such as corn, cotton, fruits and sugar-cane. The general principles of selection are fundamental, and may be applied with success to the breeding of animals, such as cattle for beef, for milk production and for draught, horses for draught or for speed. Donkeys, mules, sheep, goats, rabbits and poultry may all be improved by careful selection of the parents, by the use of good judgement in fixing upon the desirable characters, and in rejecting, as far as possible, all others. Selection as a process for the improvement of plants is beginning to be understood in a general way in the West Indies, and it might be well if certain points were brought forward for consideration in connexion with the improvement of estate animals by this means.

On most estates in the smaller islands, cattle are maintained only for purposes of draught, and the milk and butter needed are obtained from such cows as happen to be in milk. The animals used for beef are generally imported, or are estate animals which have not been raised as beef animals. On other estates, a point is made of the production of milk for sale. For each of these lines of work, different points would have to be selected, and it would be necessary, before starting out, to fix a definite system, and always to select with a view to the continuation of the same desirable points from generation to generation.

In the first place, whatever line is decided upon, the parents must be good animals of their kind. It hardly needs to be stated that poor, scrubby, undersized, weak animals are not suitable for breeding purposes. On many West Indian estates it would be possible to maintain cows for breeding only. They should be well fed, and kept in good condition. Estates which buy, on the average, ten working cattle every year might well keep ten or twelve selected cows as breeders. Most estates would keep a bull for breeding only. If these cows and the bull possessed the qualities which were most to be desired in the offspring, it will easily be seen that the estate would produce its own supply of cattle of the type desired. All the offspring, male and female, could be trained for draught except a few of the best of the females, which should from time to time be selected for breeders. The males which have been bred in the herd should not be used as sires in the same herd, nor should the same sire stand at the head of a herd for more than three or four years at a time, except for the strengthening of certain especially desirable characters, and then care should be exercised not to weaken the animals in some other particular. The strength of the herd should be kept up by the periodical introduction of strong young males from other herds, whose animals possess in a marked degree the desired qualities. For general estate purposes, the Indian breeds of cattle, the Zebu and the Mysore, are especially adapted, since they are capable of making their greatest development, and of maintaining good health and vigour under the peculiar conditions of a tropical climate. They also provide the necessary size and weight for draught animals, and often develop good milking qualities.

It is well known that certain breeds are well established as beef, and others as dairy, animals. Under conditions of intensive agriculture, these two types are kept separate, for it has been found that the best beef animals are not often profitable for dairy purposes and that the best dairy animals are not usually suitable for beef production. Many of these breeds have been introduced during past years, and cows possessing some of their characters in a marked degree may be easily recognized.

Dairymen find that, in addition to maintaining the desired breed characters, it is also necessary always to select for individual characteristics. The production of milk and butter is often an individual character, that is to say the variation in these points is often greater between individuals of the same breed than between individuals of different breeds. The ability to produce large quantities of milk, or milk containing a high percentage of butter fat, is a characteristic which has relation to breed.

The amount of milk produced by any individual cow may be greatly varied by the quantity and quality of the food: but the quality of the milk, that is to say the percentage of butter fat, cannot be changed. It is a characteristic of the individual. The amount of butter produced by a cow may be increased by care and good feeding, but the increase in butter is a result of an increased flow of milk, and not of a change in the quality of the milk. The appearance of the dairy cow should be an indication of her milk-producing abilities, in the same way as the appearance of others would indicate their suitability for draught and beef animals.

A dairy cow should be able to convert food into milk and butter to the best possible advantage, while the beef animal should produce tender flesh, and the draught animal bone and muscle. It is obviously unwise to expect that the machinery—if the digestive and secretory organs of the cow may be so designated—which has for its object the conversion of food into milk should be expected to manufacture beef or muscle to the best advantage.

With regard to the qualities required on any given estate in the animals maintained for draught, the peculiar conditions on the estate should govern the selection. The size will naturally vary with the nature of the hauls: long pulls in which short, steep hills occur often are much better managed by comparatively small, wiry, nervous cattle, while long pulls on level ground and rough roads are often better done by heavier cattle with less nervous development. These are all points that should engage the attention of the estate owner, manager, or attorney.

More attention has been paid to selection in the breeding of horses than in that of cattle. Animals are chosen, because of their qualities, to produce offspring which should have all the desirable ones of the parents, possibly with some of them improved upon, or intensified.

The production of mules in the West Indies has not been accompanied by any systematic process of selection. Excellent sires have been imported, and when the limited number of mares available for this purpose is considered, it would seem that this is all that can be done. Much might be accomplished by selection in the matter of obtaining a better class of estate donkeys.

During the last few years a very considerable improvement in the local animals has resulted from the introduction of good sheep and goats. Many of these pure-bred and half-bred animals are not on estates, but it is within the province of the estate to make the most of the improved strains, and by weeding out undesirable animals and allowing those to reproduce in which desired characters are evident, to maintain a steady improvement. Rabbits, hares, and poultry all may be improved by similar means.

It is evident that much remains to be done in the matter of definite control of the breeding of animals for the production of improved kinds, and of obtaining carefully separated strains for definite purposes. The efforts made in this direction should not be confined to the importation of pedigree animals, but a definite and continuous selection of the dams, with certain ends in view, should be made, with the result that individuals will be obtained whose character has an intimate and useful connexion with the purpose for which they are used. In this way, a greater intensive efficiency of both the large and smaller animals will be gained.

SUGAR INDUSTRY.

Bacteria and the Deterioration of Sugars.

The subject of the deterioration of sugars through the action of bacteria is dealt with in an excellent manner in Bulletin No. 9 of the Division of Pathology and Physiology of the Hawaiian Sugar Planters' Association, entitled *The Bacterial Flora of Hawaiian Sugars*, by L. Lewton-Brain (sometime Mycologist to this Department) and Noel Deerr. The results of experiments showing the influence of moisture and of the time of storage in respect to the fall in polarization of sugars, which are also dealt with in this Bulletin, were given on page 301 of the last issue of the *Agricultural News*. The following facts are taken from that part of the publication which treats more particularly of the characteristics of the bacteria which are instrumental in causing the change.

The need for the enquiry arose from the fact that sugars in storage, and especially in transit from Honolulu to New York round Cape Horn, showed by test a lower percentage of sucrose after time had elapsed while they were in store or on the voyage. An investigation as to the cause of this was made, and it was found to be due to the action of the bacteria where a minimum of 1 per cent. of water was present. (Bulletin No. 24 of the Division of Agriculture and Chemistry of the above Association.) The connexion of micro-organisms with such loss has already been indicated by Shorey and Grieg Smith, and the subject is advanced much further in the present publication.

Five forms of bacteria were isolated from the sugars with which experiments were made, and exhaustive investigations of the behaviour of these on various solid culture media, in liquid media containing a known percentage of sugar and on commercial sugars, completed, together with the necessary control experiments. The chief changes due to the action of the bacteria that were demonstrated in the case of the liquid media were the destruction of sucrose, the formation of invert sugar and the production of gums. The first two of these were also shown to take place in the case of the sugars; undoubtedly the third occurs as well, but, in the light of the second series of experiments, there was no need to take special measures to elucidate this fact. Two of the bacteria (or, more correctly, bacilli) caused a very small amount of gum formation, and at the same time, the destruction of sucrose by them was smaller than that effected by the other three. The destruction of sucrose and formation of invert sugar was greatest in the case of these three bacteria, thus it appears 'that a faculty of rapidly inverting sugar is associated in liquid cultures with the formation of gums'. In one of these three types, the total of gums and reducing sugars formed was approximately equal to the original amount of cane-sugar present; in the other two, it was less, showing that other compounds beside invert sugar and gums were formed.

Where inversion took place to any great extent, it was invariably rapid, and in the case of two of the bacterial forms, had always reached its limit by the fifth day. As the liquid media became acid while the inversion proceeded, there was a probability that this was the cause that prevented further action of the bacteria, especially on account of the fact that neutral or alkaline sugars are usually regarded as having a better keeping quality than those which are acid. In order to obtain definite information on this point, the experiments were repeated with one of the more active of the bacteria, using an alkaline instead of a neutral liquid culture medium, with the usual controls. In the result, it was found 'that it is not the acids produced that inhibit the activity of the bacteria, but probably some of the other by-products'.

The experiments with the sugars are specially interesting. Here it was found that one sterilization of thirty minutes, at 100° C., of the material both for control and inoculation, was sufficient for the purposes of the investigation; heating for longer periods caused caking of the sugars through the condensed steam that ran down inside the flasks. The cultures of the bacteria under examination were introduced into the flasks containing sugar for inoculation in the form of a liquid spray, driven under the same pressure and for the same time in each case. Before this, the controls had been treated in exactly the same way, with the substitution of sterilized water for the cultures. In this way, the condition as regards infection in the several inoculated flasks, and as regards moisture in all instances, were made as nearly alike as possible. The results obtained agree with those given by the liquid cultures containing sugar: the three gum-forming bacteria effected the largest destruction of cane-sugar and the greatest formation of reducing sugar.

In agreement with the results obtained by keeping sugars containing different percentages of water and determining the polarization from time to time (see the table reproduced from this bulletin on page 301 of the last issue of the *Agricultural News*), it was found that the amount of deterioration became greater with the percentage of water that was present, up to 5 per cent., the destruction of total sugars calculated on dry weight increasing with the greatness of the moisture content. At incubator temperature (30° C.) the process was much more rapid than at room temperature (25° C.). At 17° C., the growth of colonies of the bacteria was very slow, and it is probable that this would be the same with deterioration.

Preliminary work has been done in the direction of determining at what part of the process the introduction of bacteria takes place and the ways in which this may be avoided as far as possible. In a factory representing the older type of sugar-house design, it was found that a small part of the bacteria in the original juice survived its passage through the heaters, and that those which did so were also unaffected by the passage through the evaporators and pans, and appeared in the syrups and massecuites. A large infection took place at the centrifugals, through the water (though this was only a very small quantity) which was used mainly to wash down the spouts of the pug mills and the spindles of the centrifugals. Reinfection also took place through the reintroduction of low sugars, and the surface layers of the molasses and massecuite tanks always contained bacteria in large numbers.

The conclusions are finally reached that all means to prevent deterioration of sugars while in transit or in storage are only palliative at the best, and that the best remedies for it are the keeping of the factory in as aseptic condition as possible, the avoidance of the use of unclean water in or about the centrifugals, and the disinfection of the factory during the off season.

To Hasten the Germination of Hard Seeds.

The seeds are placed in a small sieve, or pocket, of wire gauze a few at a time, which is plunged into boiling water for a period of 10 to 20 seconds, depending on the hardness of the seed. In the case of small seeds, the sieve is plunged into cold water immediately after being taken out of the boiling water. The object of dealing with a few seeds only, at a time, is to ensure that the boiling water shall have the full effect. By this means, hard seeds were made to sprout in 10 days. (*Le Jardin*, Vol. XXII, No. 155.)

WEST INDIAN FRUIT.

MELONS AND OTHER RELATED FRUITS IN EGYPT.

Melons, cucumbers, vegetable marrows, pumpkins, vegetable sponges and the fruits of the calabash gourd are all grown to a great extent in Egypt, and their production and marketing are a source of industry to a large proportion of the inhabitants. The cultivation of these under the peculiar conditions of agriculture in Egypt is an interesting subject, and is treated of in the *Journal of the Royal Horticultural Society*, July 1909, from which the following is an abstract:—

The kind of sweet melon most commonly grown is known in Arabic as 'Shammam' (*Cucumis Dudaim aegyptiaca*). The best varieties of this plant require a fairly heavy soil and to be protected from the direct rays of the sun; it bears a fruit with a greenish-white, melting and sweet flesh. Of the varieties belonging to *Cucumis Melo*, the best known is the 'quaoon santaouy', which comes into the market later than the 'Shammam'. It is small, globular and strongly scented, and the yellow skin is somewhat deeply furrowed, with a close network of raised lines; the flesh is thin, light-orange coloured and very juicy. This variety is grown in the Delta, while a similar one is produced in Upper Egypt. In the last-mentioned region, there is also grown a smooth skinned lemon, globular in form and without furrows; the flesh of this is white, thick and very sweet, in a fruit having an average weight of about 8lb. Apart from these, the most remarkable fruit of the kind in Egypt is the one known as 'agour' (*C. Melo Chate*), which is oval but tapers to a point at each end, the length being about 10 inches. The skin is reddish-brown and covered with a close network of raised lines; the thin orange-coloured, juicy flesh is eaten with sugar, as it is not sweet, and coming at a time when other market fruits are very scarce, is much appreciated among the natives. Several other kinds of melons, which are, however, inferior to these, are also produced.

In Egypt, melons are grown largely on the light loam found on the islands and the banks of the Nile when the river is low. The following is the system of cultivation practised. Trenches running in a transverse direction to the prevailing wind are dug in the silt bordering the water. The trenches are made 8 inches wide, 1 foot deep and 3 feet apart. A layer of decayed pigeon manure is placed in the bottom of the trenches, which are then refilled with soil. Farmyard manure is used where pigeon dung is not available, but does not give such good results. The seed is soaked in water and germinated before sowing. It is then sown in holes about 16 inches apart, and a row of maize-stalks is fixed in the soil by the side of each trench, in such a manner that the maize leans over the young plants and protects them from the wind, while leaving them exposed to the sun. Where there is a danger of the plants being covered with drifting sand, low barriers are constructed around the plots. Four or five seeds are sown in each hole, but when the seedlings have attained three or four leaves they are thinned so as to leave one plant only. During the growth of the crop, the soil is hoed to keep it moist and loose. When the fruit begins to appear, the maize-stalks are removed and a second trench is often dug parallel with, and close to, that in which the plants are growing. This is filled with manure and soil in the same way as the first, and forms an additional supply of food for the plants. The best fruit on each plant is allowed to remain, the others being removed when small. These small fruits are in the case of the 'Shamman' known as 'sirt' and in the case of the 'agour' they are called 'hersh'. They are eaten in the same way as cucumbers, but are in much greater demand and bring better prices than the latter. The 'Shammam' is grown almost always as a river crop. As the roots descend 2 feet to 2 feet 6 inches into the soil, the water-level is sufficiently near the surface to enable the plants to grow without irrigation. The 'quaoon santaouy', on the other hand, is cultivated chiefly on the high sandy lands on the edge of the desert, in which situations it is, of course, necessary to water the plants. The preparation of the ground, however, is the same. The 'agour' requires a more compact soil than those just mentioned, and is therefore grown chiefly on basin lands which have been flooded during the previous autumn. In this case the seed is sown on the edge of a shallow furrow, and the manure applied when the seedlings have four or five leaves. Water melons are cultivated in the same way as sweet melons. They can, however, be grown on much poorer ground than the 'Shammam', and in situations where the sand is too loose for the 'Santaouy'.

The water melon is a very important crop, and is sown in large areas, both on the river banks and inland. The number of varieties of red-fleshed water melons is large, but many of them are not well defined, intermediate forms making classification difficult. An attempt to do something in this respect was made last year by the Horticultural Society, by collecting and comparing fruits from various parts of the country. It was, however, found that it would be necessary to cultivate all the varieties together on the same soil for one or more years, in order to arrive at definite conclusions.

The cucumbers are also of importance in Egypt; the chief ones are the ordinary variety (*Cucumis sativus*), the snake cucumber (*C. flexuosus*), and the hairy cucumber

(*C. pubescens*). The fruits of the first are always gathered when small, and in this state are crisp and of excellent flavour. Those of the snake cucumber are cylindrical, twisted, about 20 inches long, light green with dark blotches, and covered with soft, woolly hairs. The last has cylindrical, generally straight fruits, which are about 10 inches long. The skin is white, or in various shades of green, and mottled: it is covered with short hairs and shows depressed lines. All these are eaten as salads. Of the vegetable marrows, there are five chief kinds, three of which belong to *Cucurbita Pepo*, and two to *C. moschata*. The larger pumpkins (*C. maxima*) are grown to a very small extent in Egypt.

As has been stated, the article also mentions the domestic sponge and the calabash gourd. These are, of course, well known in the West Indies, though the sponge in Egypt is provided from *Luffa aegyptiaca*, and not from *L. acutangula*, as is the case here. It will be remembered that the calabash gourd (*Lagenaria vulgaris*) is used for the bowls of the now-famed calabash pipes. This is found native in the West Indies, and seeds of the plant have been obtained from South Africa by the Department and distributed among several of the Botanic Stations. (See *Agricultural News*, Vols. V, p. 399 : VI, pp. 123, 298 and 415 ; VII, p. 124 ;VIII, p. 21.)

THE ECONOMIC IMPORTANCE OF THE MANGROVE.

This subject is dealt with, from the point of view of the exploitation of the mangrove in the Philippine Islands, in the *Philippine Journal of Science* for May, 1909. The following extracts from the article should be of interest :—

In the United States, and in other countries where large amounts of leather are manufactured, the forests yielding native tanning materials have been so far exhausted that these nations must look to other countries for their source of supply. At the present time very large quantities of tan barks and cutch are imported into the United States from Borneo, Dutch East Africa, Brazil and other tropical countries, and the use of mangrove tanning materials is constantly increasing. The most abundant source of tanning substances in the Philippines is the mangrove swamps of the islands. At the present time there is no mangrove bark exported from the Philippines, and as yet the area of these swamps is not known. They occur as narrow fringes along the coast, or in considerable areas at the mouths of large rivers, especially at the head of bays. Some limited areas have been mapped and measured by the Forestry Bureau.

There are three large cutch factories in Borneo using tan barks from the same species of mangrove as those found in the Philippines. These factories regard the process of manufacturing cutch as a trade secret, but we cannot believe that these so-called trade secrets are of a very formidable nature, as we have succeeded in preparing very good grades of cutch, without any complicated processes.

The following was the method used to prepare the cutch: The finely ground bark was leached with cold water, and this solution evaporated to dryness *in vacuo*. Hot water extracts too much of the colouring matter, and no more tannin than cold water. The evaporation, at least the latter stages, must always be made *in vacuo* to avoid burning the cutch. It is sufficiently obvious that the extraction on a large scale would be carried out in such a manner that strong solutions would be employed to leach fresh barks, while weak ones would be used to extract the last percentages of the tannin from the partly exhausted bark. All the parts of the factory, except the vacuum driers, could be built on the ground, and it is evident that the fuel for the boilers and for the driers would cost very little, so that it would appear that, if the cutch manufacture were taken up in connexion with the lumbering or firewood industry, it would be exceedingly profitable.

The *Annual Report of the Board of Agriculture*, Jamaica, 1907-8, gives information as to determinations of the tannin content of several Jamaica mangroves, which were made by the Island and Agricultural Chemist. From this, it would appear that the Jamaica mangroves compare well, as a source of tannin, with the plants that are dealt with in the above-mentioned publication.

WAYS IN WHICH BACTERIA INFECT PLANTS.

Bulletin No. 23 of the Division of Biology of the New Zealand Department of Agriculture, entitled *Bacterial Diseases of Plants*, deals with ways in which bacteria infect plants, thus suggesting methods which may be employed to prevent, or minimize, the chances of such infection :—

The study of the various ways in which infection of the host plants is secured is especially valuable in devising means for the control of disease. In the case of bacterial diseases, wound-infection is very general, and in this process, insects play a very large part. In inoculation experiments, the bacteria are introduced into the tissues of the host by means of minute needle-pricks, and this constitutes typical wound-infection. In nature, infection may be divided into two classes : that which takes place on those portions of the host that are below the surface of the soil, and that which takes place on those portions of the host above ground. To the former category belong such diseases as the wet-rots of potatos and other tubers, and to the latter, bacteriosis of potato, black-rot of cabbage, wilt of cucumbers, pear-blight, etc.

With regard to underground infection, wounds are in nearly all classes directly responsible for the entrance of the disease-germ, but the physical condition and water-content of the soil play an important part, for it is in badly aerated, sour, water-logged soils that these wet-rot producing bacteria are chiefly to be found. The action of those insects and animals causing wounds on the underground portions of plants will greatly aid the spread of such bacteria through potato and other root crops.

In aerial infection the action of insects is most marked. In pear-blight, bees and other insects, in collecting from diseased flower-clusters, will rapidly spread the disease to all the healthy flowers they may visit. This method of infection is also analogous to wound-infection, inasmuch as the stigma on which the bacteria may lodge represents to all intents and purposes a wounded surface. It has been definitely proved that the potato bacteriosis (*Bacillus solanacearum*) is transmitted from plant to plant by leaf-eating beetles, and in consequence, if this disease is to be checked, these beetles must be kept well under control.

The same remarks apply to the black-rot of cabbage (*Pseudomonas campestris*) ; but in this case infection can also take place through the water-pores that are situated on the edges of the leaves. The wilt of cucumbers (*Bacillus tracheiphilus*) is likewise transmitted by leaf-eating beetles, so that in greenhouses it should be a simple matter to keep these in check, and at the same time avoid the danger of infection.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 13, with reference to the sales of West Indian Sea Island cotton:—

A fair business has been done in West Indian Sea Island cotton during the past fortnight, at firm rates.

The sales amount to about 250 bales, and include St. Croix, Antigua, Barbuda, etc., from 12½*d.* to 13¾*d.*, with a few bales at 14*d.*, and about 50 bales stains 6½*d.* to 8*d.*

A parcel of Guadaloupe cotton, lying on the Continent, has recently been sold here at 13½*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 11, is as follows:—

Only one bag of the new crop of Sea Island has been received, but it has not been sampled and will not be offered until there is some accumulation of stock, sufficient to open the market, which may not be until early in October.

CHANGES IN EGYPTIAN COTTON WHEN GROWN IN THE UNITED STATES.

In Bulletin No. 156 of the Bureau of Plant Industry, United States Department of Agriculture, the following conclusions are arrived at in connexion with the diversity which arises in Egyptian cotton when it is introduced into that country:—

The diversity found in the Egyptian cotton in Arizona appears to be of four different kinds, evidently arising from different physiological factors. Precautions which may tend to avoid one kind of diversity will not be fully effective unless other factors are taken into account at the same time. Methods of acclimatization, breeding, and culture have all to be adapted to the special needs of the case, if the full possibilities of the new crops are to be definitely ascertained.

The first and most striking of diversity is due to hybridization. The cross-fertilizing insects are much more abundant in the south-western States than in any other cotton-growing region thus far investigated. This will render it impossible to maintain a culture of pure Egyptian or other high grade cotton, unless all other kinds of cotton are excluded from the localities in which superior stocks are planted. Though the lint of the hybrid plants is often superior to that of the pure Egyptian plants, it is sufficiently different to interfere with the commercial uniformity of the product.

The second kind of diversity that affects the Egyptian cotton is evidently due to incomplete acclimatization. As with other types of cotton, transfer to new conditions induces great variation, not only in the habits of growth and other vegetative characters of the plants, but also in fertility, and in the abundance and length of the lint. This form of diversity is to be eliminated by the selection, each year, of the plants that approach most nearly to the normal form of the variety, are the most fertile, and have the best lint.

The third kind of diversity is more directly connected with differences in the physical environment which cause, or call forth, differences in the individual plants. It is shown most strikingly in comparing the behaviour of the plants in the different localities, but includes also some of the differences that occur in the same locality or in different parts of the same field. This form of diversity is familiar in all branches of agriculture but is greater with a newly introduced variety, and may be expected to decrease as a better adjustment to the new conditions is attained. The second kind of diversity represents incomplete acclimatization, while the third kind is more closely connected with the phenomenon of accommodation.

The fourth kind of diversity is shown in the different parts of the same plant, and is often very pronounced, especially in the characters of the lint. If the plants become too luxuriant, fruiting is deferred until late in the season, or the early bolls remain poorly developed and produce a very weak fibre. To avoid this form of diversity, a proper relation has to be established between the habits of growth of the plants and the methods of culture and irrigation. Sudden changes in the rate of growth are particularly to be avoided, as tending to produce fluctuations in the fertility of the plants and in the commercial quality of the lint.

The principal reason why diversity has such serious effects upon the yield of lint is found in the habit of the cotton plant to produce two types of branches, which are quite distinct in form and function. Slight differences of external conditions which might have very little direct effect upon the size and vigour of the plant are able to induce relatively great differences in the yield by inducing a preponderance of the sterile, vegetative form of branches over the fertile form.

Export of Cotton from Jamaica.—The amount of cotton exported from Jamaica during the quarter ending June 30 was 71 bales, weighing 15,360 lb. The estimated value of this was £510 16*s.*, and it was all sent to the United Kingdom. Information as to the exports from other parts of the West Indies for the same period was given on page 294 of the last number of the *Agricultural News.*

HOW LIME-SULPHUR WASH MAY BE MADE FOR STORAGE.

Lime-sulphur wash has been recommended by this Department for several diseases, especially for the 'pink-disease' and 'thread blight' of cacao (Pamphlet No. 54, *Fungus Diseases of Cacao and Sanitation of Cacao Orchards*; *West Indian Bulletin*, Vols. VI, p. 89; IX, pp. 179-80) and for 'black heart' or 'core rot' of pine-apples (Vol. VIII, p. 163.) In addition, an account is given, in the *West Indian Bulletin*, Vol. III, p. 77, of trials of its efficacy against the 'pine-apple disease' (due to *Thielariopsis ethaceticus*) of sugar-cane cuttings, while, in the same publication, Vol. I, p. 314, it is stated that this mixture (with salt added) is recommended in Queensland for the general treatment of fungoid pests. In Bulletin No. 92 of the Pennsylvania State College and Agricultural Experiment Station, entitled *Concentrated Lime-sulphur. Its Properties, Preparation and Use*, an account is given of experiments which were undertaken for the purpose of discovering a way in which the wash may be made so that it would not undergo deterioration during storage. The main facts that were elucidated are as follows:—

The present lime-sulphur wash is generally recognized as one of our most important spray materials, both as a contact insecticide and fungicide. It is also recognized as one of the most inconvenient and disagreeable. The advantages of the wash are cheapness and wide availability of materials; safety to the trees; simplicity of preparation; and substantial effectiveness, if carefully made and thoroughly applied. Of all the important sprays, therefore, this one has appeared to be in the most urgent need of study and revision.

Its main shortcomings are: extreme causticity and corrosion to flesh and machinery; large amounts of sediment of uncertain value; demand for immediate application; inability to be stored, thus requiring extra labour at times when men are already busy, and often involving loss of materials; need for heating excessive amounts of water; lack of 'creeping ability'; and absence of a sure and convenient test for reliability of the finished spray. These imperfections have unquestionably greatly limited the use of this wash, and we are informed that, in one of the regions where it has been longest known, the present home-boiled material is no longer made, having been driven out by the less troublesome commercial preparations.

These facts, together with a report of the successful preparation and use of a stock solution lime-sulphur, led the writer to undertake a careful study of lime-sulphur washes with a view to reducing some of the present difficulties of their use, and if possible, to determine the essential features involved in the preparation of storable, concentrated solutions, and to render their preparation available to fruit growers. Present experimental and commercial results indicate that concentrated solutions are fully as effective as the home-made dilute lime-sulphur, and are much more convenient in their preparation and use.

The materials that are required for making 55 gallons of concentrated lime-sulphur are: 50 lb. best stone lime (not over 5 per cent. impurities); 100 lb. sulphur (flowers); 50-55 gallons of water, at finish. The method is as follows:—

Put 10 gallons of water in a tayche or other suitable vessel and start the fire. Place the lime in the tayche. After slaking is well started, add the dry sulphur and mix thoroughly, adding enough water to maintain a thin paste; this will be about 5 gallons. After the slaking and mixing are completed, add water to the height of 50 gallons on the measuring stick, bring to a boil and stir until the sulphury scum practically disappears. Then add water (preferably, but not necessarily, hot) to the 65-gallon height and boil again to 55 gallons, if storage space is limited. If it is not limited, a little more water should be added the third time, and boiling stopped at about 60 gallons. The material should be kept well stirred especially during the early stages of the process, and any lumps of sulphur or lime should be thoroughly broken up.

The total time of actual boiling should be about an hour, though a ten-minute variation either way is not objectionable, providing the sulphur is evidently dissolved. This fact is best determined by dipping out, and slowly pouring, some of the material. The amounts of water indicated above are ample for one hour's fairly vigorous boiling, with the finishing volumes as indicated. If it is not at the desired height at the close, it may be made so by more water or more boiling, and either the amount of water in the third addition or the vigour of boiling can be so modified in later trials as to enable the total to be brought to the desired height approximately at the end of the hour.

The finished product may be immediately poured or strained into a barrel or settling tank, or into the spray tank. The straining is merely a safeguard to prevent any possible clogging because of imperfect materials, or failure to break lumps in the sulphur. When it is properly made, the amount of sediment left in the strainer is insignificant, being less than 1 per cent., and may be thrown away. To avoid any considerable loss of materials, however, the sediment in the strainer can be washed with part of the water used in making the next lot, simply pouring the water through the strainer into the tayche, and any lumps of sulphur discovered may be broken up and used again.

If the straining is not done, the whole product may be put into a settling tank or barrel, and the clear liquid drawn off later as required. This process, however, is likely to cause the loss of efficient liquid in the sludge, as well as the fine sludge itself, which may be of value in several ways, and is of no apparent hindrance in the spraying.

The crust which forms on the finished material is prevented by immediately covering the solution with a layer of oil about ⅛ inch thick, and avoiding unnecessary exposure to air in the transfer from tayche to storage tank. An ordinary kerosene oil was very satisfactory in our work, but there is reason to believe that any other oil, not injurious to trees nor likely to take fire at boiling temperatures, may be used with equal success.

The crust may also be prevented by immediate storage in tight, closed vessels, filling them completely. But partially filled vessels are likely to develop some crust, upon continued exposure.

The concentrated solution can be diluted to any required density with the aid of a hydrometer. For most purposes, it is effective with a dilution of ten or twelve times.

Carelessness in Handling Ice Scarcely another article of human consumption receives so much direct handling just before its use as ice does. Milk and water, and tea and coffee are poured. Bread, meat and butter are cut. Bread has a hard crust, which offers a rather unfavourable lodging place for germ life. Ice, on the contrary, washes the hands of every person who handles it, and affords an ever ready liquid medium for the immediate absorption of the hosts of bacteria which hands may carry. (The *Hawaiian Planters' Monthly*, July 1909.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of the present number deals with the subject of Selection in the Breeding of Estate Animals. The question is discussed with especial reference to conditions in the West Indies.

The deterioration that is undergone by imperfectly dried sugars while they are in storage or transit is an especially important subject in countries where that commodity is produced in quantity. An article on page 307 gives an account of work that has been recently done in Hawaii in connexion with the matter.

On page 309, the mangrove as a source of tannin is dealt with. The production of this substance from this and similar plants will probably, in view of the reduction in forest area that has been taking place in large timber producing countries, become of greater importance.

A way in which lime-sulphur wash may be made so that it can be stored is described on page 311.

Useful instructions in regard to making a simple contrivance by which the amount of parasitism of the cotton worm may be observed, and of one by means of which advantage of this parasitism may be taken, are given on page 314.

The Fungus Notes (page 315) of this number give information in connexion with the fungus diseases of the sugar-cane in Hawaii, and describe, with an account of remedies for a similar disease in Ceylon, a disease of ground nuts in Dominica. In connexion with the latter, it is suggested that careful observations as to the relative immunity of different varieties of ground nuts would be useful.

Weed-killing Plants.

In the Straits Settlements, one of the greatest enemies of rubber trees is a weed known as 'Lalang' (*Imperata arundinacea*). It has been found that this can be rendered less injurious by growing *Passiflora foetida* or *Commelina nudiflora* over it, the latter being more effective in this respect than the former. *Passiflora foetida* is common in the West Indies, where it is known in some parts as 'Love-in-a-mist': it is closely related botanically to the bell-apple and the granadilla. Similarly, *Commelina nudiflora* has a near relation to 'French weed' (*Commelina cayennensis*) of these islands.

Destruction of Old Cotton Plants.

The necessity for the destruction of cotton plants at the end of a crop, if anything approaching freedom from disease in the succeeding one is to be obtained, has been continually insisted upon in the publications of the Department. As an illustration of the principle involved, the Curator of the Botanic Station, Montserrat, reports an interesting example which has been afforded by his own experience. Within one week, there were discovered by him no less than seven instances where the recent development of leaf-blister mite was directly traceable to the neglect to destroy old plants. An additional feature of interest was that, in two of the instances, there were no old plants to be found in the vicinity of the attacked cotton when the visit was made, but they had been destroyed immediately before the present crop was planted in the same land. This indicates that the old cotton plants should be burnt some time before the new ones are planted.

The 'Peters' Mango.

On page 232 of the present volume of the *Agricultural News*, an account, based on information given in the *Yearbook* for 1907 of the United States Department of Agriculture, was given of a promising Indian Mango, called the 'Sandersha'. In this year's issue of the same publication, particulars of a variety of the same fruit from Trinidad, called the 'Peters' mango is given. It states that this is reputed by Mr. J. H. Hart to be the finest flavoured of all the mangos, and he gives the following description: 'green skinned, rosy purple blush, and mottled with small yellow dots. Skin thick, flesh pulpy, juicy, high-flavoured. Ripens best in dry climate of Jamaica; good and regular cropper; tree medium size, healthy grower; weight of fruit, 12 to 16 ounces; size, 3½ by 3½ inches.'

Mr. Hart states that it was introduced into both Jamaica and Trinidad, about 1868 or 1869, and that it is probably closely related to the varieties 'Peach' and 'Malda'. These are now being grafted in thousands both by the Department of Agriculture, Trinidad, and by private growers. He also observes that it does well in the dry districts in the West Indies; but in damp, tropical situations, the fruit is often subject to an undentified disease, which prevents it from ripening properly.

This mango is known in Jamaica under the name 'Bombay.' (See *Agricultural News*, Vol. V, p. 148.)

Lime and Phosphates in Soils.

Experiments that have been conducted for several years in Russia appear to demonstrate that, in soils containing a small amount of lime, the absorbtion of phosphoric acid by the plant takes place to such an extent as to interfere with its growth, because of the presence of an excessive amount of the acid. As the amount of calcium carbonate is increased in the soil by applications of lime, the absorbtion of phosphoric acid decreases, and eventually the stage is reached at which this takes place to so small an extent as to cause the plants growing in such a soil to exhibit all the symptoms of a lack of phosphorus, even in the presence of a good supply of that element.

A Method for Destroying Rats.

In the *Journal d'Agriculture Tropicale* for July 1909, a method is described for destroying rats which has been found effective against them in rice stores in Java. In applying it, the holes that are being used by the rats must first be found. This is done by stopping all the holes with clay: those that are found open on the next day are the places of entrance and exit of the rats. Into these, about half a teaspoonful of carbon bisulphide is poured and then, after a few seconds, a light is brought near the holes; there is a slight explosion of the mixture of the vapour and air, and the rats are killed by the poisonous products of combustion.

The usual precaution not to bring a light near the liquid in quantity must, of course, be observed, and the room should be left open for a time after treatment, so that the poisonous vapour may escape. The cost of the method is small, as one hundred holes only require about 7 ounces of the bisulphide.

Seedling Canes in Jamaica.

The *Bulletin of the Department of Agriculture*, Jamaica, for July, 1909, gives interesting information in connexion with results that have been obtained with the seedling canes B.208 and B.147 at Sevens Estate in Clarendon. In conducting the experiments, a fair average for the estate, and for places similarly situated in the island, was obtained by selecting canes for the experiment from three fields in different parts of the estate, which are not in receipt of manure, but which give large yields, owing to the fact that they are flooded during heavy rains, and thus receive sediment from the rich soil of other portions of the estate. This flooding does no harm, as the fields are well drained.

B.208 and the estate cane (White Transparent) had been planted together in the first field cut, and had reached the stage of first ratoons, there being 2,500 stools to the acre. The method adopted was to cut and weigh carefully one hundred stools of each, when it was found that B,208 gave 35·1 tons, and the estate cane 21 tons, per acre—a gain by B.208 of 66 per cent. The second field contained third ratoons, the varieties being B.208, the estate cane, and B.147. In this case a similar experiment gave: B.208, 50·09; the estate cane, 34·8; and B.147, 30·3, tons per acre, so that the yield from B.208 was 46 per cent. greater than that from the estate cane, while B.147 was inferior to both of them. In the third field, B.208 gave 47·5 tons, and the estate cane 23·2 tons, per acre, as first ratoons—a gain by B.208 of slightly over 100 per cent.

Interaction of Stock and Scion.

In a number of the *Comptes Rendus de l'Académie des Sciences* (Paris), published during the present year, there is an account of a large number of experiments which were undertaken for the purpose of finding out what effects take place when perennial plants are grafted on to annuals. The plants that are more especially considered in this paper are the potato on the tomato, and rhizome-bearing plants belonging to the sunflower genus (*Helianthus*) on that plant. It was discovered that, under certain abnormal conditions, the stock and scion react upon one-another. The scion formed aerial tubers on account of the fact that it was unable to store its reserve materials in the stock. It does, however, succeed in transferring a portion of those materials to the stock, which utilizes part of this additional nutriment in forming woody tissue that it does not contain normally, thus causing it to take on a resemblance to a woody perennial. This production of tubers on the scion, and of wood in the stock, constantly took place when the sunflower was used as a stock for tuber-bearing plants of the same genus, such as the artichoke: but this was only occasional when the potato was grafted on the tomato.

The 'West Indian Bulletin'.

The second number of Vol. X of the *West Indian Bulletin* is now being issued. In it, the sugar industry receives attention in the following papers: 'Central Factories', by Dr. F. Watts, C.M.G.: 'The Underground System of the sugar-cane', by G. G. Auchinleck, B.Sc.; 'Observations on Molasses', by H. A. Tempany, B.Sc.; 'The Packing for Transportation of Sugar-canes for Planting', by J. R. Bovell, I.S.O.; 'The Estimation of Water in Molasses', by R. R. Hall, B.A. In connexion with the cotton industry, two papers appear, entitled respectively: 'Observations on the Effects of Storage on Cotton Seed', by H. A. Tempany, B.Sc.; and 'The Cotton Industry in the West Indies'.

Among the other papers, there is one entitled 'Eucalyptus in the West Indies', which deals with the distribution of the species belonging to this genus that have been introduced into the Botanic and Experiment Stations in these islands. These stations are also dealt with, in connexion with their function as distributing centres, in a paper entitled 'Distribution of Economic Plants from West Indian Botanic Stations'. The subject 'The Treatment of Soils in Orchard Cultivation in the West Indies', which has also received attention in Vols. II, p. 96; V, p. 287; VI, p. 258; VII, p. 201; VIII, p. 131; and IX, p. 138 of the *West Indian Bulletin*, is reviewed and brought up to date.

The number closes with a paper on 'The Scarabee of the Sweet Potato', by. H. A. Ballou, M.Sc. This, as well as 'The Underground System of the Sugar-cane', and 'The Packing for Transportation of Sugar-canes for Planting', is accompanied by illustrations.

INSECT NOTES.

ENEMIES OF THE COTTON WORM.

Several articles have appeared in the *Agricultural News* dealing with parasitic insects and the beneficial effects of their attacks on the pests of various crops.

There are several well recognized pests of the cotton plant, some of which are attacked by parasites, while others are immune from such attacks, so far as is known. With regard to predaceous insects, also, certain pests are much more liable to attack than others. The cotton stainers for instance, which occur in all the islands where cotton is grown, are not attacked by parasites and are rarely attacked by predaceous insects. The cotton worm, on the other hand, is attacked by several parasitic and predaceous insects.

The small egg parasite, *Trichogramma pretiosa*, is recorded as a parasite of the eggs of the cotton worm; *Chalcis ovata* (see *Agricultural News*, Vol. VIII, p. 74) attacks the larvae and pupae; a fly, *Sarcophaga trivittata*, attacks larvae and pupae, also.

The ordinary practice of killing the cotton worm by means of Paris green or other arsenical poison kills at the same time any parasites that may be living in the tissues of the caterpillar. It is suggested that the planter should ascertain whether these parasites are abundant in his cotton fields, and if they are, that he should adopt measures to increase their numbers.

Fig. 32 shows an observation box intended for use in this connexion. In its construction, it is a small, deal box with an opening in the top; over, or under, the opening is a wire mesh too small for the cotton worm to get through, and large enough to let parasites escape. If the ordinary house fly could pass through it would be sufficiently coarse. Over the opening a glass is inverted.

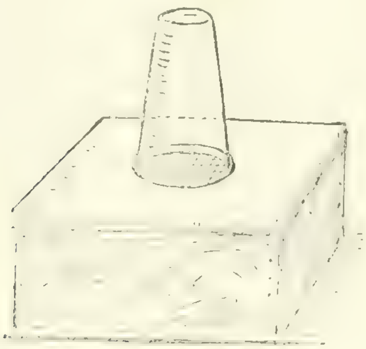


FIG. 32. OBSERVATION BOX FOR PARASITES.

The method of use is this: Full-grown cotton worms and pupae are collected and confined in the box. If any parasites are present they will escape in the course of a few days, and come up into the glass. If 100 pupae are put into the box the percentage of infestation can easily be calculated.

Planters might have several of these boxes, and by use of them ascertain in which cotton fields the parasites are most abundant. If the percentage of parasitized pupae is fairly high, it would be good policy to have boxes made for use in the field, so that the parasites could escape and return at once to the attack of other cotton worms. This might be called the field box, and it should be made with openings, covered with the wire mesh, at two ends, so that the rain may not get in too freely, and the parasites would be able to escape. No glass would be required, of course, in this case.

The use of the observation box will very quickly show how long a time is necessary for the emergence of all the parasites. When that time has elapsed, the moths, dead pupae, etc., should be thrown out, and fresh pupae collected. In this way the planter will be able to do a great deal to help in the control of the cotton worm by means of natural enemies.

It should be borne in mind, however, that the observation box should be used first, for it is evident that if there were no parasites present that it would not pay to collect on a large scale. If, on the other hand, they are fairly numerous, it would be worth doing.

In a recent article entitled 'Some Parasites of the Cotton Worm' (see *Agricultural News*, Vol. VIII, p. 74) three insects are mentioned, and figures are given which show the appearance of two of these parasites. The third of those mentioned, *Spirochalcis*, is a parasite on the Sarcophagid fly, and is consequently harmful, and should be killed if possible.

The predaceous insects which attack the cotton worm have often been mentioned in the *Agricultural News*. Among the most important of these are the wasps or Jack Spaniards. In Barbados, the two most common are the wild bee (*Polistes annularis*) and the cow bee (*Polistes bellicosus*). In St. Vincent, *Polistes annularis* is known as the Jack Spaniard; it probably occurs in all the other islands, but the term Jack Spaniard is also given to another species, *Polistes fuscatus-instabilis*. These are all much alike in form, the last being slightly smaller than the other two, but they vary in colour and markings.

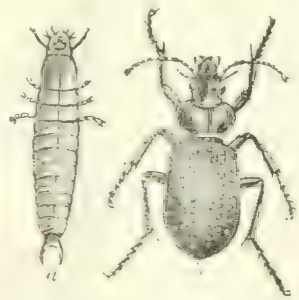


FIG. 33. FIERY GROUND BEETLE. (U. S. Department of Agriculture.) *a*, LARVA; *b*, BEETLE.

Fig. 33 shows the fiery ground beetle (*Calisoma calidum*), which has been reported at Barbuda (see *Agricultural News*, Vol. V, p. 10) and at St. Vincent (see *Agricultural News*, Vol VII, p. 250) as attacking the cotton worm. This beetle is known in the United States as an active enemy of caterpillars, and in any locality where it is abundant it would probably prove of great value as an enemy of the cotton worm.

MILLIONS FOR THE MALAY STATES.

The consignment of millions for the Federated Malay States, mentioned in the last number of the *Agricultural News* (see p. 298) has reached its destination.

The Acting Director of Agriculture for that Colony, in a letter dated July 28, 1909, writes to the Imperial Commissioner of Agriculture: 'I wish to thank you for the consignment of millions, which arrived last week in good order. I shall let you know later how they progress here.'

These fish were shipped from Barbados, on May 18, to the Zoological Gardens London, whence they were later reshipped for the remainder of the journey. From this it will be seen that only about 8 or 9 weeks were occupied in transit.

FUNGUS NOTES.

FUNGUS DISEASES OF THE SUGAR-CANE.

The following notes are for the most part taken from Bulletin No. 6 of the Division of Pathology and Physiology of the Experiment Station of the Hawaiian Sugar Planters' Association, entitled *Fungus Maladies of the Sugar-cane*, by Dr. N. A. Cobb.

A neat method of disinfecting cane cuttings, applicable to plantations of the size usual in the West Indies, is described by the author as follows: A series of wooden tanks two and a half feet in every direction is set up and filled with Bordeaux mixture. Stiff wire baskets are provided, into which the canes are put, and the baskets are then lowered into the wooden tanks. The baskets are made of copper wire, ¼-inch to ½-inch mesh wire, mounted on a stiff frame, and are provided with two strong handles. The baskets must be firm so that they will not bulge and cause difficulties in their removal by rubbing against the side of the tank; and the mesh must be small enough to prevent the cuttings from projecting and causing the same difficulty. It is possible that baskets, somewhat similar to those employed for making fish pots, etc., but with a smaller mesh and provided with strong handles, could be manufactured in the West Indies, which would serve the purpose equally well, and thus a considerable amount of the initial expense might be saved. Two men can work these baskets, and the series of tanks is of such a length that by the time the last has been filled with the disinfectant and the cuttings, the first basket of canes has been in the liquid for a sufficient time, and is ready for removal. It is merely lifted out on to a cart and taken to the field where it is to be used. The tank is then refilled, and the second basket treated in the same way. By this means no time is lost, and the cuttings usually arrive with the fungicide sufficiently dried upon them.

Attention is called by the author to the facts that no diseased canes should ever be used for cuttings, and that great care should be taken not to shatter the ends when cutting cane for planting. All cane that shows red or brown discolouration of the fibres or pith at the cut ends should be rejected for planting purposes, as disinfecting a cane that is already diseased internally is only a waste of time and money. Cuttings should never be allowed to become so dry that the ends split before they are planted.

There are at least five fungi causing root disease in Hawaii: two species of *Marasmius*, *M. sacchari* and *M. Hawaiiensis*, two belonging to the Phalloideae, *Ithyphallus coralloides* and *Clathrus trilobatus*, and one whose mycelium, only, is known. The spores of the Phalloids are disseminated by strongly flying flies, and their mycelia are capable of living on several other plants besides cane, especially *Lantana* in the case of *Ithyphallus*, so that these fungi are more difficult to eradicate than *Marasmius*, which, in the writer's opinion, is only found in Hawaii on sugar-cane.

On the other hand, there is a considerable probability that one at least of the two or more species of *Marasmius* responsible for the root disease in the West Indies is capable of living on host plants other than the sugar-cane, though this point has not yet been established. (*Agricultural News*, Vol. VII, p. 155.)

In Hawaii, however, Dr. Cobb is of opinion that *Marasmius* may be entirely starved out of any field by ceasing to plant cane, and either allowing the soil to lie fallow or planting a rotation crop. The time necessary to ensure the complete starvation of the fungus is that required for the complete decay of any dead or living portions of cane in the soil. This takes from one to three years, according to the amount of cultivation the land receives. Occasional ploughing and careful tillage, either in the presence or absence of a rotation crop, will encourage saphrophytic fungi and bacteria, and hasten the breaking down of the dead cane, and the consequent disappearance of *Marasmius*. On the whole, the planting of alternate crops seems preferable to letting the land lie fallow; but, in view of recent observations in the West Indies, it seems probable that these crops will have to be chosen with considerable care, when the main object is the elimination of *Marasmius* from the field.

As *Marasmius* has no special means of distribution of its spores (see *Agricultural News*, Vol. VIII, p. 297), it seems probable that re-infection of a field once freed from the fungus can only be brought about by the conveyance of infected earth, trash, or cane cuttings from other fields, on implements, the labourers' feet, carts, etc. Thus, once a field has been freed, it might be kept free by careful attention to cleanliness, or, if the disease did return, a careful watch would reveal the fact, and immediate applications of lime to the infected area, together with trenching, would probably prevent the disease from spreading to any extent.

DISEASE OF GROUND NUTS IN DOMINICA.

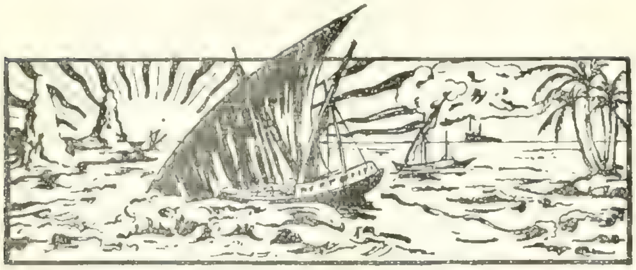
A fungoid disease has recently been found to cause considerable damage to the leaves and stems of ground nuts in Dominica. The disease attacked the Spanish variety first, and then spread to a plot of the Carolina Running variety, which was next to the original plot. A plot of Dixie Giant, on the other side of the Spanish and another of Tennessee Red which adjoined the Carolina Running were unaffected when the information was received.

The disease appears in the form of numerous, definite, black circular spots, which are somewhat raised, on the underside of the leaf, and which cause a corresponding slight depression on the upper surface. On the black spots, small brown velvety pustules are formed, arranged in concentric circles. These pustules occur mainly on the lower surface of the leaf, more rarely on the upper; they are possibly due to a fungus known as *Septogloeum arachidis*, which is mentioned as similarly affecting ground nuts in the whole of the Eastern Hemisphere. In addition to the black spots, smaller brown spots, due to the Uredo condition of one of the rust fungi, were also found, on the leaves only. This fungus has been reported as attacking the leaves of ground nuts in Montserrat. It does not appear to cause any serious damage in Dominica. The attack is probably largely due to the dampness of the season, the rainfall in Dominica having amounted to over 35 inches since June 11 of this year.

Attempts are being made to check these fungi by means of Bordeaux mixture, but the results have not been reported; this treatment should prove effective.

It would also be advisable to burn, or bury with lime, all diseased leaves and plants, and to avoid planting ground nuts on the same land for at least a year, as infection may be disseminated by spores on old leaves in the soil. The *Septogloeum* fungus spreads most rapidly after the plants are a month old.

The Mycologist of the Ceylon Department of Agriculture is of the opinion that infection of land previously free from the *Septogloeum* disease may be prevented by careful disinfection of the seed before planting; the method employed by him was to soak the pod in a 2 per cent. solution of formalin for several hours. (*Ceylon Administration Report*, 1905.)



GLEANINGS.

The sugar production of Cuba for this year is estimated at about 1,450,000 tons. Under the reciprocity treaty with the United States of America, this amount doubtless will increase year by year for some time.

The export of crude rubber from Mexico for the period June 30, 1907 to June 30, 1908 was 12,372,241 ℔. During a similar period in 1906-7, it was 10,321,248 ℔. For the last six months of 1908, the export was 6,121,863 ℔.

During the present year, to August 19, there were imported into the United Kingdom 2,579,175, bales of cotton. Of this, 5,949 bales were British West Indian cotton. The amount imported during the week ended August 19, was 31,082 bales.

According to the *Bulletin of the Imperial Institute*, Vol VII, No. 2, discoveries of graphite have recently been made in several British African colonies. Those in Nyassaland and Rhodesia, only, appear at present to be likely to become of any commercial value in England.

The imports and exports of Jamaica for 1907-8 were valued at £2,851,042 and £2,360,702, respectively. For the period 1906-7, they were similarly £2,261,469 and £1,992,007. Of the exports in 1907-8, fruit had a value of £1,193,784, rum £174,955 and sugar 109,775.

In the Philippine Islands, cassava is grown on a large scale for the production of starch. The average yield of roots per acre is about 11 tons, and as these give about 34 per cent. of starch, the amount of this product that is obtained from each acre is approximately 9,000 ℔.

During the past season, over 5,000 crates of tomatos have been shipped from the Bahamas by the Canadian Fruit Company to Canada. This company expects to ship 50,000 crates of the fruit during the coming season. (*Weekly Report, Department of Trade and Commerce*, Canada, August 30, 1909.)

From statistics given in the *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, it appears that the area in India from which crops were obtained during the period 1906-7 was 228,950,050 acres, which is an increase of 22,332,494 acres over that of 1897-8. In the first-mentioned period, the total area from which food grains were raised was 208,241,529 acres; in 1897-8, this was 191,852,026 acres.

Gauze covers for the protection of food from flies are being offered for sale by Messrs. R. Sumner & Co., Ltd., 50 a, Lord Street, Liverpool. They are made in three sizes and cost from 4*s.* to 8*s.* 8*d.* per dozen. As they can be washed, and are weighted at the corners to prevent them from being blown over, they are especially useful.

A Danish inventor has recently patented a new process for sterilizing milk, which is dependent on the existence of an enzyme, 'catalase' (see also *Agricultural News*, Vol. VIII, p. 218), in that product. The milk is heated to 120° F., and hydrogen peroxide is added. The action of the catalase on the hydrogen peroxide is to liberate oxygen from it, which destroys the bacteria.

The great earthquake in Messina, causing dislocation of trade in Sicily, created a demand for essential oil of orange from some other source, and enhanced the price. Quick advantage was taken of this in Jamaica, and good trade has been done in all the large orange producing parishes, especially St. Ann and Manchester. (*Journal of the Jamaica Agricultural Society*, August 1909.)

Experiments with the castor oil plant, in which the total weight of crop obtained per acre (from 1,210 plants) was 6,655 ℔., showed that 34·91 per cent. of this was organic matter. The nitrogen, potash and phosphoric acid that would be added to the soil from such a quantity would be 33·3 ℔., 53·2 ℔. and 21·3 ℔., respectively. (*Queensland Agricultural Journal*, August 1909.)

The red spider (*Tetrarhynchus bimaculatus*) caused considerable injury in Florida, during the spring of 1901, to vegetable and general crops, and to citrus trees. The *Journal of Economic Entomology* reports experiments for the control of the pest by means of lime-sulphur wash, lye sulphur, sulphur, and kerosene emulsion, and states that it can be kept in check by any of these insecticides.

The *Annual Report of the Bureau of Sugar Experiment Stations*, Queensland, 1908-9 states: 'B. 208 has a strong record in the West Indies as a sugar producer, and it is also very highly spoken of on the Herbert River, where it is fast becoming the leading cane. On the Mackay Station, however, it does not present a healthy appearance, and develops a rind rot at many of the joints.'

The United Fruit Company has entered into a contract with the Government of Costa Rica by which it agrees to pay an export tax on bananas. As a result, the export of bananas from Costa Rica, which is at present slightly over 1 million bunches a month, is expected to increase rapidly, owing to the security afforded to the industry by the new law. (The *Board of Trade Journal*, August 12, 1909.)

The 1908 sugar crop of Madeira was again a record one, the quantity being estimated at 50,000 tons with a value of £185,000. About 24,000 tons of cane was used for sugar manufacture, the remainder having been utilized for cane brandy and alcohol. Some 700 tons were exported to Portugal and the balance consumed locally. The coming crop promises to be larger than ever, and it is estimated that its value will be well over £200,000. (*International Sugar Journal*, August 1909.)

STUDENTS' CORNER.

OCTOBER.

FIRST PERIOD.

Seasonal Notes.

Now that corn is being reaped, the selection of seed for the next crop should be carried out. The preliminary work in connexion with this may be done in three ways: (1) by going into the field before the crop is harvested and selecting good ears on good plants bearing at least two of these, (2) by selecting from the ears that have been already brought in, (3) by choosing the best grains. Of these the first is far preferable to the others. If it is adopted, the ears from the marked plants are kept separate and are placed side by side on board or benches for the purpose of examination. As the principal object in view is the greatest production of good, deep, similarly-shaped grains on each ear, those characters which tend toward this are given the greatest weight in the selection. To this end, the shape of the ears should be cylindrical, with a circumference which is about three-quarters of the length. The grains should fill the ear well up to the tip and butt, in which regions they should be as nearly as possible of the same shape as the other grains on the ear. The rows of grains should be close together and straight, and the grains well fixed to the ear; the latter characteristic is most conveniently tested for by taking each ear well in the hands, trying to twist the ends in opposite directions, and rejecting those ears in which the rows 'give' to any great extent. The ears are weighed, and the grains shelled from those which have passed these tests most successfully, the weight of each lot of seed from the different ears being then weighed also; the grains should weigh about nine-tenths of the weight of the ear before shelling. In comparing the shapes of the grains from different ears, those should be chosen which are wedge-shaped with straight edges. The process of selection will be completed by germination tests with six grains from each ear, as described on page 255 of the present volume of the *Agricultural News*. Finally, grains for sowing will be such as grew in the region between the tips of the selected ears, and the grains from the ears will be sown in alternate rows, as the first step toward the encouragement of cross-pollination.

A thorough examination of both plant and ratoon canes, especially the latter, for root disease (*Marasmius*) should now be made. The first sign of attack by this is that the cane appears to be in want of water, for first the tips and edges, and then the whole of the leaves, roll up and finally wither and dry up. Another easily recognized sign is that the lower leaves are matted together by means of a white mycelium, while the whole of the attacked part has a musty smell. Examination of the rootlets would show that their growth is not taking place properly; they are short and have red tips. In rainy weather, in the early morning, a search should be made for the spore-bearing part of this fungus. It appears as a small, white, delicate structure which may be attached to the roots or to the sheaths of the leaves. Information concerning this disease (which is closely related to another which attacks bananas) may be found in the *Agricultural News*, Vols. I, p. 3, 259; II, pp. 162, 258; III, pp. 23, 77; VII, pp. 65, 155; VIII, p. 297; the *West Indian Bulletin*, Vols. VI, p. 34; VIII, pp. 42, 350; IX, pp. 41, 103; and in the following pamphlets published by the Department; No. 17, p. 14; No. 29, p. 32.

In applying green dressings to the soil, an interesting experiment may be performed. This consists in allowing part of the material to dry before turning it in, and making a careful note of the position of the area on which this has been done. When the following crop is growing, a comparison of its development where the dressing was buried green and where it was turned in after being dried, may lead to useful conclusions. Reference to pages 226 and 296 of the present volume of the *Agricultural News* will give information on this subject.

The method of applying pen manure that is common in Barbados consists in burying it in the soil in the cane holes. As this is generally done when the soil is wet, there is a great likelihood that the action of bacteria will be to cause the manure to give off nitrogen rather than to change it to a state of combination in which it will be more available to plants. It is suggested that experiments might be made to try the effect of burying and of broadcasting manure on the succeeding crop. Such trials would probably lead to useful practical results.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Describe, giving examples, the uses of cotyledons (seed-leaves) to plants.

(2) What are the principal phosphatic manures? Give an account of each.

(3) What are the uses of the veins of leaves? Describe the ways in which these are arranged in some of the commoner plants.

INTERMEDIATE QUESTIONS.

(1) Give an account of the chief sources of loss from the soil.

(2) What purposes are served by the breaking up of the soil in cultivation?

(3) Describe how you would lay out, and carry to a conclusion, the experiment suggested in the last paragraph but one of this fortnight's Seasonal Notes.

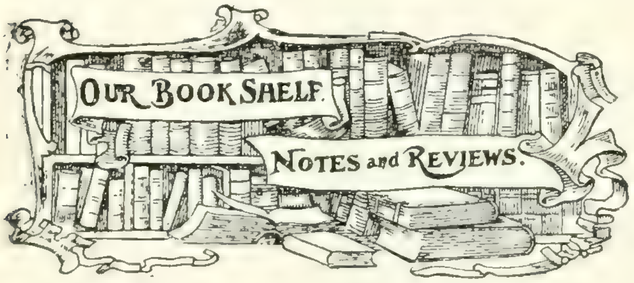
WHEN TO WATER HORSES

The following hints on this subject are taken from an article which appears in the *Hawaiian Planters' Monthly*, July 1909:—

A horse should be watered before feeding, and never given a large quantity of water after a meal, for the simple reason that the water will wash the food out of the stomach before stomach-digestion has taken place, and the food will not be well prepared for absorption; and besides, it is sometimes the cause of colic.

There is a popular idea that a warm horse should not be allowed to drink, and unlike a great many other popular ideas, there is a little truth in it. If you water a warm horse in the ordinary way, letting him drink all that he will, you are likely to have a foundered horse on your hands. This is especially so if, at the time, the horse is fatigued. Nevertheless, it is always safe to allow him from six to ten swallows, no matter how warm he is. If this be given on going into the stable, and he be allowed to stand and eat hay for an hour and is then offered water, he will not drink nearly so much as he would, had none been given him before.

The danger is not in the first swallow, as we often hear it asserted, but in the excessive quantities that he will drink if not restrained. The most dangerous time to give a horse a full draught is when he has cooled down from fatiguing work and has partaken of a meal.



AGRICULTURE IN THE TROPICS: AN ELEMENTARY TREATISE, By J. C. WILLIS, M.A., Sc. D. *Cambridge Biological Series.*

This book is not in any way a 'Tropical Agriculture' in the technical or text-book sense. No attempt has been made in writing it to produce a work that shall be primarily of use in field or factory work, neither is the information in it of such form or character as to make it a mere school-book. All such aims are disclaimed in the preface, and the reader is asked to regard it as a pioneer work, in which the subject is discussed in a general manner, before it shall be approached in a more technical and academic way. It is intended to be 'helpful and thought-stimulating for the student, the administrator, or the traveller'—a purpose which it appears to fulfil admirably.

The general scheme which is followed deals first of all with the things that must be brought under consideration before any definite conclusion can be reached as to the agricultural methods which will be suitable for any given country, and shows how those that are already existent in different parts of the world are the outcome of the conditions of soil, climate, topography of the country, state of the population, land tenure, tradition, and the influence of the more civilized races. In Chapters III and VIII the relation between population and the provision of labour, and the gradual change that has taken place in agriculture in the tropics since primitive times, are dealt with briefly and clearly. In natural sequence, this part of the subject is followed by an account of the principal plants cultivated in the tropics. Each of these only occupies a brief space, well proportioned to its relative importance, but withal, is considered very completely in a broad and general way, so that the reader easily gains an idea of its mode of growth and cultivation, its economic position, and the ways in which products of commercial value are obtained from it, without being distracted by a mass of detail that could only be of interest to a specialist.

In continuation, the third part of the work deals with ways in which agriculture is, and should be, conducted in the tropics, especially with reference to the position of the peasant and the capitalist grower in regard to finance; modes of agricultural practice and the means to be taken for their improvement, the use of education to this end being considered particularly; and the agricultural needs of both peasant and capitalist enterprise. Chapters III and IV, which are devoted to the two first mentioned subjects, are notably useful, and as the broad concise method already referred to has been followed, they allow them to be grasped in an easy manner. Finally, in Part IV, consideration is given to agricultural organization and policy, and the work of agricultural departments, especially in relation to the administrative functions of the forms of Government in connexion with which they will operate.

As may be expected, there is a tendency for the subject to be dealt with more especially in relation to Ceylon, where, of course, the author's interests are greatest, but this is never permitted to oust the claims to consideration of other tropical countries. Apparently, the conditions which have caused the rise, fall, revival or survival of certain agricultural industries in different parts of the world are given fairly; though, in this connexion, it would have been more satisfactory if the statement of the effect of the continental bounty system in reducing the prosperity of those engaged in the sugar industry in the West Indies had not been deferred from page 54 to page 187. A certain amount of repetition is noticeable in reading the book, but this is not objectionable, being necessary in a work of the kind, and expedient in that it serves to give a clearer presentation of the subject. Among minor details there may be noted the fact that the description of green manuring which is given would lead to the idea that leguminous plants, only, are useful in that connexion; that returns for the last few years are sometimes omitted from the statistics given in the introduction; and that the index though good as a rule, often fails in the matter of references to native names of plants and products.

A prevailing note of the book is that of the necessity for the exercise of caution, especially in dealing with native races engaged in agriculture, who have carried this on for centuries in much the same way. It is well brought forward that hasty and ill-conceived action will end in putting off the commencement of progress for a long period; that respect should be had to native prejudices; that the correct preliminary to the introduction of innovations is to find out what the peasant already knows and how this can be used in the process of leading up to the adoption of modern methods; that gradual improvement of native implements is preferable to the attempt to enforce the employment of modern kinds, which the native will find hard to use and impossible to repair: and that, before introducing new plants or different agricultural methods either in cultivation, or manuring, it is well to be convinced of the usefulness and efficacy of these by means of careful experiment.

Unencumbered by detail and characterized throughout by clearness, this readable book is almost indespensable to the person ignorant of the conditions of tropical agriculture who wishes to gain a knowledge of them, as well as to the one who seeks general information outside that of his own experience. Over twenty-five good half-tone illustrations add to its interest, and it is, needless to say, produced in excellent style.

Dominica Exhibits at the Canadian National Exhibition.

According to the Dominica *Official Gazette*, 78 exhibits were sent, under the auspices of the Permanent Exhibition Committee, on August 16, 1909, to the Canadian National Exhibition at Toronto.

Of these, the samples from estates were as follows:—raw lime juice (seven estates); concentrated lime juice (four estates); distilled lime oil (five estates); hand pressed lime oil (three estates); green limes (six estates); cacao (four estates); nutmegs with mace (two estates); nutmegs (three estates); and the following, each from one estate: Liberian coffee, bay oil, otto of limes, essential oil of limes, mace, and Roseau plumes for decorative purposes.

From the Botanic Station there were sent: bush coffee (*Coffea stenophylla*), Congo coffee (*Coffea robusta*), Liberian coffee (*Coffea Liberica*), cacao, cola nuts, lime juice, bilimbi fruits, nutmeg fruits and limes.

Other exhibitors were the Dominica Starch Factory, Ltd., the Dominica Fruit Growers' Association, and the Permanent Exhibition Committee. Of these, the first exhibited 'Dominax' (a food for stock) and cassava starch; the second, green limes in a barrel and crates; and the last, Carib baskets.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of August :—

The normal conditions of the Drug and Spice Markets in the month of August is that of extreme quietness. It is the month in the whole year when everybody is, or is expected to be taking a holiday. No improvement on the general dulness of the markets that has prevailed throughout the past few months was therefore to be looked for especially to the uncertainty of the results of the Budget. Notwithstanding all this, there is a feeling among business men that there is a prospect of improvement as the autumn advances. In the matter of West Indian produce the following are the chief items of interest.

GINGER

At a spice auction on the 11th of the month, though the offerings were large there was a very quiet demand. Of Jamaica, 340 packages were brought forward and 64 disposed of at the following rates: 47*s.* 6*d.* to 50*s.* for fair to good ordinary, and 46*s.* to 46*s.* 6*d.* for common. Some small sales were also effected at 62*s.* for fair bright, and 54*s.* to 55*s.* for low middling. Of Cochin and Calicut, some 856 packages were offered, and only 87 sold, small cut fetching 47*s.* and tips 45*s.* A week later the offerings at auction amounted to 238 packages of Jamaica, 120 of which were sold, 50*s.* to 51*s.* being given for small washed and 47*s.* to 49*s.* for common mixed ratoon. 100 packages of brown rough Calicut were offered at this sale, and all bought in at 41*s.* At the last sale on the 25th there was no Jamaica offered, and only moderate supplies of Cochin and Calicut, for which there was but a slow demand.

NUTMEGS, MACE AND PIMENTO.

Of nutmegs at auction on the 18th, some 112 packages of West Indian were offered, and disposed of at an advance over previous rates. Again on the 25th, 360 packages of West Indian were brought forward, nearly all of which sold at steady to higher rates. Of mace there has been a steady demand, on the 11th thirteen packages of West Indian were offered, the whole of which found buyers at 1*s.* 7*d.* for fair pale and reddish, 1*s.* 5*d.* to 1*s.* 6*d.* for fair red, and 1*s.* for broken.

In the following week, namely on the 18th, prices had somewhat advanced, West Indian fetching 1*s.* 9*d.* for fair pale and reddish, 1*s.* 5*d.* to 1*s.* 7*d.* for fair to good red, and 1*s.* to 1*s.* 3*d.* for broken. Java at the same sale realized 1*s.* 10*d.* for fair pale, and 1*s.* 8*d.* for fair red Wild Bombay was offered, but bought in at 5*d.* per lb. At the last sale on the 25th mace declined 1*d.* per lb. West Indian was represented by 104 packages, all of which were disposed of at the following rates: good pale, 1*s.* 8*d.* to 1*s.* 9*d.*; fair, 1*s.* 5*d.* to 1*s.* 7*d.*; red and ordinary, 1*s.* 3*d.* to 1*s.* 4*d.* per lb. Pimento, at the auction on the 11th, was in small demand, some sales being effected at 2¼*d.* per lb., which price has ruled for the remainder of the month.

ARROWROOT.

A quiet tone has prevailed in this article throughout the month. On the 11th small sales of St. Vincent were effected at 1⅞*d.* per lb. for fair.

SARSPARILLA.

At the drug auction on the 12th, sarsparilla was represented by 42 bales of Grey Jamaica, 11 of Lima Jamaica, 28 of Native Jamaica, 6 of Honduras, and 10 of Mexican. Ten bales, only, of grey Jamaica were disposed of at 1*s.* 3*d.*, and slightly coarse at 1*s.* 2*d.* per lb. Two bales of ordinary Lima Jamaica sold at 1*s.* per lb., and one bale of sea damaged at 10*d.* per lb. Three bales only of Native Jamaica found buyers at 1*s.* for fair red and 10*d.* for dull. Two bales of coarse Mexican fetched 4½*d.* per lb., and Honduras was all bought in at 1*s.* 8*d.* per lb. No further sales of importance have been made during the remainder of the month.

KOLA, LIME JUICE, CASSIA FISTULA.

In the second week of the month, nineteen bags of West Indian kola, good dried halves were disposed of at 2½*d.* to 2¾*d.* per lb., and at the last auction a single bag of dried small and medium Jamaica was sold at 2¼*d.* per lb. On the 11th of the month, common brown raw Antigua lime juice was brought in at 1*s.* 1*d.* and good pale Montserrat at 1*s.* 3*d.* On the 25th, ten puncheons of fair pale raw Dominican were offered and bought in at 1*s.* 3*d.* per gallon. Oil of lime was brought forward at auction on the 11th, six cases being offered two of which sold at 5*s.* 6*d.* for good expressed Dominican, 1*s* 9*d.* being paid for distilled. On the 12th, two bags of good bright Cassia Fistula sold at 18*s.* per cwt., and on the 26th. four cases of fair St Lucia were offered and bought in at 20*s.* In the early part of the month some private sales were reported to have been made in Antigua tamarinds at 10*s.* per cwt., in bond.

RICE IN BRITISH GUIANA.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated September 17, 1909, gives information as follows : —

The weather during the fortnight has been very hot, and paddy is ripening fast. Some of the new crop will be ready for reaping at the end of this month. The old crop paddy is now about all milled, and there will be very little rice in the market for the next fortnight.

The local demand has fallen off somewhat: dealers were buying from hand to mouth in anticipation of being able to secure new crop rice at somewhat lower prices than at present prevail.

The new rice crop will not be in the market in any quantity before the end of October, though small lots may be offered early in the coming month.

Shipments to the West India Islands during the fortnight amounted to about 3,500 bags.

We quote to-day, f.o.b. Demerara, for good export quality : —

Nominally 18*s.* 9*d.* to 19*s.* 9*d.* per bag of 180 lb. gross.
,, 17*s.* 3*d.* to 18*s.* 3*d.* ,, ,, ,, 164 lb. ,,

We have, however, no stock to offer for export.

Lime Juice Tests in Dominica.

The Demerara *Official Gazette* contains an announcement that arrangements have been made to test samples of lime juice at the Botanic Station.

Determinations will be undertaken for both raw and concentrated juice. For a test giving the total solids, citric acid, and solids not citric acid in ounces per gallon, and the purity and specific gravity, a fee of 2*s.* for each sample of concentrated juice, and one of 1*s.* 6*d.* for each sample of raw juice, will be charged. If the test is to include the determination of citric acid, only, the charges will be respectively 1*s.* 6*d.* and 1*s*, for each sample.

MARKET REPORTS.

London,—The West India Committee Circular, September 14; Messrs. E. A. de Pass & Co., August 20, 1909.

Arrowroot—St. Vincent, $1\frac{3}{4}d.$ to $3\frac{3}{4}d.$, according to quality.
Balata—Sheet, 2/6; block, 1/10½.
Bees'-wax—£7 15s. to £8 for fair to good.
Cacao—Trinidad, 52/- to 62/- per cwt.; Grenada, 49/6 to 54/ per cwt.; Jamaica, 48/- to 53.
Coffee—Depressed; Jamaica, 40/6 to 100/.
Copra—West Indian, £22 per ton.
Cotton—St. Croix, Antigua, Barbuda, $12\frac{1}{2}d.$ to $13\frac{3}{4}d.$; stains, $6\frac{1}{2}d.$ to $8d.$
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 45/- to 50/-; low middling to middling, 51/- to 55/-; good bright to fine, 57/- to 65/-.
Honey—23/6 to 30/.
Isinglass—No quotations.
Lime Juice—Raw, 1/2 to 1/3 per gallon; concentrated, £18 15*s.* per cask of 108 gallons; Otto of limes 5/6 to 6 .
Logwood—No quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Common, $2\frac{1}{4}d.$ per lb.; fair, $2\frac{1}{4}d.$; good, $2\frac{3}{8}d.$
Rubber—Para, fine hard, 8/2½ per lb., fine soft, 7/3; fine Peru, 8/1; Negroheads, Manaos 4/11*d*; Islands, 3/3; Cameta, 3/7; Peruvian, 4/4.
Rum—Jamaica, 2/11 to 7/-; Demerara, no quotations.
Sugar—Crystals, 14/6 to 16/-; Muscovado, 12/- to 15/- per cwt.; Syrup, 13/6; Molasses, no quotations.

New York,—Messrs. Gillespie, Bros. & Co., September 3, 1909.

Cacao—Caracas, 11¾c. to 12½c.; Grenada, 11¾c. to 12¼c.; Trinidad, 11c. to 12c.; Jamaica, 9¾c. to 11c. per lb.; Dominica, 11c. to 11½c.
Cocoa-nuts—Jamaica, select, $28·00; culls, $18·00; Trinidad, select, $27·00 to $28·00; culls, $17·00 to $18·00 per M.
Coffee—Jamaica, ordinary, 7½c. to 7¾c.; good ordinary, 8c. to 8¼c.; and washed 9½c. to 10c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, no quotations; Barbados, 50c. to 53c.; St. Thomas, St. Croix, St. Kitts, 47c. to 50c. per lb., dry flint; Antigua, 48c. to 50c. per lb.; Caburettas from 35c. to 40c. per skin.
Grape Fruit—$2·75 to $3·25 per box.
Limes—Dominica, $4·75 to $5·50 per barrel.
Mace—28c. to 34c. per lb.
Nutmegs—110's, 9½c. per lb.
Oranges—Porto Rico, $1·05 to $1·50 per box.
Pimento—4⅝c. to 4½c. per lb.
Sugar—Centrifugals, 96°, 4·17c. per lb. Muscovados, 89°, 3·67c.; Molasses, 89°, 3·42c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., September 18, 1909.

Cacao—Venezuelan, $11·50 to $11·75 per fanega; Trinidad, $11·40 to $11·75.
Cocoa-nut Oil—68c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—$3·75 per 100 lb.
Dhal—$4·00 per 2-bushel bag.
Onions—$2·50 to $2·60 per 100 lb.
Peas—Split $5·50 to $5·75 per bag.
Potatos—English, $1·60 to $1·90 per 100 lb.
Rice—Yellow, $4·70 to $4·80; White, $5·00 to $5·25 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., September 27; Messrs. T. S. Garraway & Co., September 27 1909.

Arrowroot—St. Vincent, $3·75 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Cocoa-nuts—$14·00.
Coffee—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., according to quality—scarce; Venezuelan, $1[illegible]·00.
Hay—$1·00 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00.
Onions—Strings, $3·00 per 100 lb.
Peas—Split, $6·00 per bag of 210 lb.; Canada, $4·00 per bag of 120 lb.
Potatos—$2·10 to $2·50 per 160 lb.
Rice—Ballam, Calcutta, no quotations; Patna, $3·80; Rangoon, $3·00 per 100 lb.; Demerara, Ballam, $4·63 to $5·25 per 180 lb.
Sugar—Dark Crystals, 96°, no quotations; Muscovado, 89°, no quotations; Centrifugals, no quotations.

British Guiana.—Messrs. Wieting & Richter; Messrs. Sandbach, Parker & Co., September 17; 1909.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	NO QUOTATIONS RECEIVED.	$8·50 to $9·00 per 200 lb.
Balata—Venezuela block		Prohibited.
Demerara sheet		48c. to 50c. per lb.
Cacao—Native		12c. per lb.
Cassava—		——
Cassava Starch—		——
Cocoa-nuts—		$16 per M, peeled and selected.
Coffee—Creole		12c to 13c. per lb.
Jamaica and Rio		13½c. per lb.
Liberian		7c. per lb.
Dhal—		$4·20 to $4·40 per bag.
Green Dhal		——
Eddos—		——
Molasses—Yellow		——
Onions—Teneriffe		No quotation
Madeira		2¾c. per lb.
Garlic—		7c. to 8c.
Peas—Split		$6·40 to $6·50 per bag (200 lb.)
Marseilles		Nominal $5, none
Plantains—		——
Potatos—Nova Scotia		$3·25 per barrel.
Lisbon		No quotation
Potatos-Sweet, Barbados		
Rice—Ballam		$4·75
Creole		$4·25 to $4·60
Tannias—		
Yams—White		——
Buck		——
Sugar—Dark crystals		$2·25
Yellow		$3·00
White		$3·60 to $3·80
Molasses		$2·00 to $2·30
Timber—Greenheart		32c. to 55c. per cub. foot
Wallaba shingles		$3·50 to $5·50 per M.
,, Cordwood		——

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. VIII. No. 195. BARBADOS, OCTOBER 16, 1909. PRICE 1*d*.

CONTENTS.

The Imperial Institute.

THE increased interest in the colonial and other possessions of England, and the recognition of their importance as sources of commodities which could not be produced in that country have made a great difference in the way in which those possessions are regarded by the Mother Country. This change of attitude has taken place most quickly during the last twenty years, and the erection of the Imperial Institute at South Kensington, as the National Memorial of the Jubilee of Queen Victoria, was its direct outcome. Opened in May 1893, this institution has quickly increased in importance and usefulness until the present time.

An appreciation of the intimate connexion between the work of the Imperial Institute and the progress of the English possessions will be gained when its object is considered. This is stated in the *Report of the Work of the Imperial Institute,* 1908*, to be 'to promote the utilization of the commercial and industrial resources of the Empire by arranging comprehensive Exhibitions of natural products, especially of the Colonies and India, and providing for their investigation and for the collection and dissemination of scientific, technical and commercial information relating to them'. Thus the provision of the best, unbiased scientific research and advice is made, for the special purpose of the advancement of commerce.

This work must naturally be passive as well as active. That is to say there must be the provision of both literary and examplary records, as well as of advice and the results of investigations which are designed for a direct commercial application. The former of these exists in the valuable Colonial and Indian Collections, by which raw materials and primary manufactures are displayed for public examination; and in the Reference Library, which provides works of reference relating to the Colonies and India, with such periodicals and newspapers as are likely to be required by those using it. The latter is provided in the Scientific and Technical Department, which includes a special staff and research laboratories: in the *Bulletin of the Imperial Institute*, which is described in the report already referred to as 'a quarterly publication containing a record of the work of the Imperial Institute, in its various branches, as well as special articles on subjects connected with the industrial utilization of

* Colonial Reports—Annual, No. 601.

mineral and vegetable products'; and in a Centre Stand in connexion with the public exhibition galleries, where personal attention is given to enquirers, and publications are distributed.

The Colonial and Indian collections are open free to the public daily. These are very comprehensive, and, being arranged on a geographical system, convenient for reference. The Library and Reading Rooms give facilities for access both to standard and current scientific and commercial publications; they are available for Life Fellows of the Imperial Institute, as well as for others who have obtained a proper introduction.

The Scientific and Technical Department was established for the purpose of making expert enquiry into the properties and possible uses of new or unexploited natural products from the Colonies and India, and of giving trustworthy scientific advice on matters connected with industries that are already well established in those parts of the world. This work is by no means of the nature of a merely academic type of investigation. It is technical, and is directed with the chief aim of becoming useful commercially. Its scope cannot be indicated better than by quoting from the Report already cited: 'Materials are first investigated in the research laboratories of the department, and are afterwards submitted to further technical trials by manufacturers and other experts, and finally are commercially valued.' This work is chiefly initiated by the Home and Colonial Governments and the Government of India. It may also be undertaken for British representatives abroad, through the medium of the Foreign Office. Investigations on behalf of private individuals are only made under special circumstances. Other means for increasing the effectiveness of this department are the maintenance of a sample room by it, where samples of the products which have been dealt with up to the present are kept; co-operative work with the Agricultural and Mines Departments in the Colonies; mineral surveys under the supervision of the Director; and arrangements by which the operations of the Agricultural Departments in West Africa are correlated with the work of the Imperial Institute.

The *Bulletin of the Imperial Institute* is, as has been stated, published quarterly. Its scope may be indicated by reference to the contents of a recent number (Vol. VII, No. 2). These included: Recent investigations in regard to food grains, cotton, fibres, rubber, and graphite; general notices regarding the occurrence, use and development of economic products such as tungsten ores, peppermint oil, silk from the Tussore silkworm, and cacao; general notes in connexion with various publications and with samples that have been submitted for examination; summaries of recent reports and other publications received at the Imperial Institute from Agricultural and Technical Departments in the Colonies and India, as well as of general Colonial and Indian publications; notices of recent scientific literature; and a list of recent additions to the Library. This will serve to show the wide range of subjects dealt with in the Bulletin. The Centre Stand for the facilitation of the distribution of literature and the provision of personal attention and advice contains a supply of pamphlets, circulars, hand-books etc., which are intended to be of use chiefly to the scientific or commercial enquirer, and to the intending emigrant.

From a less general point of view, other interests that are served by the Imperial Institute are those of the administrative departments in East and West Africa, and of representatives from the Colonies or India who may require room for meetings or receptions in London. In regard to the first, special courses in tropical hygiene, law, accounting and tropical resources are provided for candidates who have been selected for administrative appointments in East and West Africa, instruction being given in the last subject by members of the Scientific Staff of the Institute.

Until the end of 1902, the Imperial Institute was managed by a Governing Body and an Executive Council, on the latter of which the Indian Empire and all the British Colonies and Dependencies were represented. After this, its management was transferred by Act of Parliament to the Board of Trade, assisted by an Advisory Committee. This Committee includes representatives of the Colonies and India, and of the Colonial and India Offices, the Board of Agriculture and the Board of Trade. During last year, great progress was made in improving the Colonial and Indian Collections. This was effected by reorganization and the receipt of fresh exhibits, the arrival in London of exhibits from all parts of the British Empire for display at the Franco-British Exhibition at Shepherd's Bush affording an especially good opportunity for replenishment.

Special recognition of the assistance given by the Imperial Institute has been shown during the past year in the action of the Transvaal Government in considerably increasing its previous subscription, and in that of the Government of the Australian Commonwealth in announcing its intention of contributing toward its funds. Gratifying as these incidents are, no better testimony as to the value of this institution is required than that which is afforded by the recognition of the scope and thoroughness of its work.

SUGAR INDUSTRY.

Cane Variety Experiments in Antigua.

At a meeting of the Agricultural and Commercial Society, Antigua, held on September 10, 1909, Mr. H. A. Tempany gave an acccount of the trials with varieties of sugar-cane that were conducted in that island, during the season 1908-9, by the Imperial Department of Agriculture.

Mr. Tempany put before the meeting a short summary of the results of the sugar-cane experiments conducted by the Imperial Department of Agriculture during the last season.

The experiments had been laid out under the direction of Dr. Watts, but the work in connexion with the reaping had devolved on him.

The method of planting and the treatment of the canes during growth had been the same as in previous years; the canes under experimental cultivation had received the same care and treatment as the ordinary canes on the estates, and thus the results of the experiments could be directly compared with crop results. The following estates had been used as experiment stations: Cassada Garden, Bendals, Friars Hill, Tomlinsons, Blubber Valley, The Diamond, Ffryes, Big Duers and Thibous.

The rainfall during the year had been deficient and badly distributed, and as a result the crop had suffered considerably, the total output of sugar for the island being about 8,600 tons. The quantity of syrup and molasses exported was somewhat greater than usual, and it was interesting to note that the quantity of grey crystals exceeded the amount of muscovado sugar produced.

With regard to the experiments themselves, instead of there being twenty-one varieties of cane in duplicate plots on the various stations, forty-two varieties had been planted in single plots, the total number of plots being the same as in previous years, but the number of different varieties being doubled.

Taking plant canes first, the following fourteen canes had given the best results:—

Plants.	Sucrose per gallon, in pounds.	Sucrose per acre, in pounds.
1. B.4,596	1·87	5,800
2. D.625	1·85	5,540
3. Sealy Seedling	1·97	5,410
4. D.848	2·01	5,140
5. B.3,696	1·86	4,670
6. B.376	2·06	4,590
7. B.1,753	1·81	4,460
8. D.1,452	1·82	4,410
9. B.156	1·88	4,390
10. D.116	1·84	4,190
11. B.1,355	2·06	4,120
12. D.109	1·93	4,030
13. B.1,528	1·95	3,980
14. B.1,030	2·03	3,840

The results were poor, and considerably below the average for the past eight years. It should be noted that eight out of the first fourteen canes are newly introduced varieties, and that six out of these eight gave exceptionally good results during the season 1907-8.

Sealy Seedling, an old favourite, had again given good returns, while B.208 had dropped down to seventeenth on the list, as it did not appear to be able to withstand drought.

Of the first fourteen, six were canes which had been grown during at least four seasons, and all these had proved their value except D.625. B.4,596 had shown itself to be the best cane of the year, and was recommended as being worthy of careful and extended trial by planters.

Taking the results on each estate, a method of comparison introduced by Dr. Watts, it is found that:—

B.4,596	stands	among	the	first	14	canes	on	9	estates.
B.1,753		"	"	"	"	14	"	"	8	"
B.109, B.3,696	stand	"	"	"	14	"	"	7	"
D.625, Sealy Seedling	"	"	"	"	14	"	"	6	"
B.376, B.1,528	"	"	"	"	14	"	"	5	"
D.848, D.1,452, B.156	"	"	"	"	14	"	"	4	"
B.1,355	stands	"	"	"	14	"	"	3	"
B.1,030	"	"	"	"	14	"	"	2	"

The yields from ratoon canes had been especially low last season. D.109 had taken first place, and seemed to bear out its reputation as a good ratooning and drought-resisting cane. B.306 and Sealy Seedling followed next in order. B.208 had dropped to the tenth place, and had again shown inability to withstand drought. White Transparent, it may be noted, had taken a very low place.

Ratoons.	Sucrose per gallon, in pounds.	Sucrose per acre, in pounds.
1. D.109	2·07	3,500
2. B.306	2·17	3,230
3. Sealy Seedling	1·96	3,040
4. D.95	2·19	2,950
5. B.147	2·06	2,940
6. B.109	2·04	2,940
7. B.376	2·11	2,790

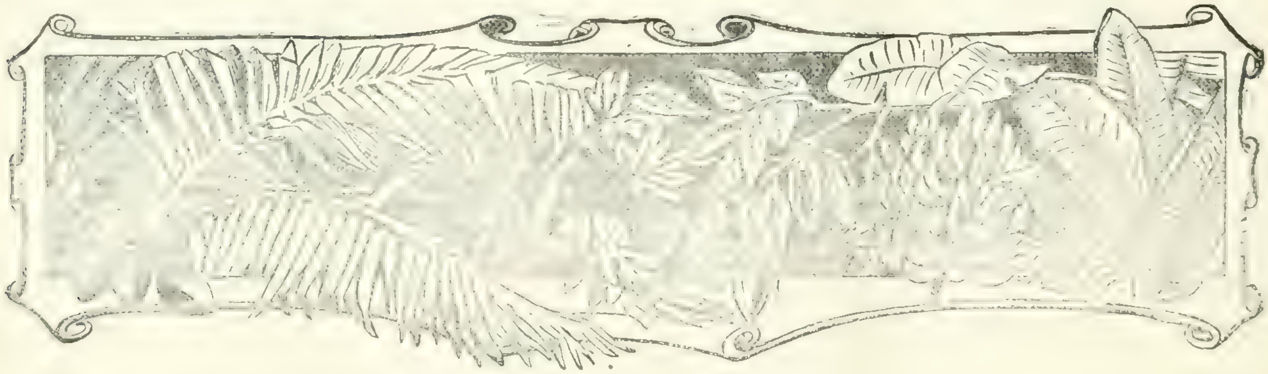
The same method of comparison as for plant canes gives the following results:—

Sealy Seedling	stands	among	the	first	7	canes	on	7	estates.
B.306		"	"	"	"	7	"	"	5	"
B.156, D.116	stand	"	"	"	7	"	"	4	"
D.95, B.109, D.109	"	"	"	"	7	"	"	3	"
Burke, D.74	"	"	"	"	7	"	"	2	"

With regard to the newly introduced canes, B.4,596 had again come out first, followed by B.1,528, B.3,696 and B.1,753, an order which corresponded closely with that observed in the case of plant canes.

New Varieties, Ratoons.	Sucrose per gallon, in pounds.	Sucrose per acre, in pounds.
1. B.4,596	2·00	4,780
2. B.1,528	2·02	4,230
3. B.3,696	1·88	3,720
4. B.1,753	1·82	3,080
5. D.790	1·91	2,730
6. D.132	1·82	2,500
7. D.1,119	1·82	2,430

Mr. Tempany concluded his remarks by thanking the planters and estate owners, who had been of great assistance to the Department in enabling it to carry out the sugar-cane experiments for the last year to a successful issue.



WEST INDIAN FRUIT.

THE SOIL REQUIREMENTS OF THE PINE-APPLE.

The reason why the pine-apple will flourish on some soils, while it is a complete failure on others, is not fully understood. The following notes, which are taken from Bulletin No. 8 of the Porto Rico Experiment Station, contain interesting information in the matter, and indicate that there is no reason why the cultivation of this plant should not be tried on widely varying types of soil, provided that especially careful attention is given to the matter of drainage:—

In Florida most of the pine-apple soils consist of over 99·5 per cent. of insoluble silica or sand of rather coarse texture. The mechanical analysis shows very small amounts of organic matter, very fine sand, silt and clay. Soil of this character is not very often found in Porto Rico, or, as a matter of fact, in the West Indies. It was therefore a question for the pioneer planters of Porto Rico as to what soil to choose for pine-apples. True enough, they were found growing wild in many sections, and had been cultivated in limited quantity near Lajas for a great many years, but nothing was known beyond the fact that pine-apples would thrive there in a certain restricted locality, and it was believed that they would not thrive on soils more than half a mile distant. The practice of the last few years has shown beyond question that pines can be produced on soils of widely different character; although the best quality of fruit is raised on soils somewhat resembling those of Florida.

The three requirements of the pine-apple plant are that the roots must have a limited amount of water, the necessary supply of plant food, and an unlimited amount of air. It will be understood that a well-drained sandy soil, in which the individual soil particles are coarse, fills some of the requirements. It will need frequent stirring of the top soil until the plants become large enough to shade and protect it from evaporation. The plant food, of course, will have to be supplied. In clay soil and in loam and even in fine sand the conditions are not so readily controlled. A heavy rain will pack the surface, excluding the air from the roots, and unless the land is bedded, the water is likely to remain in the soil long enough to cause serious injury to the roots.

Aeration is really the underlying principle of pine-apple cultivation. The pine-apple plant is not averse to water, but the water, when filling up the soil, excludes the air. We have grown plants in jars of water for months, and found the root development to be vigorous and healthy, and the increase in the weight of the plant equal to that of plants grown in soil. We have also grown plants in tubes filled with gravel previously washed with hydrochloric acid and distilled water, and in similar tubes which were perfectly empty, and we found that by watering every day with a very dilute plant-food solution, roots were developed and the plants increased in weight, not alone in the tubes containing gravel, but also in those which were empty and that served only to support the plant and protect the roots from light. These methods are not recommended as being practical, but they serve to illustrate the nature and the requirements of the pine-apple plant. Methods quite similar are followed on the Florida Keys, where pine-apples are often planted in a few inches of leaf mould on the top of the bare coral rock, and whenever the amount of soil is insufficient to support the plant a few pieces of stone are used to hold it in place. Under such conditions, pine-apples will grow and produce fruit until the leaf mould is all exhausted. The reason for not growing for a longer time is not so much the lack of soil for root formation as the exhaustion of plant food. This is further illustrated in the pine-apple regions in Florida, where the soil only serves as a support for the plant and all the necessary plant food must be added. These are some of the things known, but in applying this knowledge locally it is often found that there are other conditions which we are not yet able to explain. For instance, one soil may to all appearances be physically suited and yet be a failure, while another may seem to be anything but a pine-apple soil and yet produce a satisfactory growth of plants and yield of fruit. It is therefore never safe to say that a field will or will not produce pine-apples before making a practical test. The amount of preparation needed and the methods to be followed will depend entirely upon the class of soil selected.

THE MANUFACTURE OF LEMON OIL.

A perusal of the following paragraph will show that the method for the extraction of oil from the rind of the lemon that is used in Sicily is similar in some respects to the 'écuelle' method that is employed for a similar process with the lime in Montserrat and other West Indian Islands:—

In a recent report, the United States Consul at Messina refers to the lemon oil manufacturing industry of Sicily, and gives some interesting particulars of the method in vogue there in the manufacture of the oil. In order to prepare the essential oil, he states, the peels are first soaked in water for some four or five minutes for the purpose of softening the envelopes of the oil vesicles, and rendering easier the expression of the oil. The peels are then carried to the expressing room which is usually darkened, and kept as cool as possible, to guard against any changes in the character of the delicate and unstable oil. In the expressing room each workman is seated on a low stool, and has before him a glazed earthenware bowl, across which, and resting in depressions in the rim, is a wooden rod run through a good-sized sponge. In his left hand the workman holds another sponge, often cup-shaped, against which he presses the outside of the peel, giving this a circular twisting motion. By this means the walls of the oil cells are broken, and the oil is squeezed out into the sponge to drip into the bowl. In this, the oil rises to the top of the water, and can be decanted off. The oil is filtered into large copper containers, in which it is stored to await sale. Various machines have been tried for expressing the oil, but so far without success. The amount of oil obtained will vary largely, according to the district and the season, but will average from 0·7 lb. per 1,000 lemon peels to 1 lb., and, in rare cases, to as much as 1½ lb. (*Natal Agricultural Journal*, July 1909.)

THE MANUFACTURE OF NITRATE OF LIME.

The following is abstracted from a paper on this subject by Herr Sam Eyde of Christiania, which appeared in the *Journal of the Royal Society of Arts*:—

In order to explain the Birkeland-Eyde method, it is necessary first to describe the flames, consisting of arcs of light, which are used in the electric furnaces. The formation of the flame occurs through an arc of the electric flame being formed between the points of the electrodes, which are close to each other. By this, an easily movable and flexible current is established which, with the arrangements made, will be found in a highly magnetized field. The electric arc that has been formed moves, on account of this magnetic field with great velocity perpendicularly to the lines of force, and the electric arc's foot draws back from the points of the electrodes. When the length of the electric arc increases, the electric resistance becomes greater and the tension increases, until it becomes so great that a new electric arc starts from the points of the electrodes.

To regulate the current, an inductive resistance is used in series with the flame. With an alternating current, all these arcs are formed in opposite directions and appear to the eye to be circular discs. It appears that we have discovered in this flame a powerful technical means for the oxidation of the nitrogen of air. The flame in our furnaces burns with a steadiness that is really astonishing.

On electrodes of 1·5 cm. thick copper tubing, through which water passes for cooling them, one can take up over 1,500 horse-power, with a flame of 1·8 m. in diameter. The chamber in which the flame burns is circular, of only a few centimetres width, and about 2 m. in diameter. After the oxide of nitrogen is formed in the furnace, it is converted in the oxidation tank into peroxide of nitrogen, and in the absorption towers into nitric acid.

The flame chamber of the furnace is formed of fire-clay brick; through the walls of this the air is conveyed to the flame. The nitrous gases formed in the flame escape through a channel made along the casing of the furnace, which, like the flame chamber, is furnished with fireproof lining.

With this furnace we have achieved such steady working that it burns for weeks without any regulation worth mentioning. It may further be stated that the maintenance of the furnace and its repairs are simple to a degree, as the most exposed portions, the electrodes, only require to be changed every third or fourth week, and the fireproof masonry every fourth to sixth month.

The temperature in our flames exceeds 3,000, or perhaps 3,500, degrees Centigrade. The temperature of the escaping gases may vary between 800° and 1,000° C. during ordinary working. The furnaces are made of cast steel and iron, the middle of the furnace being built out to a circular flame-chamber. By aid of centrifugal fans, the air is brought into each furnace through tubes from the basement.

When the air in the flame-chamber has been treated by the electric flames, the nitrous gases formed pass out through a channel built along the casing of the furnace, and thence out through the lower part of the furnace to two fireproof-lined gas-collecting pipes, about 2 m. in diameter, which convey the gas through the basement out to the steam boiler house. In the boiler house the gas passes through four steam boilers, in which the temperature, which was, as mentioned, 1,000 degrees Centigrade, is reduced. The heat given off by the gas is used for concentrating the products, and in the winter time for warming the factory buildings.

The steam produced in the boilers is utilized in the further treatment of the products. In the boiler house there are also two large and two small air-compressors, which supply compressed air for pumping acids and lye in the factory's various chemical departments.

The gases pass on from the steam boilers through an iron pipe into the cooling house, with the object of completing the cooling commenced in the steam boilers. This cooling is necessary in order to obtain a suitable absorption. Each cooler consists of a great number of aluminium tubes, over which cold water runs, while the hot gases pass through them. The temperature of the gas is considerably reduced. From the cooling chambers, the gases go on to the oxidation tanks.

These oxidation tanks are vertical iron cylinders, lined with acid-proof stone. The object is to give the cooled gases a sufficient period of repose, in which the oxidation of the oxide of nitrogen may have time to take place The necessary amount of oxygen is present in ample quantity in the air which accompanies the gases from the furnaces. From the oxidation tanks the gases are led into the absorption towers. All the towers are filled with broken quartz, which is neither affected by nitrous gases, nor by nitric acid. To assist the passage of the gases on their way from the furnaces, there are centrifugal fans, constructed of aluminium, on each row of towers.

The gases enter at the base of the first tower, go up through the quartz packing and thence, by a large earthenware pipe, enter the top of another tower, through which they pass downwards through the quartz at the bottom of the third tower, and so on, until the air, relieved of all nitrous gases, leaves the last tower. Water trickles through the granite tower, and this is gradually converted into weak nitric acid, while the liquid used in the wooden towers is a solution of soda. The absorbing liquid enters the top of the tower and is distributed in jets by a series of earthenware pipes, so that the permeating gases come into immediate contact with the absorbing liquid. In the granite towers nitric acid is thus formed, and in the wooden towers a solution of nitrate of soda.

The final stage of the process is the neutralization of the nitric acid thus obtained, by means of limestone. From the liquid formed, solid 'nitrate of lime' (calcium nitrate) is separated by heating it in vacuum evaporators.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 27, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 100 bales of West Indian Sea Islands have been sold, at rather hardening rates.

The sales are chiefly comprised of Barbados cotton at 14*d.* to 16*d.*

The Savannah market has opened at 12⅝*d.* for the best Georgias and 13½*d.* for the best Floridas, and the market is steady to firm.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 18, is as follows:—

There have been no receipts of new crop Sea Island cotton during the week, and it may be a fortnight yet before sufficient cotton is marketed to admit of factors offering anything for sale. Recent rains have retarded the harvesting and delayed the movement.

THE BREEDING OF COTTON IN THE UNITED STATES.

The breeding of types of Sea Island cotton immune to various diseases, the securing of types of nitrogen-gathering plants to use in rotation with such kinds of cotton, and improvement of the fibre of other kinds of cotton and of its productivity, are among the achievements of plant breeders.

Hybridization and seed selection in the case of existing crops have been performed scientifically to produce varieties to meet new conditions, to produce larger yields, to resist cold, drought, and disease. With the advent of the cotton boll weevil the breeding of cottons fitted to escape weevil injury, to produce longer staple and heavier yields, and to resist wilt, root-rot, and other diseases, was undertaken with gratifying results.

Several entirely new cotton hybrids have been developed, which possess great improvement over former varieties. This Department's newly-bred, heavy-yielding, long-staple Upland cotton, the Columbia, received a gold medal at the Jamestown Exposition.

The wilt-infested cotton soils of the South-east have been outwitted by the breeder of wilt-resistant varieties of both Sea Island and Upland cotton. The breeder has hastened the maturing of cotton to ensure the safety of the crop upon the arrival of the boll weevil. Varieties of Guatemala cottons have been introduced and acclimatized because they have characteristics that enable them to resist the boll weevil.

The United States imports about $15,000,000 worth of Egyptian cotton annually for the manufacture of special fabrics. The growing, grading and handling of this crop have been so perfected that the product is exceedingly uniform, and the fibre being of a very high quality, fancy prices are always received for it.

For a number of years the Department has been endeavouring to establish this crop in the United States. Several years ago, some work was undertaken in the South-west, notably at Yuma, in cooperation with the Reclamation Service, on one of their projects. This work has already progressed sufficiently to warrant us in saying that there is great promise of establishing an important cotton industry in the region mentioned.

During the past year, a total of about 40 acres was planted in Egyptian cotton at various localities in South Arizona, seed of the acclimatized strain that has been grown for six years in the South-west being used. The indications point to an average yield of 1 to 1½ bales per acre wherever the planting was done in good season and the cotton received reasonable care. A good commercial fibre was obtained, satisfactory in strength and fineness, but not in the matter of length and colour.

It is planned to sell the product at the highest price obtainable, in order to ascertain approximately what profit can reasonably be expected by growers of Egyptian cotton in the South-west. The marked interest in these experiments evinced by a number of American manufacturers of Egyptian cotton makes it reasonable to expect that the Arizona-grown fibre can be marketed advantageously.

The peculiar climatic and soil conditions in this region have developed a number of unexpected problems, which will necessitate careful laboratory and field work for settlement. It is found, for example, that, for reasons not yet fully explained, cottons hybridize naturally. In view of the fact that one of the essentials in establishing this industry is the securing of a uniform product, there is some careful work ahead in the matter of determining the causes of the variations noted, and fixing by practical methods the types which the market demands, and for which it is ready to pay the highest price. (*Yearbook*, 1908, of the United States Department of Agriculture.)

Export of Cotton from Antigua.—The amount of cotton exported from Antigua during the quarter ending September 30 was 32 bales, weighing 7,100 lb., and of an estimated value of £384 11*s.* 8*d.* This was all Sea Island cotton, and was sent to the United Kingdom.

THE RESIDUAL RUBBER IN TAPPED TREES.

The milky juice (latex) which yields the rubber of commerce is a waste product, as far as the plant which secretes it is concerned; that is to say, it can no longer be converted into products useful in nutrition or the provision of energy. In any method of tapping, a certain amount of this latex must remain behind in the tissues of the plant. An explaination of what becomes of this is given in the following abstract, which is taken from the *Tropical Agriculturist* for October 1909:—

It is generally believed that all the rubber which is formed in the stem of a tree accumulates in the latex-bearing tissue until the planter chooses to tap it; that if he does not tap until the tree is eight years old, he will obtain all the rubber which was in the tree when it was, say, six years old, plus the amount which has formed in the additional two years. From a botanical standpoint this is improbable. After the stem has passed its green stages, it acquires the normal secondary cortex with a dead corky layer on the outside; and as it grows older, this corky layer increases in thickness. But the corky layer is formed from the latex-bearing layers. This is readily seen when a tree is pared; the exposed latex-bearing tissue is then rapidly covered by a new corky layer, which is obviously formed from it. Further, if a tree is tapped by the full spiral method, with spirals 1 foot apart, and the tapping is stopped after a breadth of 6 inches has been cut away along each spiral, the original bark left between the spirals will, in some cases, scale off in flakes down to the level of the renewed bark. I have taken off scales of brown bark 10 inches long, which were formed between two spirals. Now, the brown, corky layers, and the scales just referred to, were originally laticiferous, and the current belief assumes that this latex was transferred inwards to the inner bark when the corky layer was formed. But if the brown scales of corky bark are pounded up in a mortar, and then extracted with carbon bisulphide, it is found that they contain an appreciable quantity of rubber. Just as in the case of the leaves, therefore, rubber is discarded with the brown bark, and thus the current belief is shown to be incorrect. When latex-bearing bark is converted into corky bark, the latex which it contains dries up, and the rubber is left in the dead layer. Some of the rubber which was in the tree at the age of six is undoubtedly rendered unavailable before the tree is eight years old. The amount might be estimated if the rate of growth of bark were known; it cannot be a very considerable quantity when the tree is young.

It appears, therefore, that the tree is always discarding rubber as well as manufacturing it, the balance being, of course, in favour of the latter process. This obviously contradicts the idea that the rubber from a six-year old tree is itself six years old, or that rubber extracted from an eight-year old tree is necessarily older than that extracted from a six-year old tree. However, this contradiction is superfluous, for it is evident that in any tree most of the latex is derived from near the cambium in the present systems of tapping, and that that latex is the most recently formed.

This is not intended to serve as an argument in favour of early tapping. That interpretation of the experiment would involve the confusion of two distinct theories, viz., (1) that all the rubber formed is stored in the laticiferous tissue, and so 'matures' there, and (2) that the rubber formed at the age of six is as 'strong' as that formed at the age of eight. The experiment proves that the first of these is, at least in part, incorrect; it gives no information whatever with regard to the second.

HOW EEL WORMS ARE SPREAD.

As eel worms are capable of doing much damage to plants and are difficult to eradicate from soil which is infested by them, it is important to know how they may be prevented from spreading to soil which is comparatively free from them. This subject is dealt with in Bulletin No. 6 of the Division of Pathology and Physiology, Hawaii, from which the following extracts are taken. Other information in connexion with these pests will be found in the *Agricultural News*, Vols. III, p. 283; VI, p. 123; VIII, pp. 138, 280.

The disease will usually spread from a centre of infection at the rate of a few rods each year. In such cases its progress is through the soil, and may be marked by its effects on roots. But the infection does not always occur in this manner. During a spell of dry weather, the eggs and dried up larvae exposed on the surface of cultivated ground may be whirled aloft by the wind and scattered for miles over adjacent territory. The disease may thus, unseen, spread by leaps, making itself felt however in the new localities only after some years have elapsed, and when the worms have become abundant by natural increase from the few eggs or larvae deposited by the wind. These facts indicate sufficiently the rate at which root-gall may be spread by the wind. The facts are much the same as for *Tylenchus devastatrix*, a nematode fortunately so far unknown in Hawaii.

The different means by which the disease may pass from one piece of land to another deserve careful consideration, for upon them may be based a number of useful precautions. The migrations due to the worm's own muscular powers are not rapid or great, in fact they are so slight that it may be questionable whether they would account for anything but the very slowest spread of the disease. Even when the worms pass from plant to plant in the same field, it is questionable whether the movement is not due to transportation by some of the numerous agencies constantly at work in their neighbourhood. Almost everything that moves either in or upon the soil may transport the minute eggs and larvae of eel worms. Air, water, animals, are all agents in disseminating the disease. The general lay of the land determines largely the nature and direction of the water-currents in the soil. These doubtless have something to do with the spread of the disease. Here very little can be suggested beyond a proper system of drainage.

One set of agencies in the spread of root gall, and a most important one, too, has not yet received attention. Insects, earthworms, birds, domestic animals, man himself, are all factors in the life-history of the eel worm. The insect that burrows in the ground and brings to the surface subterranean material is active in aiding the eel worm in finding new victims. The egg or larva leaves the mandibles of the insect only to be caught up by the wind, or to be pressed with other matter into some crevice in boot or hoof, and thus, it may be, travel miles before being again set down. This is no fancy sketch: every statement rests on the most unimpeachable observation. Even the hands when soiled from field work may carry enough material to start a thriving colony of eel worms. It only needs to be washed off, and thrown with the water around the roots of some favourite plant to form a nucleus for a new infected area. But enough has been said to put those interested on their guard. The thorough cleansing of boots and hoofs before passing from infested land to uninfested land is too obvious a precaution to need mentioning.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial has for its subject the Imperial Institute. Especial reference is made to the aim and scope of the work of this institution.

On page 323, the results of the sugar-cane variety experiments in Antigua, for the season 1908-9, are summarized.

An interesting account of the way in which nitrate of lime is manufactured appears on page 325.

Page 327 contains information which deals with the question as to what becomes of the rubber that is left in trees that have been tapped, and with the ways in which eel-worms are conveyed to soil which has previously been free from them.

In Insect Notes (page 330) an interesting article, which is illustrated, has for its subject Cotton Stainers.

In the Students' Corner, on page 333, a useful diagram, which will serve as a guide in mixing manures, is given.

The Annual Reports of the Botanic Stations, etc., in Antigua and Grenada, are noticed on page 334.

Cases of sudden death among fowls are often difficult to diagnose without a post mortem examination. On page 335 hints are given which should enable such an examination to be conducted in a simple, but useful, manner. Information is also given, on the same page, with regard to the progress of the rubber industry in Nigeria.

A Correction.

The second word in the last paragraph but one on page 319 of the last issue (No. 194) of the *Agricultural News* should be 'Dominica'.

Cotton in Rhodesia.

According to the *Empire Review* for September 1909, satisfactory reports are being received which show that short and medium stapled cotton of an excellent quality can be succesfully grown in both North-eastern and North-western Rhodesia. Samples from an experimental plantation of about 50 acres, grown from Egyptian and American seed, were sent to the British Cotton Growing Association for inspection, and were reported to be of good colour and of long and strong staple, the value being 7¾*d.* to 8½*d.* per lb. Further samples of Abassi and Upland from another plantation were highly commended by the British Cotton Growing Association, and were valued at 8*d.* to 8½*d.* per lb., with Middling American at 6·65*d.* per lb. Cotton has, for some years, been shipped from North-eastern Rhodesia to Liverpool, but the progress of the industry has been slow, and it has been conducted on more or less experimental lines. Awakening interest, however, gives hope of its speedy development.

Experiments with Camphor in Jamaica.

An account of experiments with camphor, which were carried out at the Government Laboratory, Jamaica, is given in the Report of the Department of Agriculture for that island for the year 1908. Weighed quantities of different parts of the stem, which were obtained from trees growing at Knockalva Pen, were subjected to steam distillation, and the distillate suitably treated in order to separate oil and camphor, the latter then being heated over quicklime for the purpose of getting the pure sublimate. The highest yield of camphor was obtained from the tips of the shoots. The amounts of camphor oil and camphor that were obtained, on an average, from the whole stem were respectively 0·23 per cent. and 0·28 per cent., making a total of 0·51 per cent.

The *West Indian Bulletin*, Vol. IX, pp. 275-6, gives an account of somewhat similar experiments that have been carried out at the Government Laboratory and Botanic Station in Antigua. In these, oil only was obtained, and it was found that the wood gave 0·4 per cent. of this, while the amount that was obtained from the leaves and twigs was 1·2 per cent. Thus in both cases the observation was made that the younger parts of the plant give the largest yields.

Science in the Primary Schools, Grenada.

A Rule has recently been made by the Board of Education, Grenada, whereby an old Rule of the Primary Education Ordinance, 1907, which defines various conditions under which bonuses may be given to head teachers from any special sums voted from public revenue for such purposes, is amended in the following way. Special bonuses will be paid to head teachers of combined schools for efficient instruction in (a) Practical Agriculture, (b) Sanitation and Hygiene. With regard to the first, bonuses will be granted to a head teacher in respect of each pupil teacher or examinable male pupil in standard VI or VII who, having been taught by him, gains a certificate from the Imperial Department of Agriculture for a pass in its Preliminary Examination in Agriculture. In the case of Sanitation and Hygiene, similar grants will be made in respect of classes composed of pupils belonging to Standards V, VI and VII, who show a competent knowledge of these subjects at the annual examination.

New Plants in the United States.

The *Yearbook* of the United States Department of Agriculture for 1908 gives an account of explorations that have been undertaken in various countries by that Department for the purpose of securing new crops and establishing new agricultural industries. Among the discoveries is a new forage plant, in the shape of a promising clover, called 'Shaftal', from the valleys of the Himalayas. This is stated to have produced exceedingly good crops in the hottest part of the south-western States, and it is expected to prove valuable in rotations in that part of the country, especially with the advent of Egyptian cotton cultivation.

According to the same publication, an unusual number of East Indian varieties of the mango have fruited during the year, and advantage will be taken of the fact to extend the area on which this plant is grown, especially in Florida. The statement is also made that the discovery that the bamboo can be grown successfully in the Gulf States and California has led to the importation of several thousand plants from Japan, with a view to its production for extended use in the country.

Transference of Salts in Soils.

An account is given, in the *Experiment Station Record* of the United States Department of Agriculture, of experiments which were made with soils from some of the Russian steppes for the purpose of gaining information as to the rate at which alkali soils are formed in those regions. The salts which cause the alkalinity are, of course, carried up in the capillary water of the soil. The rate at which this water rises was found to be greatest at first where the soil particles are largest, but it becomes smaller in the course of time, more quickly with coarse soils than with fine soils. When the layers of soil of different degrees of coarseness were placed in tubes in the order in which they occurred naturally, the rise of water appeared to depend entirely on the capillary state of the lowest layer, that is the one in contact with the water-supply.

Determinations of the salt content of the samples of soil at different levels disclosed the fact that complete transfer of the salt from the lowest to the highest layers took place in about four months.

The interesting observation was also made that water travelled as far in an hour, in a horizontal direction, in the soil experimented on, as it did in a month in a vertical direction.

Prize-holdings Competitions in Grenada.

During the year 1908-9, three prize-holdings competitions were held in Grenada. Two of these were in the parishes of St. David and St. John, and had been initiated in the period 1907-8; the third took place in St. Patrick's parish for the first time. In the first, there were forty-three entries and nineteen prizes were awarded. It was not intended, originally, to award this number of prizes, but it was subsequently found advisable, in view of the high percentages of marks gained, to divide some of them. In St. John's parish, the number of entries was twenty-nine, and fifteen prizes were awarded; here the high standard attained by the recipients of the lowest prizes necessitated an addition to their value. In the third-mentioned parish, notwithstanding the existence of a certain amount of suspicion on the part of the peasants, on the introduction of the competition, there were twenty-four entries; twenty competitors worked for prizes under the scheme, and eleven prizes were awarded. In all cases, the judges recommended the continuation of the scheme.

In consequence of the success of the competitions, it has been decided to continue them, and to extend them to every parish in the island.

Underground Stem of the Sugar-cane.

In the last number of the *Agricultural News*, an account of the contents of Vol. X, No. 2 of the *West Indian Bulletin*, which has just been issued, was given. Among these is a paper by G. G. Auchinleck, B.Sc., Science Master at the St. Kitts Grammar School, which is specially interesting as it shows that the sugar-cane possesses a true rhizome, or underground stem, the existence of which does not appear to have been suspected hitherto. Leading from the observation that a clump of well-grown canes which has been removed from the ground shows a connexion between its parts and a rigidity that do not seem to be sufficiently explained by a supposition that they are due to an entanglement of roots, the writer goes on to demonstrate that, by suitable removal of these organs, it becomes apparent that the means of the connexion and the cause of the rigidity are supplied by a true rhizome, that is a horizontal underground stem. A description of the appearance and mode of growth of this structure follows, and from the latter the way in which the sugar-cane is enabled to ratoon continuously and the fact that a clump of canes can arise from the growth of one eye of a cutting are demonstrated and accounted for in a plain and satisfactory manner. At the end of the paper, the practical applications of the facts disclosed are considered. These are, briefly, two: care must be taken not to injure the stools during cultivation, for the loss of a rhizome means the loss of next year's stalks; tillage of ratoons, if it is necessary, should take place as soon after reaping as possible, so that the cutting of the roots may be avoided, for the ratoon quickly becomes independent of the plant, and the latter is sure to die after it has flowered.

The paper is illustrated by a useful diagram, and its interest will repay perusal.

INSECT NOTES.

COTTON STAINERS.

Cotton stainers have been discussed at some length in the publications of the Imperial Department of Agriculture during the past few years. In the *West Indian Bulletin* (see Vol. VII, p. 65) an article on this subject gives an account of the characters of the genus, the distribution of the American species, and descriptions of three new species. In the *ABC of Cotton Planting*, and in various articles in the *Agricultural News*, are given the remedies to be employed against these insects when they become abundant.

It will be remembered by readers of the *Agricultural News* that the cotton stainer of the Northern Islands and that of the Southern Islands are different from one another and from the species which are most abundant in Trinidad and in the South-eastern States of America.

The accompanying illustrations, which are three times the natural size of the insects, will serve to give a good idea of the appearance of these three cotton stainers. They have been prepared from drawings made by Mr. John Belling, B.Sc., late Science Master at the St. Kitts Grammar School, while he was temporarily attached to the Staff at the Head Office of this Department.

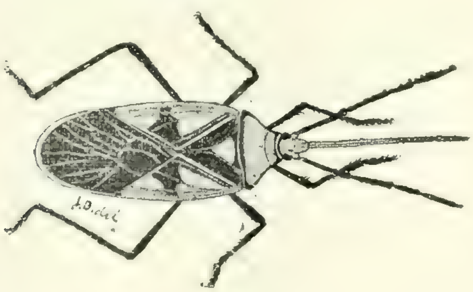


Fig. 34. Dysdercus andreae.

Dysdercus andreae (Fig. 34) occurs in the Virgin Islands, St. Kitts-Nevis, Antigua, Montserrat, and Guadeloupe. The parts dotted in the figure are bright yellowish-red, the black parts are black and reddish-black, in nature; the St. Andrew's cross is whitest. *Dysdercus delauneyi* (Fig. 35) has been recorded from Montserrat and Guadeloupe, and is the cotton stainer of the islands south as far as Grenada. In this island, there also occurs *D. fernaldi*. The parts dotted in the figure are pinkish-red in the natural insect, those in black are black or reddish-black, and those left white are whitish or white. *Dysdercus howardi* (Fig. 36) occurs in Trinidad and Tobago, together with *D. howardi*, var. *minor*, in the former island. The parts left black in the figure are black in the insect, those dotted are pinkish-red or ferruginous, and the cross-shaded parts are brownish-yellow.

Cotton stainers will feed on other, closely related plants, in addition to cotton plants. The seed of the silk cotton tree, all parts of the ochro and musk-ochro, and the fruit of the orange are attacked by these insects, and it is likely that, in places where such plants are not abundant, the cotton stainers have other food-plants.

It will always be well to destroy, as far as possible, the wild or native food-plants of these insects, and their breeding-places. Waste cotton and cotton seed scattered about the ginneries and store-houses are responsible, in many instances, for the carrying over of enormous numbers of this troublesome pest from one season to another; thus means for the early infestation of the neighbouring cotton fields are provided.

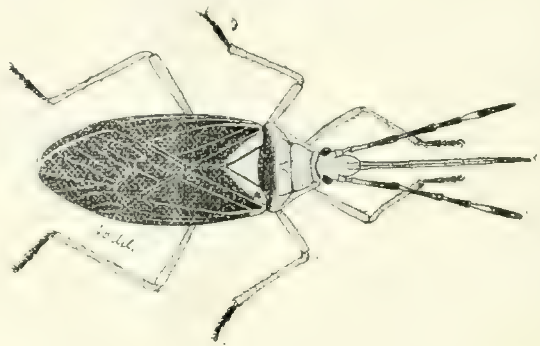


Fig. 35. Dysdercus delauneyi.

Many planters in the West Indies do not find the cotton stainers a serious pest, but on the other hand, these insects have been the cause of serious loss in many instances. The following extract from the letter of a correspondent in Tobago shows what one planter's experience has been :—

'Cotton stainers in the West Indies, Tobago in particular, do a great deal more harm to the cotton crop than has been assigned to them. They puncture the very young bolls, causing them to drop off. The first-planted cotton does not suffer much, but any later-planted, which is producing flowers and young bolls when the stainers become more numerous, suffers to a great extent. Last year, I lost a lot from this cause. I did not know how much labour I should be able to command for picking, so I planted over a very long period, with the result that the last planted cotton gave me very little fibre indeed. This season, I have begun to catch the stainers at once, and hope to be able to control

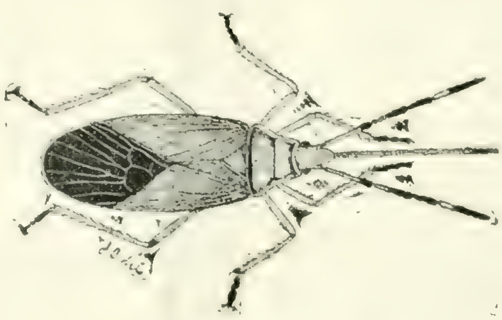


Fig. 36. Dysdercus howardi.

them. When the first crop has been picked, I shall cut down the plants close to the ground, burn the tops, and while the new growth is coming on, trap all the insects I can.'

FUNGUS NOTES.

MINUTE FORMS OF LIFE IN THE SOIL.

As the knowledge of the minute organisms which live in the soil increases, the tendency grows which places them in a position of greater importance every day. The recognition of this importance is enhanced all the more as the fact is grasped that the higher plants are mainly affected favourably or adversely by soil conditions in an indirect manner. Such plants depend chiefly upon the changes that are caused by the life-processes of the microscopic organisms in the soil for the origin and continuation of a state of that medium which will enable them to flourish. The herbivorous animal is dependent upon the existence of suitable conditions in the soil before it can feed indirectly upon the substances which it eventually gains from it, and from the air, through the medium of the plants which it takes into its system. Similarly, those plants themselves are largely dependent upon favourable conditions for the existence of still lower organisms for the unlocking of the store of food, which is present, but not available for them, in the soil.

The chief forms of minute life that work beneath the surface of the ground are the bacteria, true fungi, moulds and yeasts. The magnitude of this work, both beneficial and destructive as far as the higher plants are concerned, is hardly realized. This is, perhaps, because the minuteness of the individuals is well recognized, the limitations as to effect being gauged, in the case of bacteria for instance, by the fact that the measure of their diameter is only about one-twenty-five thousandth of an inch. When it is reflected, however, that a cubic inch of soil can contain about 10 billions of these before there is undue competition in the matter of food supply, the capacity of such organisms for effecting rapid and deep-seated changes can be more fairly appreciated. Bacteria are most abundant to a depth of 1 foot beneath the surface. Below this, they decrease quickly in numbers, though it was found by Fraenckel in Berlin that that they were still present in considerable numbers at a depth of 9 feet below the pavements.

It is well known that the effects of various bacteria on the media in which they live are very different. Some decrease the amount of nitrogen; others, when supplied with air, increase it. Some reduce compounds of sulphur, such as hydrated sulphate of calcium (gypsum) and set free hydrogen sulphide; others make use of this hydrogen sulphide, employing the sulphur which they liberate from it as part of their food. Some require organic matter in order that they may continue an active existence, while others can live on an inorganic medium, and so on. The favourable or unfavourable conditions of the soil in regard to each will determine whether or not that kind will flourish. This is partly why the same soil, under different conditions, will exhibit such varying properties in regard to its capacity for supporting crops. Again, if such a soil is subjected to treatment such as draining, ploughing, or cultivation for the purpose of ameliorating its state, it is not long before the evidences of response are at hand. As bacteria bring about in a large degree the causes of the changes that supply those evidences, and as each kind of bacterium has its own definite effect, it must be a fact that these organisms have the power of changing the balance of numbers of the different species in a comparatively short time. It is easy to account for this fact when it is remembered that each individual lives about thirty-five minutes, and at the end of that time, if conditions are favourable, forms two new individuals by division, so that, at the end of twelve hours, in the event of the survival of the whole of its offspring, its descendants would number four millions. For every state of the soil there is a bacterial balance, as each kind will reflect the favourableness of its environment in the magnitude of its numbers, the chief factors being temperature, amount of moisture, supply of food, presence or absence of air, effect of the excretory products of other bacteria, and the rate at which removal of its own waste products takes place. In a change of environment, that is in the soil, those forms which are not suited to the new conditions suffer a check which is sufficient to reduce their rate of propagation, and therefore to lessen their numbers. At the same time, such as are favoured by the new state of affairs will, as has been seen, increase at a sufficient rate to produce an entirely new bacterial balance, with most of the new phenomena due to its influence, in a very short space of time.

The soil, then, is not the rigidly constituted, slowly changeable medium that was pictured so long in the minds of the earlier investigators. It is not a collection of matter which is merely undergoing comparatively slow chemical and physical changes. It is alive, in the truest sense of the word.

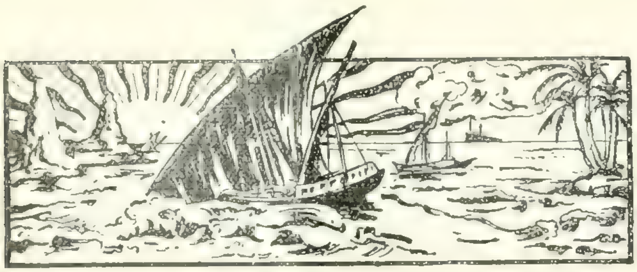
A GREEN MANURE AND FIBRE PLANT.

On page 271 of the present volume of the *Agricultural News*, a description is given of a plant, *Sesbania aculeata*, which is attracting attention in India as a green manure and fibre plant. In *Progress Report*, No. XLV, of the Ceylon Agricultural Society, an analysis of the material obtained, when a crop of this plant is cut and allowed to dry naturally, is detailed. This is given below, and for the purposes of comparison, similar information, in regard to naturally dried weeds and leaves, from the Botanic Station, Dominica, which is taken from the *West Indian Bulletin*, Vol. VIII, p. 49, is also tabulated :—

	Sesbania aculeata. Per cent.	Weeds, leaves, etc. Per cent.
Water	13·5	12·6
Organic matter	80·3	77·9
Ash	6·2	9·5
Nitrogen	2·80	2·12
Potash	0·97	0·64
Phosphoric acid	0·43	0·16

In making comparisons by means of the data which appear in the above table, it must be remembered that the grass, leaves, etc., which were obtained from the Dominica Botanic Station, contained pods and other débris of leguminous plants. This accounts for the fact that this material has a nitrogen content which is not very far below that of the leguminous plant *Sesbania aculeata*.

The amounts of water and organic matter that are present are very similar in the two cases. It must be taken into account, however, that the grass, leaves, etc., probably lost more water in drying than the Sesbania, which is an undershrub, so that the organic matter in the former before drying will, as would be expected, bear a lower proportion to the weight of the undried plants than is the case with the latter. A similar explanation would appear to account for the apparently high ash content of the weeds, etc. It is noticeable that the ash of the leguminous plant is richer in potash and phosphoric acid than that of the vegetable débris.



GLEANINGS.

In 1908, the Anglo-Ceylon sugar estates in Mauritius obtained 13,360 tons of sugar from 120,400 tons of cane, a yield of 11 per cent. of sugar on the weight of cane ground.

The quantity of raw sugar that was imported into the United Kingdom for the present year, up to the end of June, was 400,985 tons. For a similar period in 1908, the amount was 363,225 tons.

The Curator of the Botanic Station, Montserrat, states that the area planted in cotton in that island during the present season is about 1,800 acres. He further states that, on the whole, there is promise of a good crop.

The exports of cacao from the German Cameroons have shown a steady increase. In 1904, they amounted to 209 cwt., valued at £436 16*s.*; in 1907, the amount was 1,028 cwt., worth £2,496 9*s.*

From an account of the scale insects of India, given in the *Memoirs of the Department of Agriculture—Entomological Series*, Vol. II, No. 7, it appears that there is no indication at present that these and similar insects will ever become as serious a pest in India as they have in several other countries.

It is reported in the *New York Experiment Station Bulletin*, No. 306, that an efficient means has been found for controlling the apple leaf-blister mite, which is spreading in the Eastern States. The remedy consists in the application of lime-sulphur wash while the leaf-buds are growing, followed by sprayings with Bordeaux mixture.

The *Annual Report of the Collector of Customs*, Trinidad, for 1908-9, shows that, from the period 1876-80 to the period 1906-9, the average annual value of the cacao exported from that island has increased from £306,973 to £1,246,915. In the case of sugar, there has been a decrease, similarly, from £800,621 to £471,084.

The *Journal of the Jamaica Agricultural Society* states that a grant of £10 has been made by that Society, and one of £15 by the British Cotton Growing Association, for the purpose of conducting experiments in cotton growing on the land belonging to small settlers along the dry seaboard of St. Elizabeth, St. Ann, Trelawny, and St. James. These experiments will be under the direction of the Agricultural Instructors in those districts.

It is announced that a Universal Exhibition will be held in Brussels in September 1910. At the same time, there will be an International Congress of Agricultural Associations and Rural Demography in that city, to which all societies having for their object the improvement of agriculture, in its widest meaning, are invited to send delegates.

At the Botanic Station, Tortola, it has been found that a modification of the Dutch, or scuffle, hoe is useful for keeping the soil stirred round lime trees. This consists of an old spade fixed on a straight handle, with which the cultivation can be performed without risk of damage either to the labourer or to the trees.

In Bulletin No. 78 of the Bureau of Entomology of the United States Department of Agriculture, it is stated that the development of the State of New Jersey has been hindered by the mosquito plague of that part of the country. It is estimated that the annual cost of screening houses against mosquitos and the house fly exceeds £2,000,000.

At the St. Kitts Grammar School, eleven candidates offered science subjects in the Cambridge Local Examinations held in 1908, and of these eight passed. Of two who entered for Agricultural Science, and passed, one obtained the mark of distinction in that subject. This is the first time that such a success has been gained in the Leeward Islands.

In the *Journal of Economic Entomology*, potassium cyanide is suggested as a remedy for ants. A solution of this salt, containing 1oz. to a gallon of water, when poured into the burrows made by these insects, was found to destroy them to the depth of 1½ feet below the surface. The cost of such a solution was about 1*d.* per gallon. It is, however, injurious to plant life.

Experiments at the Rome Agricultural Experiment Station have shown that an increase in the supply of phosphates to a plant did not cause any variation in the nitrogen content of the seed produced by it. The amount of that element in the nitrogenous food bodies in the seed was increased slightly, however, while there was a corresponding decrease in the non-proteid nitrogen.

During the month of August in the presant year, the plants and seeds distributed from the Antigua Botanic Station consisted of: screw pine 1,475, lime 760, cacao 56, saman (rain tree) 53, mahogany 26, casuarina 22, grafted mango 1, miscellaneous economic plants 16, broom corn seed 142 lb., cotton seed 117 lb., *Canavalia* seed 16 lb. In addition, 322½ lb. of onion seed was distributed among Antigua, St. Kitts-Nevis, Montserrat and the Virgin Islands.

The Agricultural Instructor at Grenada states that the palm *Corypha elata* (a native of India) is flowering at present; it is about 40 feet in height. He also states that one of the trees of *Spathodea campanulata* (which is indigenous to tropical Africa) at the Station has set viable seed during the year—the first time that this has occurred, although the trees have flowered for several years. It would be interesting to know if the specimens of the plant at other Botanic Stations in the West Indies have produced seeds.

STUDENTS' CORNER.

OCTOBER.

SECOND PERIOD.

Seasonal Notes.

In the event of there being fields of cotton on an estate in which the plants are not making satisfactory growth and where the bolls are not developing in sufficient number, it will be well to enquire as to the origin of the seed that was sown, if this is not already known. These circumstances may be caused by the use of seed that has not been carefully selected, or of that which has been selected in, and imported from, an island where conditions are quite different from those in the place in which it has been planted. Where selected and ordinary seed have both been sown, arrangements should be made at picking time to ascertain the yields from each kind, in order that these may be compared. In going through the fields for the purpose of choosing plants that will yield seed for selection, notice that there is great variation in the number of bolls that are borne on the different plants; also observe that many of the plants show greater or smaller departures from type. Mark in a suitable manner several very young flower-buds and make observations with a view to gaining information about the following points: (1) when the flower usually opens, (2) how long it remains open, (3) the time that elapses before the corolla falls off and the style and stamens begin to wither. Surround some of the unopened flower-buds with paper bags until the corolla falls, and ascertain later on if seed has been set where this has been done.

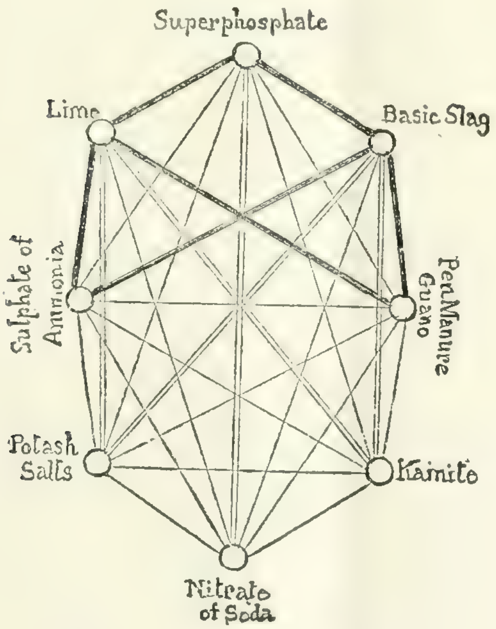


FIG. 37. THE MIXING OF MANURES.

When the sugar-cane begins to arrow, note to what extent this takes place in the case of the different varieties that you are enabled to observe. What are the chief difficulties that are met with in obtaining seedling canes, and why is it that this work is continued, and regarded as being of great importance? What would you expect to find, on comparing different seedlings, in the matters of mode of growth and sugar content? The ratoons of a variety often occupy a similar place to the plants of that variety, in regard to the amount of sugar that they yield. What circumstance in the life-history of the sugar-cane would appear to account for this?

It is sometimes convenient to mix manures before them to the soil, but when this is done, due regard e had to the nature of the manures which it is proposed to mix. A manner of giving information as to the mixing o manures is shown in Fig. 37, which is adapted from a reproduction of a diagram which appears in the *Agricultural Journal of the Cape of Good Hope*, Vol. XV, No. 2, and which was originally prepared by Dr. Geehen, in Germany. The substances whose names are connected by thick lines should never be mixed; those whose names are joined by double lines should only be mixed immediately before use, while the thin lines run between the names of substances which may be mixed with impunity. Thus neither lime nor basic slag should be added either to sulphate of ammonia or farmyard manure, for a loss of ammonia, and therefore of nitrogen, would be the result. Loss of nitrogen will likewise take place if superphosphate is allowed to remain in contact with nitrate of soda for any length of time before use. On the other hand, as is indicated by the thin lines, no harm will result from making and keeping mixtures which may contain sulphate of ammonia, superphosphate, pen manure, guano, potash salts, nitrate of soda, and kainite.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Make a sketch of a flower and name the parts. What is the chief difference between the flower of the pumpkin or cocoa-nut palm and that of cotton or the tomato?

(2) Describe, giving examples, a 'runner', a 'rhizome', and an 'offset'.

(3) How can stones and rocks in soils be regarded as sources of plant food?

INTERMEDIATE QUESTIONS.

(1) Describe the root system of (a) maize, (b) alfalfa, (c) the Irish potato. What is the practical importance of the differences in these systems?

(2) Explain as fully as you can why recently cleared forest land is more fertile than land which has been long cultivated.

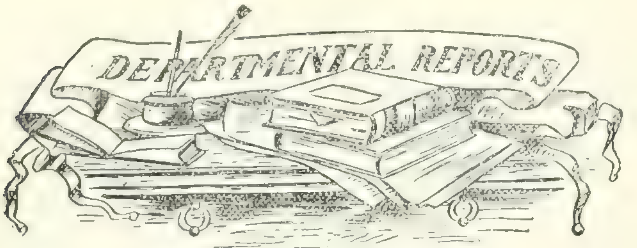
(3) State what varieties of sugar-cane are suited best to your neighbourhood.

THE BRITISH COTTON GROWING ASSOCIATION.

Advantage of the presence of the Imperial Commissioner of Agriculture in England has been taken by the British Cotton Growing Association to confer with Dr. Watts as to the position and prospects of the cotton-growing industry in the West Indies

To this end, a meeting of the Association was held at its offices in Manchester on Tuesday, September 14. At this, Dr. Watts discussed with the Association the conditions as regards cotton growing which obtain in the West Indies, and other matters of interest. Advantage was also taken of the presence of the Imperial Commissioner in Manchester for him to confer with the British Cotton Growing Association and others interested in cotton, such as Messrs. C. M. Wolstenholme, E. L. Oliver, and A. H. Dixon, on matters of importance affecting the West Indian cotton industry.

In the evening of the same day, Dr. Watts was entertained at a dinner given in his honour by the Association.



ANTIGUA: ANNUAL REPORTS ON THE BOTANIC STATION, EXPERIMENT PLOTS, AND AGRICULTURAL EDUCATION, 1908-9.

At the Antigua Botanic Station, the total expenditure during the year 1908-9 was £753 17*s.* 4*d.*; of this £392 12*s.* 1*d.* was from Imperial, and £307 5*s.* 2*d.* from local, funds; while £54 0*s.* 1*d.* was spent on special services. A sum of £103 3*s.* 6*d.* was received for produce sold, including £56 15*s.* 9*d.* for plants and seeds.

The total number of plants distributed was 78,256, of which cane plants formed the largest proportion, namely, 71,000. Next in number to these were limes and cocoa-nuts, with 3,650 and 1,975, respectively. A large distribution of seeds and cuttings was also made; this included 15,239 potato cuttings, 591 lb. of yams, and 583½ lb. of seeds of leguminous plants which were mostly suitable for the provision of green dressings.

Among the industries that are subsidiary to that of sugar in the island, there are specially mentioned those of the production of cotton, cocoa-nuts, and onions. The first of these has received a severe check, chiefly through the damage done by the flower-bud maggot. For the second, there is a limited area of land that is suitable, and though the extension of the growing of cocoa nuts is still in its infancy, there are indications that the new plantations will prove more successful than the old ones. The area planted in onions is about 50 acres, and does not vary much from year to year.

The variety and manurial experiments in connexion with sugar-cane have been continued on ten stations. They included 1,100 plots with varieties, and 256 plots with manures, and will form the subject of a separate report.

The experiments at the stations at Scott's Hill and Skerrett's have included trials with cassava, sweet potatos, yams, cotton, broom corn, eddos and tannias, ground nuts, sesamum, fruits, lemon grass, castor oil plant, forage plants, and plants for green dressings. As regards cassava, the variety that was most suited to the conditions at the station was 'Brown Stick', received from St. Kitts. The best of the Jamaica and Montserrat varieties came next, while those from Columbia were a comparative failure. The number of varieties of sweet potatos under test was sixteen. The advisability of planting cuttings or roots was also tried. Eleven varieties of yams were under trial, and for these, as well as for sweet potatos, the results for a period of nine years are given. The experiments with cotton included the continuation of the improvement of seed by selection, and observations on the effects of close and wide planting, as well as a trial with the Stirling variety from Barbados. The number of different plants that are being tried as green dressings is sixteen. Of these, cowpeas, the Barbuda bean, and the sword bean have given the best results during the year, notwithstanding the susceptibility of the first to insect attacks.

The arrangement has been continued by which a limited number of boys who have taken up agricultural science at the Grammar School can spend some of their time during the day at the Botanic Station, where they fill the position of cadet. This recognition of the educational side of the work at the Botanic Station is continued in the employment of it as a means of training the juniors, so that they may be capable of filling the post of Assistant for Agricultural Experiments, in the event of their being required to do so. In this way, they should become fitted to take up work on estates.

GRENADA: ANNUAL REPORTS ON THE BOTANIC STATION, AGRICULTURAL INSTRUCTION, AND EXPERIMENT PLOTS, 1908-9.

Among the economic plants that have been disposed of during the year, the chief demand has been for Sisal and Castilloa. In addition, 2,100 plants of seedling cane D.95 and 4 lb. of Castilloa seed were sent out from the Station. The receipts for the sale of plants, seeds, fruits, etc., amounted to £40 17*s.* 11*d.*

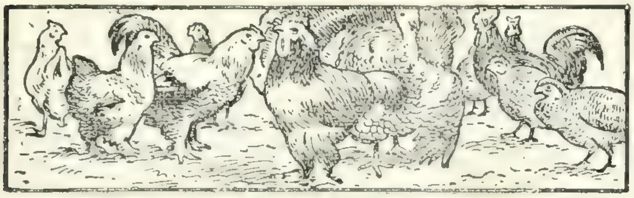
The experiment stations for cacao have been kept up, and several new ones have been started. Where these have been carried on for three years, useful information in connexion with the manuring of cacao has been gained. The experiment plots in country districts are planted in cotton and cacao. In connexion with these, it may be stated that, in accordance with a recommendation of the Peasant Proprietary Commission, a new plot has been started at the head of the Concord Valley, showing that they have a well-recognized usefulness. The cotton experiments have been successful, and indicate that this crop may attain to some importance in certain parts of Grenada.

The rainfall for 1908 at the Richmond Hill Station, at the Government Observatory, was 68·44 inches, which is 7·99 inches below the average for the last eighteen years. The average precipitation at the eleven stations in the island, from April 1908 to March 1909, was 96·92 inches. The distribution of the rainfall throughout this period has been abnormal, as was the case in the two previous years, and not altogether favourable to cacao. The fairly normal conditions of the earlier part of the year were succeeded by a reduced fall in August, September and November, the last of which was exceptionally dry, causing the crop to be late. The end of December, and January and February were very wet, however, and this will have probably restored the yield of cacao to the average.

The interest in the cultivation of rubber-yielding plants still continues to be shown, although, owing to untoward circumstances in connexion with the supplying of seed, little was added to the acreage covered by those plants. The plants that have been established have made good growth.

Among the crops cultivated in the island, fruits and ground provisions make an insufficient showing owing to the greater interest that is taken in cacao and nutmegs by the peasantry. Efforts are being made, both on the part of the Agricultural Department and of the Agricultural Society, to encourage progress in this direction.

The lectures in country districts have continued to be given, and the interest in them has been such as to warrant an attempt to hold them more frequently. Similar success has been gained in the matter of the Prize-holdings Competitions, and these have been extended so as to include a third parish. By these two means and by the work in connexion with the experiment plots in country districts, the Officers of the Department are brought into specially close touch with the peasantry. The Scheme of Reading Courses for Overseers and Examinations in Practical Agriculture was introduced by the Imperial Department during the year, and has met with the approval of the Agricultural Society and the Board of Education.



POULTRY NOTES.

DETERMINATION OF CAUSE OF DEATH IN FOWLS.

The following useful hints for the conduct of a post mortem examination of fowls that have died suddenly, for the purpose of ascertaining the cause of death where this is unknown, are taken from the *Rhodesian Agricultural Journal*, August 1909:—

First it is advisable to examine the outside of the specimen for wounds, bruises, skin diseases or broken limbs. The appearance of the comb, face and plumage should be noted. The mouth and throat must be examined, and any abnormal conditions, such as a purplish colour, growths of a cheesy nature or accumulations of saliva be observed. The fowl may then be laid on its back upon a table, its feet towards the operator, and the wings held down on either side, well spread away from the body. Pluck a few of the feathers from each side of the breast and abdomen, and while this is being done, note the appearance of the skin, or whether the fowl is thin or fat, or in an apparently healthy condition. If there is scarcely any flesh upon the keel bone, liver disease may be suspected, and the feathers being matted and dirty about the vent often indicates enteritis or inflammation of the bowels, particularly if the excrement is of a white or yellowish-green colour. Now make a cross cut in the skin of the abdomen immediately behind the breast bone, taking care not to touch the bowels. Run the scissors down each side to the back, and then make a lateral cut through the ribs on both sides. The whole of the breast may then be lifted up and forced back towards the bird's head, exposing the gizzard, liver and heart. The remaining skin on the abdomen may be cut on either side and drawn away towards the stern, showing the entrails, and, if the bird is a hen, the egg organs between them and the back. The liver may be examined first, as it will be the first organ to strike the eye. It should be firm, not unnaturally large, and of a healthy chocolate-red colour. It should not have a yellow-brown tint, nor should it show specks of any kind.

If an incision is made through the thin diaphragmatic membrane between the liver and the walls of the chest, the lungs will be seen on either side at the back of the heart. These organs, if healthy, should be of a bright salmon-pink colour, and a piece of one put in water should float. They are frequently affected by tuberculosis, which shows itself in little yellowish growths or nodules, which also not infrequently spread and attack the heart. The latter organ should be of a deep red colour, and although it may have a marbling of fat round its base, this should not be excessive, and any specks of fat that may appear should not be mistaken for the tuberculosis nodules already mentioned. The heart should be evenly shaped and not distended with blood on the one side, and shrunken and empty on the other. If it is so, and it is known that the fowl dropped down dead suddenly, the cause of death may without hesitation be put down to syncope, or heart failure. The throat, crop and gizzard may next be looked at, the 'canal' being laid open right along for any obstruction that may have taken place—an accident that would be more likely to occur between the crop and the proventricle than anywhere else. In the case of a hen, the cause of death may often be found in the egg organs. There may be some contents of a broken egg in the oviduct, or there may have been an escape of some of those contents into the abdominal cavity, where acute inflammation would immediately be set up, peritonitis bringing about speedy death. The gizzard may be cut open and the contents examined. The intestines should be of a greyish-white colour, and the kidneys, which are fixed to the spine, a reddish brown. If the symptoms before death are observed, it will seldom be necessary to go through all the various organs of the body in search of the affected parts. For instance, a dejected look, a yellow hue of face and comb, variable appetite and loss of flesh will denote tuberculosis or some liver affection. Diarrhoea will usually indicate some intestinal irritation. An apoplectic seizure and delirium will point to an effusion of blood upon the brain, and, as already pointed out, a fainting fit, followed by death, directs one to look at the heart for confirmation.

RICE IN BRITISH GUIANA.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated October 1, 1909, gives information as follows:—

The weather during the past fortnight has been very hot, and reaping has commenced in some districts, but will not be general until the middle of the month.

The local demand is still dull, dealers holding off in anticipation of reduced prices for new rice.

The new rice crop will not be in the market in any quantity before the end of the present month, although small lots are now being offered.

Shipments to the West India Islands during the fortnight amounted to 3,600 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 18*s.* 9*d.* to 19*s.* 9*d.* per bag of 180 lb. gross.
17*s.* 3*d.* to 18*s.* 3*d.* ,, ,, ,, 164 lb. ,,

We have, however, no stock to offer for export at present.

Rubber in Nigeria.

According to the *African World*, the desire of Sir Alfred Jones, K.C.M.G., to further the Para rubber afforestation of the Eastern Province of Southern Nigeria, by carrying distributed plants in his steamers, freight free, is already acting as a stimulus, particularly to native chiefs and traders possessing farm lands. Promptly following the free delivery of 2,000 Hevea plants, 5,000 have been applied for by another important native chief, and similarly large orders are expected from enterprising natives. The Forest Officer of the Eastern Province has over 30,000 plants to distribute this year, and assuming that 90 per cent. of them grow, there will be next year over 50,000 Hevea trees in the province, growing vigorously in different suitable localities. (The *India-Rubber Journal*, August 23, 1902.)

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, September 28, 1909; Messrs. E. A. DE PASS & Co., August 20, 1909.

ARROWROOT—1⅝*d.* to 3¾*d.*
BALATA—Sheet, 2/5; block, 1/10.
BEES-WAX—£7 15*s.* to £8 for fair to good.
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 49/6 to 54/6 per cwt.; Jamaica, 48/- to 53/-.
COFFEE—Quiet; Jamaica, 40/6 to 100/-.
COPRA—West Indian, £21 10*s.* per ton.
COTTON—St. Croix, Barbuda, Antigua, no quotations; Barbados, 14*d.* to 16*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet; common to good common, 45/- to 50/- per cwt.; low middling to middling, 51/- to 55/-; good bright to fine, 57/- to 65/-.
HONEY—23/6 to 30/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/- to 1/3 per gallon; concentrated, £17 5*s.* to £18 15*s.* per cask of 108 gallons; Otto of limes, 5/6 to 6/-.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Steady; 3½*d.* to 5¾*d.*
PIMENTO—Common, 2⅛*d.* per lb.; fair, 2¼*d.*; good, 2⅜*d.*
RUBBER—Para, fine hard, 8/10 per lb., fine soft, 8/4; fine Peru, 8/8.
RUM—Jamaica, 2/11 to 7/-.
SUGAR—Crystals, 14/6 to 15/9; Muscovado, 12/- to 15/-; Syrup, 13/6; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., September 17, 1909.

CACAO—Caracas, 11¼c. to 12½c.; Grenada, 11¾c. to 12c.; Trinidad, 11¾c. to 12¼c.; Jamaica, 9½c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $28·00 to $30·00; culls, $17·00 to $18·00; Trinidad, select, $28·00 to $30·00; culls, $17·00 to $18·00 per M.
COFFEE—Jamaica, ordinary, 7½c. to 8c.; good ordinary, up to 8½c.; and washed, up to 10½c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, 58c.; Barbados, from 50c. to 55c.; St. Thomas, St. Croix, St. Kitts, 47c. to 50c. per lb.; Antigua, 48c. to 50c., dry flint.
GRAPE FRUIT—$4·50 to $6·50 per box.
LIMES—Dominica, $5·00 to $6·00 per barrel.
MACE—28c. to 34c. per lb.
NUTMEGS—110's, 8½c. to 9c. per lb.
ORANGES—Jamaica, $4·50 to $5·00 per barrel.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 4·21c. per lb.; Muscovados, 89°, 3·71c.; Molasses, 89°, 3·46c. per lb., all duty paid.

INTER-COLONIAL MARKETS.

Barbados,—Messrs. LEACOCK & Co., October 11, 1909; Messrs. T. S. GARRAWAY & Co., October 11, 1909.

ARROWROOT—St. Vincent, $3·50 to $3·75 per 100 lb.
CACAO—$11·00 to $13·50 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb.
HAY—$1·00 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00; Sulphate of potash, $67·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, $3·00 per 100 lb.
PEAS—Split, $6·00 per bag of 210 lb.; Canada, $4·20 per bag of 120 lb.
POTATOS—Nova Scotia, $2·20 to $2·50 per 160 lb.
RICE—Ballam, $4·85 to $5·20 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. SANDBACH, PARKER & Co., October 1, 1909.

ARROWROOT—St. Vincent, $9·00 per 200 lb.
BALATA—Venezuela block, prohibited; Demerara sheet, 50c. per lb.
CACAO—Native, 12c. per lb.
CASSAVA—60c.
CASSAVA STARCH—No quotation.
COCOA-NUTS—$16·00 per M.
COFFEE—Creole, 12c. to 13c.; Liberian, 7c.; imported 13½c.
DHAL—$4·20 to $4·40 per bag of 168 lb.
EDDOS—No quotation.
MOLASSES—No quotation.
ONIONS—Madeira, 2½c. to 2¾c. per lb.
PLANTAINS—No quotation.
POTATOS—$3·25 per barrel.
POTATOS—Sweet, Barbados, no quotation.
RICE—Ballam, $4·75; Creole, $4·25 to $4.60.
SPLIT PEAS—$6·40 per bag (210 lb.); Marseilles, $5·00.
TANNIAS—No quotation.
YAMS—No quotation
SUGAR—Dark crystals, $2·35; Yellow, $3·00; White, $3·60 to $3·80; Molasses, $2·00 to $2·30 per 100 lb. (retail).
TIMBER—Greenheart, 32c. to 55c. per cubic foot.
WALLABA SHINGLES—$3·50 to $5·50 per M.

Trinidad,—Messrs. GORDON, GRANT & Co., September 18, 1909.

CACAO—Venezuelan, $11·50 to $11·75 per fanega; Trinidad, $11·40 to $11·75.
COCOA-NUT OIL—68c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 9c. per lb.
COPRA—$3·75 per 100 lb.
DHAL—$4·00 per 2-bushel bag.
ONIONS—$2·50 to $2·60 per 100 lb.
PEAS—SPLIT $5·50 to $5·75 per bag.
POTATOS—English, $1·60 to $1·90 per 100 lb.
RICE—Yellow, $4·70 to $4·80; White, $5·00 to $5·25 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

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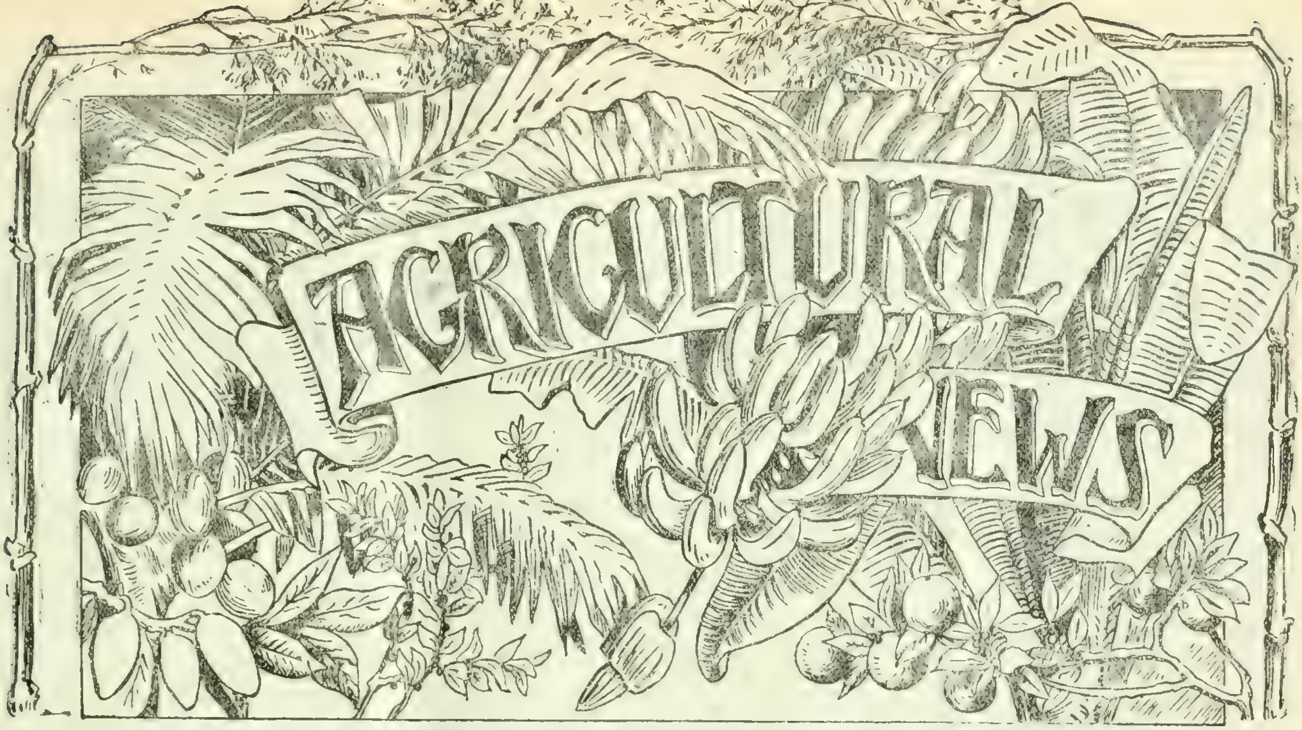

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AGRICULTURAL NEWS.

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OF THE

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CONTENTS.

The Canadian Trade Commission.

IT will be remembered that a Conference relating to the Trade Relations between the West Indies and Canada was held in Barbados in January, 1908. On this occasion, meetings were held between delegates from all parts of the West Indies and the Canadian Representatives, Mr. W. G. Parmalee, I.S.O., and Mr. A. E. Jones; Mr. E. H. S. Flood, the newly appointed Canadian Trade Commissioner, was also present. Among the resolutions that were finally adopted at the Conference was the following: 'That in the opinion of this Conference, the Governments of the various West Indian Colonies, including British Guiana, should, with the least possible delay, proceed to rearrange their Customs Tariff, with a view to giving a preference to the goods set out (in the schedule hereto annexed) when such goods are the growth, produce, or manufacture of any part of the British Empire.' The purpose of this resolution was to enable each colony to take up a definite position in regard to the matter by assenting to, or dissenting from, the principle involved. By this and other resolutions it was shown that the Conference was in favour of an arrangement for mutual concessions between Canada and the West Indies.

In August of the present year, a Royal Commission was appointed to enquire into trade relations between Canada and the West Indies. The members of this Commission are the Right Honourable Lord Balfour of Burleigh, K.T., the Honourable William Stevens Fielding, Minister of Finance, and the Honourable William Paterson, Minister of Customs, in the Dominion of Canada; Sir John Poynder Dickson-Poynder, D.S.O., M.P., and Sir Daniel Morris, K.C.M.G., D.C.L., D.Sc. In addition, Mr. H. R. Cowell, of the Colonial Office, has been appointed Secretary to the Commission, and Mr. R. H. McCarthy has been selected as its technical adviser.

The English members of the Commission left Liverpool for Canada on September 11, and arrived at Ottawa on September 20, where they were met by the Canadian members. The session was opened at Ottawa on September 22, by Lord Balfour of Burleigh, and the Commission afterwards proceeded to Toronto, Montreal Halifax and St. John.

In opening the session at Ottawa, Lord Balfour of Burleigh said that he could conceive nothing which would be more protective of the good of the Empire than the closest interchange of trade between its constituent parts, and that the Commission would be glad to receive suggestions, from any source, for the improvement of transportation facilities, cheaper communication, and the promotion of better trade relations generally

At Halifax, the first session was held on October 1. In opening this, the President of the Board of Trade extended a welcome to the Commissioners on behalf of that Board, and referred to the long period that had elapsed, during which trade had been carried on between Halifax and the West Indies. The Commission was also welcomed by the Mayor, on behalf of the City. In reply, Lord Balfour of Burleigh made acknowledgement, on behalf of himself and his colleagues, for all the care and trouble that had been taken for the purpose of making their visit a success. He also read the exact terms of the instructions that had been given to the Commissioners, which were as follows : 'To make inquiry into the present condition and future prospects of trade between Canada and Our West Indian Colonies, and to suggest measures for promoting closer trade relations between them, including not only the special matters referred to in the minutes of the Privy Council of Canada, but also such matters as the improvement of transportation and a cheaper and more efficient telegraph system, together with all other matters that appear to you to be best calculated to strengthen and extend commerce and communication between Canada and the West Indies.'

At Ottawa, it was explained by the Deputy Minister of Trade and Commerce (Mr. O'Hara) that Canada paid $65,700 yearly for a twelve-day steamship service from Halifax to the West Indies, and it was stated by him, as well as by others, that an improved service was required. Further, Mr. McDougall, Commissioner of Customs, submitted a report showing that the exports from the Dominion to the West Indies were of the value of $2,847,381 in 1906, and of $3,090,468 in 1908. He stated that there was evidence that preference promoted trade between Canada and the West Indies.

The Commissioners met again at Toronto on September 27, when the evidence showed once more that the present transport facilities are insufficient, and a fast line of steamers from Canadian ports was advocated.

At the Halifax sessions, there was again unanimity in the demand for efficient means of communication between Canada and the West Indies. In addition, some of the witnesses advocated the provision of vessels fitted with refrigerating apparatus, which would carry meat to the West Indies and would return with fruit, and that such vessels should be adapted as far as possible to pass over the bars at those ports where these were present, in order that distant anchorage should be avoided, with the consequent saving in time and money with regard to lighterage. It was also suggested that there should be a direct steamship service to and from Montreal in the summer, with a change to St. John in the winter. Evidence was forthcoming to show that the route by way of the United States had no advantages over the direct Canadian one.

Other subjects that were dealt with were the advisability of increasing the scope of the Canadian banking concerns in the West Indies, the concessions to Canadian refiners contained in the last budget, the granting of a preference tariff for British-grown sugar, and the necessity for better cable communication. In connexion with the first, it was agreed that the expense incident on the upkeep of branch banks in the West Indies was severe, and that trade on a preferential basis would make commercial conditions easier. The opinions as to the present state of the relations between the Canadian refiner and the West Indian sugar producer were conflicting. The general consensus of opinion, in a broad way, was however, that the trade between the two countries would improve if mutual concessions were made.

It is expected that the Commission will meet again in the West Indies in the month of February, 1910.

AN OIL TRACTOR FOR IMPLEMENTAL TILLAGE.

The *Agricultural Journal of India* gives an account of an engine for implemental tillage and other agricultural operations, which is known as Marshall's 30 horse-power Oil Tractor.

This oil tractor is manufactured by Messrs. Marshall, Sons & Co., Ltd., of Gainsborough, England, with the object of supplying a cheap mechanical power for agricultural purposes, which may possibly be useful in India.

The tractor is fitted with a two-cylinder engine and has three speeds, 2, 4, and 6 miles per hour. The engine can be run on petrol, kerosene, benzine, gasoline, etc. With tanks filled with kerosene, it can be run for ten hours continuously.

The engine is fitted with wide travelling wheels to travel over sandy ground. In working order, it weighs approximately 4½ tons and carries 25 gallons of fuel and 75 gallons of water ; it is fitted with a water-cooler and a patent pump for circulating water through the cylinder jacket.

The engine can be used for ploughing, harrowing, cultivating, sowing, reaping and hauling ; it can also be used for driving any fixed machinery such as threshing and winnowing machines, corn and cake-grinding mills, chaff-cutters, etc., without any addition or alteration. This engine drives a full sized Marshall's Threshing Machine fitted with a chaff fan, Bhoosa rollers and Bhoosa shifters continuously for five hours with a consumption of 1½ gallons of kerosene per hour. One man is required to operate it.

Experiments in India show that it can plough 1½ acres of land that has been previously broken, per hour, with a consumption of less than 2 gallons of 'Chester Brand' kerosene oil, and uncultivated land at the rate of 1 acre per hour with the same consumption of oil.

The cost is £533. The Deputy Director of Agriculture, Bengal, saw the machine at work at Semapore and reported thus: 'We were only able to test the ploughing, as there was nothing to thresh and no pumps or ordinary machinery to be worked. Soil tested by ploughing was sandy loam. Two four-furrow ploughs were attached to the back of the tractor, and eight furrows, 6 inches deep and 9½ inches wide, were ploughed at one and the same time.

'Plough:—Cockshutt's (Canada) Four Furrow Plough, cost £20.

'Work done:—9 acres in seven hours. Cost of fuel per acre:—1*s.* 7*d.* Area ploughed per day of ten hours:—13 acres. The oil tractor will not suit small holdings or paddy cultivation, but where large holdings of high land cultivation are concerned, and where labour is scarce and dear, the oil tractor is an economical motive power for ploughing.'

SCIENCE IN PRIMARY SCHOOLS IN THE LEEWARD ISLANDS.

The following abstracts are taken from the *Annual Report of the Inspector of Schools for the Leeward Islands,* for 1908-9. This was drawn up by Mr. W. Skinner, M.A., then Acting Inspector of Schools for that colony:—

There are not so many schools as formerly where the complaint has to be made that the lessons in Elementary Science are mere parrot work, or a catechism after the style of 'Lessons in Common Things', and 'Mangnall's Questions'. In some few schools, teachers have not got beyond this, but only in a few; most of the schools are provided with object-lesson sheets with pictures of the animals which are the subjects of the lessons. Wherever pictures were not found, the matter was brought to the notice of the managers, and doubtless before the next examination the desired sheets will be provided. So many publishers nowadays issue well executed drawings, in colours, of the domestic and other animals which are prescribed by the code as subjects of the lessons, and the prices are so moderate, that there ought to be no difficulty in every school possessing some of these sheets, and yet I regret to say there were some schools where there were no object-lesson sheets, and the teacher was obliged to use the very small woodcuts of animals found in the Tropical Readers. The lessons, as a natural consequence, afforded no satisfactory training for the children's powers of observation, and a badly equipped school became also an inefficient one.

In the Middle Division, most of the teachers had studied the Hints to Teachers for teaching science in the Middle Division, and the work was fairly creditable; only in a few instances did I find that lists of terms, meaningless to the children, had been committed to memory. In the Upper Division, in a general way, the lessons on plant life, and on the structure and functions of the different parts of a plant, were well given, and the subject was fairly understood; there were faults, however, in the logical treatment of the subject, and the order of the questions asked. I did not find so great a tendency to make use of difficult scientific words as on former occasions.

There are in the colony thirty-six recognized school gardens, as follows:—Antigua, 12; St. Kitts, 8; Nevis, 6; Dominica, 4; Montserrat, 6. In nearly all the gardens the children now take a keen interest, and good results in the growing of the vegetables have been obtained in most cases. During the year new tools were supplied to six schools. I did not find that the record of work done was kept very systematically at any of the schools examined by me. For the purposes of the grants for school gardens, these records should be kept carefully written up to date. All schools where there are school gardens have now received record books, in which entries should be made every day on which work is done. These books should be submitted to the Inspector of Schools at the Annual Examination, if a grant is desired by the teacher.

Grants have been awarded for this work as follows:—Antigua, to 10 schools; St. Kitts, to 4 schools; Nevis, to 5 schools; Dominica, to 4 schools; Montserrat, to 6 schools.

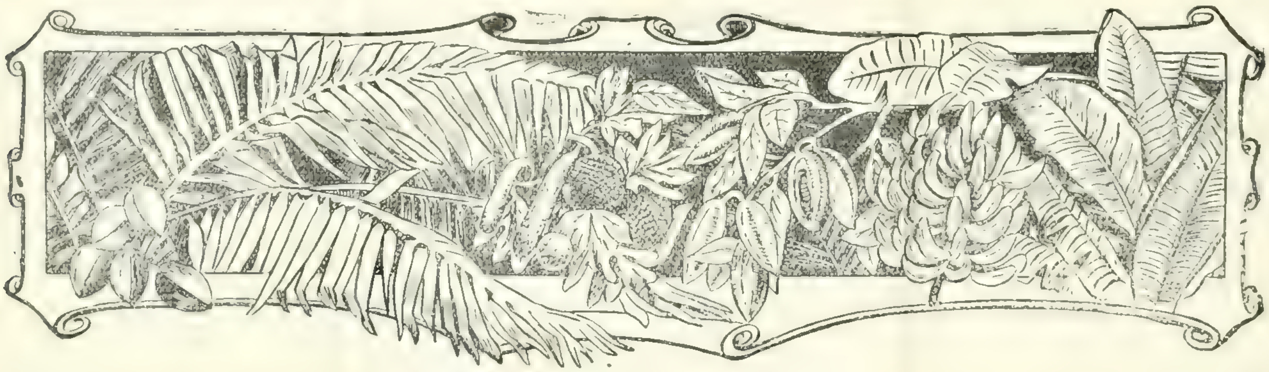
IMPURITIES IN SULPHATE OF COPPER.

The Board of Agriculture and Fisheries for the United Kingdom has on several occasions drawn attention to the importance of using pure sulphate of copper when making Bordeaux mixture, or when using it either for the destruction of charlock, for dressing wheat, or for the cure of foot-rot in sheep. In purchasing it, care should be taken to demand a product of 98 per cent. purity, while the article offered as 'agricultural' sulphate of copper should be scrupulously avoided. The usual adulterant is sulphate of iron, which is much cheaper. An easy test for the presence of iron in sulphate of copper is to dissolve a little in water and add ammonia, constantly stirring until a deep blue liquid is formed. Any quantity of brown flocks floating about in this blue liquid indicates the presence of so much iron that the sulphate of copper should be subjected to a proper analysis before use.

During the past year, the Board has had evidence that impure sulphate of copper continues to be sold in considerable quantities. Early in 1908, the Crown Agents for the Colonies stated that certain wholesale chemists, in executing an order for sulphate of copper for the Agricultural Department of one of the Crown Colonies, sent sulphate of iron containing about 10 per cent. copper sulphate; and that in reply to the representations of the Crown Agents, they stated that this was the usual article supplied under the designation of sulphate of copper for agricultural purposes.

In consequence, eighteen samples were purchased by Inspectors of the Board from chemists in different parts of the country. Of these, twelve were commercially pure blue vitriol, or sulphate of copper. In two cases the description sulphate of copper, or blue vitriol, was applied to articles containing 51·5 and 39·2 per cent. respectively, of sulphate of iron. In these cases the Board directed enquiry to be made with a view to prosecutions under the Merchandise Marks Acts. One sample, described as powdered vitriol, contained 78·6 per cent. of sulphate of iron, and was coloured with Prussian blue. Another sample, described as vitriolized wheat dressing, contained 66 per cent. of sulphate of iron, and two other samples, sold under a fancy name, contained 76 per cent. and 56 per cent., respectively, of sulphate of iron.

It is evident, therefore, that farmers should exercise considerable caution in purchasing sulphate of copper. (The *Journal of the Board of Agriculture*, September 1909.)



WEST INDIAN FRUIT.

THE MANURING OF CACAO.

The following is taken from the seventh of a series of articles by J. H. Hart, F.L.S., on Cacao, which are appearing in the *West India Committee Circular*. Reference to these articles has been made already on pages 260 and 292 of the present volume of the *Agricultural News*:—

The application of manure is a subject upon which chemists and vegetable physiologists differ in many respects. The chemist is apt to insist upon the manure being buried beneath the soil, or, he says, much of its value will be lost owing to the dispersion of its volatile properties by moving air; but the cultivator may easily ascertain the best method of applying manures of all kinds, if he studies the life-history and character of the plant, and the nature and morphology of its organs of assimilation; and moreover, the frequent showers of the tropics prevent any great waste of the volatile constituents, unless they come so heavy as to wash them away.

The destruction of roots which the operation of burying manure occasions, would, in most instances, completely nullify the action of the manure applied, as the broken roots would not have the power, or the same amount of surface for absorbing food, as when uninjured; and the manure applied, through its coming into direct contact with injured tissue, would tend to destroy the roots by its caustic character, rather than to be absorbed by them. That beneficial results follow the application of manure when buried beneath the surface, is, of course, patent to the novice, but in the case of surface-feeding plants, it is only after the roots have recovered from the injuries done by the digging, that they are able to take up any manure which has been applied when these organs are again in a condition to perform their proper functions. Even granting that no special harm is done to the trees, there is inevitable delay in the economy of growth, the hazard of losing a flowering season, and consequent loss of crop.

With deep-rooting plants the burial of manure is the most economical method of application, as there can then be no loss of volatile constituents.

If we think over for a while the course which Nature has pursued for ages in supplying plants with their food, we shall find that the method adopted is purely surface manuring, and this method, with not a few modifications, is generally being adopted in what are called Orchard Cultures. Even the ground the plant grows on, has been almost entirely formed, by additions to its surface, by detritus from surrounding lands, by deposits made by flood waters, or by decay induced by the flow of water over its surface carrying with it solvents which are able to disintegrate the materials of which it is composed. For tree cultivation, surface-manuring is the only method in which the manure can be fully utilized, and we can easily take steps to guard against evaporation or dispersion of volatile principles, by covering the manure with material which will act as an absorbent and thus retain the constituents likely to escape.

In practice, the covering of the ground with fresh or decaying vegetable material is known as 'mulching', and it has been proved that for cacao the practice is of the greatest value.

Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, in reporting on experiments in Dominica, has the following, with reference to five experiment plots of cacao: 'The most interesting plot is the one mulched with grass and leaves, the sweepings of the lawn at the Botanic Station. In the first period, this plot, though giving a greater yield than the no-manure plot, fell far behind the plot receiving dried blood, or the plot receiving complete manure, viz. dried blood, phosphate and potash (2 A) and that receiving dried blood with phosphate and potash (4 E). The yield was practically identical with that from the plot receiving dried blood alone (3 B). In the third year, this plot far surpassed all the others, giving yields 66 per cent. greater than that obtained from the no-manure plot.'

In the Botanical Department, Trinidad, for many past years, mulching has been taught as a valuable method for orchard culture of cacao and other products, and in Vol. V, *Botanical Bulletin*, Trinidad, 1902-3, the following beneficial effects are recorded, viz., that mulching:—

(1) Keeps down weeds.

(2) Prevents evaporation, and keeps ground moist.

(3) Furnishes suitable manure in gradual supplies.

(4) Attracts earth worms to the surface, and causes them to cut numerous burrows, which aerate and cultivate the soil; in fact the worms actually manure it by carrying down into the tunnels the decomposed organic matter.

By the use of 'mulching,' it is certain that cacao can be grown successfully on lands that could not produce it otherwise; and on some of the large estates the practice is being adopted, especially on those fields which suffer during the dry season.

The cacao tree, although it likes a deep, rich soil, is also a surface-feeding plant, and the ground round the trees cannot be dug or forked with impunity, for, although the tree will stand considerable hardship, it is nevertheless materially injured when the roots are mutilated. There are conditions, however, such as when the surface soil has been thoroughly baked by drought, when it would be beneficial to lightly prick it up with a fork, taking care not to break the roots (vertical forking). A slight forking is, however, permissible at times, previous to applying farmyard manure upon the surface, having due regard, of course, to what has been said in the foregoing remarks on the injury caused by the injudicious use of fork and spade. Manure applied to the surface should be covered, if possible, with a thin layer of earth; but if applied in the form of compost, this is not so necessary an operation, as the volatile constituents of the manure are then in a great measure held fast.

In applying chemical manures of a caustic character, it is always well to mix them with a suitable proportion of absorbent earth, and to cover again with a coating of the same material. The primary object in applying manure is to maintain a due proportion of plant food when land has become exhausted of its natural constituents, or to supply something in which the land is deficient. It is of course patent that, with the continued production of annual crops, a large quantity of material is removed from the soil, and this must be replaced, whether by Nature or artificially, or the crop will fall short. Farmyard manure takes a foremost position for this purpose among all others, and long-continued practice shows that, when properly applied, it is of the greatest value to the land, not only for its manurial properties, but also for its mechanical action upon the soil; and moreover, it can never be as dangerous to use as chemical manures, which are admitted to be decidedly hazardous when applied by unskilled labour.

QUALITIES OF A GOOD MILKING COW.

Useful information as to the characters of a good cow of the dairy type is given in Bulletin No. 20 of the Storrs Agricultural Experiment Station, U.S.A. From this the following extracts are taken:—

DIGESTIVE ORGANS.—Milk is a manufactured article, produced by the cow from the food which she consumes. The capacity of a cow for producing milk depends largely upon her capacity for digesting food and assimilating it into her tissues. For the accommodation of a large and efficient digestive apparatus, a good dairy cow should have a long, deep and wide barrel with well sprung ribs. This form of middle piece gives ample room for the storage of food, and for an apparatus capable of disposing of large quantities of the coarse, bulky fodder which the cow consumes.

HEART AND LUNGS.—The chest should be deep, providing room for generous-sized heart and lungs. These organs, vital in every animal, are required to do more than ordinary work in the dairy cow. The digestion of a large amount of food and its conversion into milk require an expenditure of energy and vitality equal to that spent in the performance of hard work. Therefore, there should be a vigorous circulation of blood and ample provision for its purification, and for a large supply of oxygen.

Collier estimates that a cow, giving an average quantity of milk produces, on an average, 138,210,000 fat globules per second during each twenty-four hours. This, and the secretion of the other constituents of the milk, illustrate the amount of activity in the milk organs alone, and suggests the need of a highly developed nerve system. The more pronounced of the outward signs that indicate this nerve development are a bright, lively, and prominent eye, this prominence causing a dished face; a wide forehead; a wide junction of the skull and spinal column, indicating a large brain; a large prominent backbone, giving room for a well developed spinal cord; a long slim tail; and considerable energy and vigour and style of action.

MILK ORGANS.—The milk organs are quite intimately concerned in the productive capacity of the cow, as it is in these that the milk and butter-fat are finally elaborated from the food. It is not altogether clearly understood how the milk is made in the gland, but it seems quite probable that it is produced by the epithelial cells within the udder. So far as is known, the quantity of milk that can be produced depends in a large part upon the number and activity of these cells. The number of such cells is limited by the size of the udder and the amount of fatty tissue it contains. The dairy cow should have a large udder capacity, the larger the better, but the size of the udder should not be due to any large amount of fat or flesh. There should be an elasticity of the tissue, with a shrinkage of the udder when empty. The udder should have considerable surface, extending far forward and well up behind. It should be well balanced and symmetrical in shape, indicating good development in all quarters; for the more perfectly developed the organ is, the larger the amount of milk it will be likely to yield. It should be spread considerably from side to side also, while the teats should be even, and squarely placed. To make room for such a capacious, well developed udder, the hind legs of the cow should be wide apart, the thighs should be thin, and the flanks high arched.

The milk veins should be large and elastic, should extend well to the front, and should enter the abdomen through large or numerous orifices, thus permitting a strong flow of blood through them, with a minimum of resistance as it returns to the heart. Besides these veins, there is a network of them in the four quarters of the udder, and still others pass upward behind, which, when large, indicate considerable productive capacity.

Many generations of selection and breeding by man have prolonged the period of activity of these organs in the dairy cow, but the beginning is always a function of reproduction, which must occur with considerable regularity in profitable cows. In order that this may happen with the least tax upon the general vigour and activity of the cow, she should have broad hips and a high pelvic arch.

AGRICULTURAL EXAMINATIONS.

The Second Preliminary Examination, in connexion with the scheme of Reading Courses established by the Imperial Department of Agriculture, was held on October 11, in Antigua, Barbados, Dominica, Grenada, St. Kitts, St. Lucia, and St. Vincent. Twenty candidates, altogether, presented themselves for examination: five in Antigua, four in Barbados, two in Dominica, three in Grenada, one in St. Kitts, three in St. Lucia and two in St. Vincent. Of the whole number, five failed to satisfy the examiners.

The names of the successful candidates are as follows:—

FIRST CLASS.	SECOND CLASS.
G. W. B. McDonald (Antigua)	J. H. Roden (Antigua)
J. H. Field (Barbados)	C. H. Shepherd ,,
A. E. Owen (St. Kitts)	E. M. Peterkin (Barbados)
R. W. Niles (St. Lucia)	G. de Lachevotier (Dominica)
D. Derrick (St. Vincent)	W. M. Arrindell (St. Lucia)

THIRD CLASS.

J. G. Kirton (Barbados)
J. T. Gairy (Grenada)
J. Maricheau ,,
C. W. Mathurin (St. Lucia)
G. A. Robertson (St. Vincent)

Of those in the First Class, G. W. B. McDonald (Antigua) and R. W. Niles (St. Lucia) obtained special mention.

Further particulars concerning this examination will be given in the next number of the *Agricultural News.*

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 11, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 200 bales West Indian Sea Islands have been sold ; they chiefly consist of the remainders of crops, and include Barbados, $12\frac{1}{2}d.$ to $15\frac{1}{2}d.$; St. Croix, $12\frac{1}{2}d.$ to $14\frac{1}{2}d.$; St. Vincent, $11\frac{1}{2}d.$ to $15\frac{1}{2}d.$; Tobago, $15d.$; Antigua, $13\frac{3}{4}d.$ to $15\frac{1}{4}d.$; Jamaica, $13d.$; St. Kitts, $11\frac{1}{2}d.$ to $13\frac{1}{2}d.$; St. Lucia, $15d.$; and Nevis, $13\frac{1}{2}d.$, the remainder being stains at $7\frac{1}{2}d.$

Prices of all Sea Island descriptions are hardening, and quotations of Georgias and Floridas are raised $1\frac{1}{2}d.$ per lb., this being the advance obtained for new crop. Carolinas and West Indians are raised $1d.$ per lb. in sympathy. So far, the quality of the Georgia and Florida Sea Island is the best we have seen for several years.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 9, is as follows :—

The Sea Island receipts during the week were 297 bales, making the total receipts of new crop cotton so far 325 bales. The factors have not sampled or offered for sale any of these receipts as yet, having agreed to delay opening the market until the movement is larger. However, they express a willingness to contract to sell ahead 300 to 400 bales on a basis of Fully Fine, 30c.-$16\frac{3}{4}d.$ There has been no demand on this basis.

COTTON GINNING AND SELECTION IN ST. VINCENT.

The following abstracts are taken from the report for the crop season 1908-9 (September 1, 1908, to August 31, 1909) on the work of the Central (Government) Cotton Ginnery in St. Vincent. The quantities of seed-cotton dealt with do not, of course, include that which was sent to private ginneries in the island :—

The ginnery continued to be worked under the supervision of the Agricultural Superintendent. The staff consisted of a manager, overseer and engine driver. When in full work about twelve men and boys, and sixteen women were also employed. Eight gins were worked successfully. No breakdown occurred in connexion with any part of the machinery. The ginnery was opened for the receipt of seed-cotton on October 26. Ginning was started on November 12, and carried on as found necessary until May 29, 1909. The actual number of ginning days was fifty-eight, as against eighty-four during the previous season.

The total weight of Sea Island seed-cotton sent in amounted to 747,506 lb. This was 220,894 lb. less than that received last season. The yield of lint was 205,688 lb., or 27·5 per cent. of the total weight of seed-cotton received. This percentage is 1·3 less than the record of the previous year, and is in no small measure due to the fact that one or two large estates grew a fine variety which only gave a low percentage of lint—often below 25 per cent. The weight of stained Sea Island lint was equal to 9·4 per cent. of the whole. Twelve thousand and nineteen pounds of Marie Galante seed-cotton were also received. This gave 2,781 lb. of lint, equal to 23·1 per cent. of the weight of seed-cotton.

The percentage weight lost in ginning the total amount of Sea Island and Marie Galante seed-cotton sent in, was 1·3. Six hundred and sixty-two bales were made during the season, most of which contained 360 lb., net, of lint.

For the purpose of meeting the local and export demand for cotton seed, 11,032 lb. of Ottley Hall seed were purchased at $1d.$ per lb. The lint from this seed fetched $18\frac{3}{4}d.$ per lb., as against $16d.$ per lb. for ordinary lots, and the yield was good. After selection, the total quantity of seed obtained for sale was 8,313 lb., or about 75 per cent. The price charged locally for the seed was $2\frac{1}{2}d.$ per lb.; for export $3d.$ per lb. From April 28 to August 27, 1909, 5,458 lb. of treated seed, were sold to local growers. Besides this, 2,356 lb. of planters' own seed was dealt with for them, making a total of 7,814 lb., or a quantity sufficient to plant 1,302 acres. To other colonies 2,855 lb. was sent.

EXPORTS OF COTTON FROM THE WEST INDIES.

The returns that have been received so far show that the amounts of cotton exported from the following places during the quarter ending September 30, 1909, were : Barbados, 320 bales (155,103 lb.), of an estimated value of £7,755 3s.; of this cotton, which was all Sea Island, 302 bales (146,357 lb., value £7,317 17s.) was sent to the United Kingdom, and 18 bales (8,746 lb., value £437 6s.) to the United States. St. Vincent, $46\frac{1}{2}$ bales (14,912 lb.), of an estimated value of £780 18s. 4d.; all this was exported to the United Kingdom, and was made up of 28 bales (9,732 lb., value £608 5s.) of Sea Island, and $18\frac{1}{2}$ bales (5,180 lb., value £172 13s. 4d.) of Marie Galante. Trinidad and Tobago, 13 bales (2,011 lb.) ; this all went to the United Kingdom, and was made up of Sea Island, 3 bales (511 lb.), and Marie Galante, 10 bales (1,500 lb.). No cotton was exported either from British Guiana or Montserrat during the stated period.

USEFUL BACTERIA IN JAMAICA SOILS.

The bacteria which possess importance in connexion with their relation to the nitrogen in the soil are, broadly speaking, of five kinds: those which change ammonium salts into nitrites: those which convert the nitrites thus formed into nitrates: those which take nitrogen from the air and actually enrich the soil with that element by adding it in a fixed condition; those which live in the nodules of leguminous plants and supply them with nitrogen from the air; and finally those which break down nitrogen compounds in the soil and return the nitrogen that they contained to the air. The first two are called nitrifying organisms; they do not add nitrogen to the soil, but render more available that which it already contains. The third are termed nitrogen-fixing bacteria; the reason for this is evident from what has been stated. Of the last two, little need be said here except that the former are, of course, beneficial, while the latter are responsible for the loss of nitrogen from badly kept soils.

In the *Bulletin of the Department of Agriculture*, Jamaica, Vol. I, No. 2, the results of an investigation of the nitrifying and nitrogen-fixing bacteria in the soils of Jamaica, which was carried out at the Government Laboratory there, are given. The following are extracts from the paper:—

The preceding issue of the Bulletin contained an article describing broadly the relations between the biochemical activity of the more important soil bacteria and the fertility of the land. Special attention was drawn to the 'nitrifying' and the 'nitrogen-fixing' bacteria. The writer has recently examined some Jamaican soils for the presence of those two groups of organisms. To test for the 'nitrifying' bacteria two mineral solutions were employed, one containing sulphate of ammonia, nutritive salts and carbonate of lime, and the other nitrite of sodium together with nutritive salts.

To prove the presence of 'nitrogen-fixing' bacteria, a solution of sugar (or the closely allied mannite) was used, together with nutritive salts and carbonate of lime, but no combined nitrogen in any form. These liquids were rendered sterile by heating in steam. The moist samples of the different soils were partly dried, broken down into a fine condition, well mixed, and 1 gramme (about 15 grains) of each introduced into the three culture solutions, which were then put in a dark place at air temperature.

The three soils tested were:—

1. A soil at Hope Gardens cleared of bush during the last year and planted with Guinea grass.

2. A rather stiff soil from a citrus fruit plantation at Hartlands.

3. A Westmoreland sugar-cane soil at the foot of a range of limestone hills.

These soils had all a neutral reaction to litmus. The Hope soil set up 'nitrification' of the ammonia and the nitrite, only after a long interval, and the characteristic 'nitrogen-fixing' *Azotobacter* appeared in the sugar solution also at a late date.

The phenomena were brought about by the Hartlands soil much sooner, while the Westmoreland soil acted still more promptly.

The earlier 'nitrification' and 'nitrogen-fixation' begin, the more numerous and the more active are the respective bacteria in the soil. In the Hope soil, the bacteria were scanty in numbers and sluggish in action, whereas in the other two soils they were numerous and active, especially in the Westmoreland soil. The differences shown stand in clear connexion with the amount of calcium carbonate present in the respective soils. The Hope soil was very deficient in the base carbonate of lime, whereas the relatively small amount present in the Hartlands soils was enough to secure a healthy multiplication and activity of both groups of bacteria. Chemical analysis of the *Azotobacter* cultures from the Hartlands and Westmoreland soils, after the sugar had all been oxidized by the bacterium, showed in both cases that 9 parts of nitrogen had been gathered from the air for every 1,000 parts of sugar destroyed. Some of the sugar solutions (containing glucose) inoculated with the Hope soil yielded no *Azotobacter*, but gave rise to a long continued butyric fermentation due to spores forming species of *Clostridia*. Analyses of these showed that only $\frac{3}{3}$-part of nitrogen had been gathered from the air for every 1,000 parts of sugar decomposed. Where, therefore, soil conditions are unfavourable for the abundant growth of the *Azotobacter*, owing to the deficiency of carbonate of lime, the nitrogen-gathering power of the soil is greatly weakened, since the *Clostridia* are only one-third as efficient workers as the *Azotobacter*.

JAMAICA RUM.

A paper in the *International Sugar Journal*, Vol. II, No. 129, gives the results of an investigation of Jamaica rum which was conducted by Dr. Karl Micko, Director of the Public Research Institute for Foodstuffs, Graz. The conclusions reached are as follows:—

1. Jamaica rum contains an aromatic constituent peculiar to it alone, which is the basis of its characteristic flavour. This constituent is found neither in high class European spirits nor in artificial rum.

2. This typical flavouring body of Jamaica rum is a colourless, not difficultly volatile, fluid of a delicate aromatic smell, and its boiling point lies higher than that of ethyl alcohol.

3. This typical body belongs neither to the esters, ketones, or aldehydes. It has the general characteristics of an ethereal oil, and it is not improbable that it stands in nearer relation to the terpenes.

4. The typical flavouring body does not dissolve in caustic soda; but on prolonged contact with it, it assumes an aromatic, but more resinous, smell.

5. In Jamaica rum, as in other high class spirits, is a body possessing a terpene-like aroma which is entirely absent from artificial rum. But it is less characteristically a proof of Jamaica rum, as in other high class spirits similar bodies, rich in terpenes, are found.

6. In Jamaica rum, there occurs in the last distillation fraction an aromatic-smelling, resinous substance, which dissolves in caustic soda and is precipitated by the addition of acids. It is questionable whether this substance is a primary fermentation product, for we can produce such substances easily from aldehydes.

7. The analyst with sensitive nose and palate can easily distinguish artificial, from Jamaica, rum. He is also in the position to be able to detect mixtures of Jamaica with artificial rum.

8. From chemical analysis alone, however, no thorough conclusion is possible, but when used in conjunction with the smelling test, it is extremely valuable. The ester number is of especial value for determining whether the given sample is of a concentrated or a diluted rum.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of this number has for its subject the Royal Commission that has been appointed to enquire into the trade relations between Canada and the West Indies.

On page 339, there is an interesting note on the impurities that are sometimes to be found in sulphate of copper (bluestone).

Extracts from an article on the manuring of cacao are given on page 340.

Useful information as to the qualities that should be shown by a good milking cow appears on page 341.

The same page contains the results of the recent Preliminary Examination held in connexion with the Reading Courses of the Imperial Department of Agriculture.

The results of investigations in connexion with some of the bacteria in Jamaica soils appear on page 343.

In the Insect Notes of this issue (page 346), there appears the first of a series of articles on the Natural History of Insects. In this, Figs. 38, 39 and 42 are from blocks supplied by the United States Department of Agriculture. Figs. 40 and 41 are redrawn from illustrations in Comstock's 'Manual for the study of Insects'.

Part of the information in the Fungus Notes (p. 347), which deals mostly with diseases of the ground nut, should be of use to those who are interested in flower gardens.

The Destruction of Weeds by Insects.

An interesting account of the introduction of insects into a country for the purpose of destroying a noxious weed is given in the *Hawaiian Forester and Agriculturist* for August last. In 1858, a plant known as Lantana, which belongs to the same genus as one of the wild sages of the West Indies (*Lantana Camara*), was introduced into the Hawaiian Islands from Mexico as an ornamental plant. This escaped from cultivation, and, owing to the absence of its natural enemies, and the dissemination of the seeds by a bird which had actually been introduced for the destruction of caterpillars, it became a serious weed in pasture and in sugar lands. In 1900, the Entomologist in the islands conceived the idea of introducing some of the insect pests of the plant from its native country, Mexico. This he did, and insects have been acclimatized which attack the branches, leaves, flowers, fruits, and seeds of the Lantana, with the result that it is quickly being brought under control.

A grave danger exists, however, in the employment of such a method of dealing with weeds. The insects that are introduced must only be of such kinds as have very specialized habits and food plants, in order that there may be no chance of their adapting themselves in such a way as to obtain shelter or sustenance from valuable plants that already exist in the country to which they have been brought.

Alcohol from Bananas.

In a recent number of the *Journal d'Agriculture Tropicale*, an article appears which deals with the manufacture of alcohol from bananas. The subject is introduced by a consideration of the fact that, in countries that produce bananas for export, a large quantity of the fruit is rejected as being unfit for shipment, and is consequently often wasted completely. Information furnished by the Agricultural Society in Jamaica, and by growers in Guatemala, shows that the loss from such fruit is about 20 per cent. of the crop; this, in the case of Jamaica, is equivalent to 2 million bunches a year. In view of this, various means have been tried for the purpose of utilizing the waste material. Among these have been the drying and preservation of the fruits, and the production of banana flour from it. None of them have, however, sufficed to deal with the quantity of unexportable fruits that have been produced, and it has become necessary to seek for other methods for the disposal of it.

Experiments conducted at the Central Laboratory of Guatemala, in association with the director of a distillery at Puerto Barralos, Guatemala, led to the production of a very good spirit, which is said to be something like whisky, from bananas which were about to be thrown away. Samples of this spirit were reported at the St. Louis Exhibition to be of superior quality, and, after analysis in the Laboratories of the United States Department of Agriculture, the manufacturers were awarded a gold medal.

The yield of spirit is estimated at 4½ litres (about 1 gallon) from each bunch of bananas. As regards the cost of manufacture, this is said to be much less than that of whisky, and two years' working of a plant for the production of the spirit showed that the manufacture can be carried on profitably.

Nitrification and Soil Conditions.

According to an abstract of a paper which is given in the Journal of the Chemical Society, it has been found that nitrification, both in unsterilized soil and in sterilized sand or soil, is accelerated in the presence of small amounts of a sugar such as dextrose. In the case of unsterilized soil, the greatest effect is produced in the second and third week; the effect diminishes afterwards, while denitrification increases. Other sugars such as cane-sugar and milk-sugar (as well as glycerine) also seem to have a favourable effect. Other substances, such as calcium butyrate, calcium acetate, peptone and urea, either have no effect, or retard nitrification.

The effect of water was such that nitrification alone was most active when 16 per cent. of that liquid was present. It was reduced when the amount of water decreased to 10 per cent., or increased to 26 per cent. Dextrose has an injurious, rather than a beneficial, action if an excess of water is present.

The Propagation of the Eucalypti.

Information has been received from the Curator of the Antigua Botanic Station to the effect that experience seems to point out that the propagation of Eucalypti there is, if special methods are not adopted, a somewhat difficult process. Recently, there has sprung into existence a demand for these trees, and efforts have been made to raise them in fairly large numbers.

At first, the usual method of raising seedlings was adopted; the seeds were sown in boxes, and the young plants potted when about 2 inches high. With this method, the mortality was very great, not more than 2 to 3 per cent. of the plants being saved.

In consequence of repeated failures to raise plants by what could, perhaps, be called the orthodox method, different ways were tried, the soil used in each being a somewhat open loam. The greatest success was obtained when the seeds were sown in small pots, the diameter of which was from 2 to $2\frac{1}{2}$ inches. Two to four fertile seeds were placed in each; the first seed that germinated was left, and as the others grew they were pulled up and destroyed. Whenever water was required during the time that the seeds and young plants were in these pots, they were placed in a bucket containing it to the depth of their own rim. No water was given overhead; protection from heavy rains was provided. As soon as two leaves other than the cotyledons were formed, the plants were carefully transferred to pots having a diameter of about 6 inches. Afterwards, the first watering was performed as described above, the subsequent ones being done with a watering pot from overhead. Little or no shade was given to the seedlings. To protect the seeds from ants, which do a great deal of damage if no precautions are taken, the soil surrounding the seedlings was well soaked with water containing a little kerosene.

The Mistletoes of the West Indies.

At least three genera of plants are included under the name 'mistletoe' in the West Indies ('Captain Bois' in Grenada). These are all semi-parasites, that is they supplement the food produced in the leaves by a certain amount which is obtained by them, with the aid of special organs for the purpose, from the plants to which they are attached. These organs are called haustoria; they are not true roots, for they do not possess root hairs and they have the power of secreting a ferment which dissolves a path for the haustorium which produces it through the tissues of the host plant. They have another function also: it is by them that the plant food which is destined for use in the cambium layer is transferred to the parasite—an action that may take place to such an extent as to weaken or destroy the host plant. Of economic plants in the West Indies, cacao seems to be the one which is most likely to be damaged in this way, and it is at the present time of the year that the parasite is most active. The only remedy is removal by cutting the mistletoe out of the affected branch or branches. It must be clearly understood, however, that the mere removal of the parasitic plant alone is useless, as the haustoria left in the branch will most probably produce new shoots of it. In cutting it out, therefore, a fairly large portion of the branch should be removed as well; in the case of badly affected plants, whole branches, or even the whole plant may have to be removed.

Such measures should result in complete control, as these plants are disseminated comparatively slowly, mostly by the accidental conveyance of the seed by birds.

The 'Butter Tree' of Sierra Leone.

The Curator of the Dominica Botanic Station states that, in July 1897, that Station received from Kew six plants of *Pentadesma butyracea*, the butter tree of Sierra Leone. According to the *Treasury of Botany*, this is a large tree, which yields in several parts, especially in the fruit when cut, a yellow, greasy juice, whence is derived its popular name. The leaves are opposite, leathery, and elegantly marked with numerous parallel veins; the flowers large and handsome, solitary and terminal. The fruits are said to be edible. Of the plants received, several were placed out in the gardens, but all failed to grow, owing, probably, to the dry climate. One plant was presented to the Pointe Mulâtre estate, where it was planted in a valley in which the rainfall is over 100 inches per annum. In the course of twelve years, it has developed into a large, handsome, spreading tree. During this year, it flowered and fruited. Fruits have been sent to the Botanic Gardens, where seedlings are being grown. Another attempt will be made to establish this interesting species in the gardens, and later a few plants may be available for distribution. It would be interesting to learn if this tree has fruited in other parts of the West Indies.

When established, the tree occasionally produces suckers from the surface roots. Its propagation may, therefore, be carried on both by suckers and by seedlings.

INSECT NOTES.

NATURAL HISTORY OF INSECTS.

Part I. Introduction.

The animal kingdom is divided into several great groups, or sub-kingdoms, in each of which the members have some points in common. The members of different groups have more points of difference than of likeness.

One of these groups has been given the name Arthropoda which means 'jointed feet', or perhaps, better, 'jointed limbs'.

The arthropods are all alike in having jointed limbs, and they also have other points of likeness. They have bodies that are jointed, or at least that are easily separable into regions or sections, such as head, thorax (the middle body) and abdomen; or head and hind-body; or cephalothorax, head and thorax fused together, and abdomen. Arthropods have an exoskeleton of a hard, firm substance, known as chitin, to which muscles are attached on the inside, and which protects all the soft and delicate organs.

The arthropods in their turn are divided into four classes as follows:—

Class I. Crustacea—Crabs, Lobsters, etc.
,, II. Araneida—Spiders, Mites, Scorpions, etc.
,, III. Myriapoda—Centipedes, Millipedes, etc.
,, IV. Hexapoda—Insects.

Among the Crustacea are to be included crabs, lobsters, shrimps, barnacles, etc., many of which are familiar objects in most parts of the West Indies. Fig. 38 represents the wood-louse, or sow-bug, one of the crustaceans. The crustaceans are mostly aquatic; a few live in damp situations such as damp soil or decaying vegetable matter. They breathe by

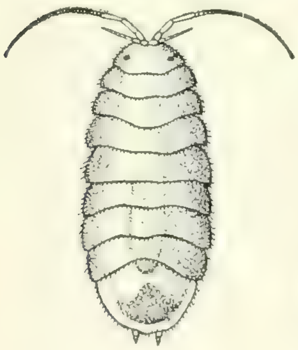


Fig. 38. Wood-louse.

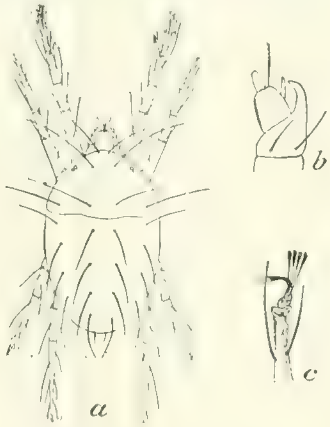


Fig. 39. Red Spider.

means of gills, the head is provided with two pairs of antennae, the abdomen has appendages which are used in locomotion, and the eyes are usually compound, sometimes stalked. The body is divided into two regions, the cephalothorax and the abdomen. The cephalothorax is composed of the head and the thorax fused together, and is often protected by a hard shell, the carapace. The exoskeleton of chitin is often impregnated with large quantities of lime.

The Class Araneida includes the spiders, mites, ticks and scorpions. Fig. 39 shows one of the red spiders, a mite of this class which is sometimes injurious to plants. These animals breathe by means of air tubes (tracheae), or air sacs. Certain species, mites especially, have the entire surface of the body adapted for respiration. In the case of most members of this group, the head and thorax are fused to form a cephalothorax, and the eyes are simple.

The Myriapoda, Class III, include the centipedes and the millipedes (Figs. 40 and 41). These are elongate animals with segmented bodies and jointed limbs and appendages.

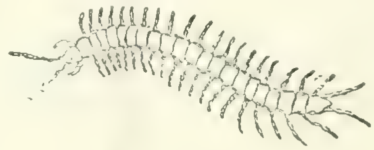


Fig. 40. Centipede.

Fig. 41. Millipede.

The head is distinct from the rest of the body, but the thorax and the abdomen do not differ in structure. The hind body is generally provided with legs its entire length, one or two pairs to each segment.

Fig. 42. Silver Fish.

Class IV are the Hexapoda, or true insects. The name Hexapoda means having six legs, and this expresses one of the most distinguishing characters of the insect. In addition to being arthropods having six legs, insects are to be distinguished from others of the group by the following features. The insect body is readily separable into three definite regions—head, thorax and abdomen, and the adult is usually winged. The normal number of wings is two pairs, but it sometimes happens that one, or even both, pairs of wings are wanting, as in the silver fish (Fig. 42).

FUNGUS NOTES.

DISEASES OF GROUND NUTS.

During the last few years, attempts have been made to introduce into the West Indies new varieties of ground nuts from the United States noted for the large size of their nuts and their heavy yield. The somewhat disappointing results so far obtained have been reported from time to time in the *Agricultural News*. (See Vols. VII, p. 117 ; VIII, p. 206.) These results are in part due to the severe attacks of fungous parasites, some of which have already been mentioned, and others still remain to be identified.

A species of *Uromyces*, one of the rust fungi, is reported as occurring on the leaves of ground nuts in St. Vincent during 1908. The attack, however, was not of a serious nature.

In the year 1907, another, or possibly the same fungus, described as *Uredo* sp., was reported from Montserrat, and the attack was thought to be sufficiently severe to have caused shrivelling of the nuts. The same fungus has been found this year in Dominica on the Spanish and Carolina Running varieties, though up to that time, no fungus had appeared and the trials were promising. This fungus occurred in Dominica in connexion with another, which may prove to be *Septogloeum arachidis*, causing a black spot on the leaf. An account of this appears in the current volume of the *Agricultural News*, No. 194, page 315.

Spraying with Bordeaux mixture was tried, but did not prove effective. A mixture of equal parts of sulphur and lime, dusted on to the leaves, had some effect in checking the disease, though it was not entirely successful. To save the remains of the crop, the nuts were harvested and all the rest of the plants burnt. It would be advisable not to plant ground nuts again in the same soil for at least a year.

To give some idea of the damage wrought by the disease, probably the 'black spot' fungus more particularly, it may be stated that the yield of nuts from one plot was only 35 lb., as against 106 lb. from the same plot last year.

A root disease was also found on ground nuts in the same island, which is due to a fungus as yet unidentified. It causes the leaves of plants attacked to wilt, and about two days later the plants die. The roots, pods, and probably the nuts, are attacked, and in advanced cases the lower parts of the stem, above the collar. The diseased portions exhibit a fine, web-like, white mycelium, which, in its older portions, is covered with straight, rod-like crystals. This produces small white tufts which grow somewhat, become yellow, and finally brown. They are about ¼ inch in diameter when fully grown, and roughly spherical in shape.

In section, they show two or three layers of firm, brown hyphae, forming an outer covering, which encloses a mass of swollen, colourless hyphae, completely undifferentiated. They are probably of the nature of sclerotia. No other fruiting bodies have yet been found.

A similar disease, probably due to the same fungus, attacks tomatos and egg-plants, and other garden crops in Dominica, and has also been found on Antirrhinum, some aroids, and other plants in Barbados. It seems distinctly probable that the root disease mentioned in the St. Kitts report for the year 1908-9 as attacking the Spanish and Tennessee Red varieties, was due to the same fungus, though this is not yet known definitely.

When the disease appears in a flower bed, or a plot of ground nuts, all the plants attacked should be immediately dug up, together with the earth round them, and buried with lime in a deep pit; the holes from which they have been taken should also be dressed with lime. Should this treatment not be effective, it would be advisable to remove all the plants from the bed, or all the crop, as soon as possible, bury them with lime or burn them, and dress the whole of the bed or plot with lime, at the rate of about ½-lb. to the square foot. It should then be allowed to lie fallow for one or two months, and be subsequently planted with different flowers, or a different crop.

In all probability, the wet weather is largely responsible for the increased incidence of the diseases mentioned, and it has a further ill effect by causing the ground nuts to germinate too soon, or to rot in the soil. It has been found necessary in St. Lucia to plant the seed so that the ripening period may fall between February and May. In Bengal, if any rain falls at the ripening period, the ryots endeavour to save as much of the crop as possible by ploughing up the land at once and exposing the pods. (*Handbook of Commercial Products*, No. 24, Imperial Institute Series.)

In the case of the Dixie Giant variety of the ground nut, it has been found that the seeds frequently rot in the ground, even when the soil is fairly light and has been carefully prepared. This was noted particularly in St. Kitts and Nevis. It is possible that the trouble might be overcome by carefully disinfecting the seeds with a solution of corrosive sublimate of the same strength as is used in the case of cotton seed. It is hoped that it will soon be possible to undertake experiments at the Head Office, with a view to finding out if disinfection can be effectively carried out without injuring the germinating power of the seed. If this treatment should be found not to be injurious, it would probably be of assistance in combating other diseases besides the rotting of the seed.

Although the results have been so far rather unsatisfactory, yet it has been noticed in several of the islands that the Carolina Running variety gives fairly good results, and appears more resistant to disease than the other imported forms. Moreover, it is possible that the latter in particular, and all the varieties in general, may improve considerably as they become more acclimatized, so long as they are planted in a fairly light soil. This gradual acclimatization, both local and general, is a factor which must always be taken into account when dealing with newly imported varieties of plants.

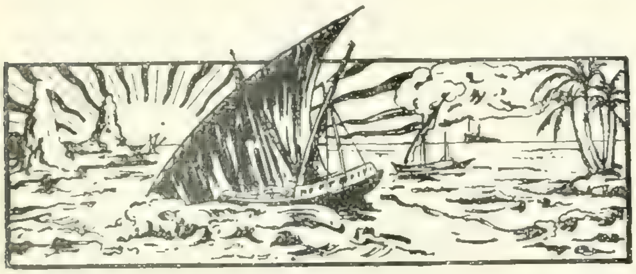
Another method by which improved results may eventually be obtained is by crossing one of the more promising imported varieties with a local hardy form, and subsequently separating out, on Mendelian lines, a variety which combines the good cropping powers of the imported form with the disease-resisting power of the local variety.

It seems probable, then, that before long it will be possible to obtain, by a combination of the methods mentioned, a variety of ground nut giving good and reliable returns, and thoroughly suited to the conditions in the West Indies. Such a plant would undoubtedly form a valuable addition to the agricultural products of these islands.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned from England to Barbados by the R.M.S. 'Atrato' on October 26.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, left by the R.M.S. 'Berbice' for St. Lucia, on October 26, for the purpose of making investigations in connexion with the cotton industry in that island.



GLEANINGS.

A communication from Santo Domingo states that an effort is to be made to increase the area in cultivation of Sansevieria in that Republic.

During this year, the staff of the Cadastral Survey of Egypt has verified the whole area of cotton planted in that country. It was found to be 1,466,530 feddans, or 1,522,258 acres.

During the cotton spinning season just closed, the number of mills working in the Southern States of America has increased by ten. At the same time, the increase in the consumption of cotton has been 339,129 bales.

It is estimated that the rice crop of the present year in Japan will reach 54,300,000 'koku', which is equivalent to about 95 million bags of 180 lb. This will be an increase of 17¼ per cent. over the average year's crop.

The most important manufacture in Brazil is probably cotton spinning and weaving. The number of mills at present working in and near Rio de Janeiro is 119. The total production per annum is nearly 235 million yards of cloth.

In 1894, the plant which yields sisal hemp (*Agave rigida*, var. *sisalana*) was introduced into Egypt. So far, it has succeeded well, and the results obtained at an experimental factory appear to indicate that a flourishing sisal hemp industry could be established in that country.

On September 15, Messrs. Workman, Clark & Co., of Belfast, launched a new steamer for the Tropical Fruit Steamship Company. This vessel will be engaged in the West Indian fruit-carrying trade, and will have accommodation for a large number of passengers.

The *Annual Report*, 1908, of the Comptroller of Customs for Barbados shows that the net receipts were £109,072, as compared with £117,995 in 1907. The exports amounted to £608,004—a decrease of £5,735. Of these, the value of sugar increased by £28,026, while that of cotton decreased by £21,783.

The total revenue of British Honduras for the year ended March 31, 1909, amounted to $353,641, and the total ordinary expenditure was $322,388. It is a significant fact that the receipts from the sale of Crown lands were, during the same period, $7,068, as compared with $1,915 for the year ended March 31, 1908.

In the *Philippine Journal of Science*, an account is given of *Parameria philippensis*, which is a woody, climbing vine containing a rubber-like gum. This is present in the bark to about 5 per cent. and, when extracted with carbon disulphide it is yellow, but turns black on exposure to the air and becomes 'tacky'.

The *Bulletin of the Liverpool School of Tropical Medicine*, of which the first number has just been issued, states that the expense of the anti-malaria measures on the Suez Canal had averaged 18,000 francs per annum. In 1903, malaria cost the Suez Canal Company 38,200 francs; last year, the cost was 16,800 francs.

A new rubber pest has been announced from Ceylon by the Government Entomologist. It is described as a slug about 1⅛ inches in length. It damages the young plants by eating the opening leaf-buds at night. The remedy suggested is to keep a bare space of earth around each tree, and occasionally to sprinkle this with lime.

The legislature of North Dakota has passed a comprehensive seed law, which is intended to regulate the sale of agricultural and garden seeds, providing for the proper labelling of such seeds and for the establishment of a seed laboratory, at the North Dakota Agricultural College, in connexion with the Department of Botany.

According to the Report of the Curator of the Botanic Station, Antigua, for last month, the distribution of plants from that Station was as follows: hay grass (*Andropogon caricosus*), 7 bags of roots (490 plants); *Casuarina*, 91 plants; cacao, 86 plants; mahogany, 64 plants; walnut (*Andira inermis*), 12 plants; red cedar, 5 plants; 1 palm; castor seed, 30 lb.

The planting of rubber trees in German New Guinea during the past six or seven years has proceeded on such a scale that there are at present about 500,000 trees, growing on an area of approximately 3,000 acres. So far, the plants which have flourished best have been those of *Castilloa elastica*, *Ficus elastica*, and *Hevea brasiliensis*. (The *Frankfurter Zeitung*.)

The *Annual Report* of the Protector of Immigrants for Trinidad for 1908-9, shows that, during that period, 2,392 East Indian immigrants arrived in that colony, and 726 returned to Calcutta. The savings of the latter amounted to £17,712, besides jewellery, while £3,491 was remitted to India during the year. In the same period, 1,802 acres of Crown lands were purchased by immigrants. At the end of 1908, £115,224 stood to the credit of East Indian immigrants in the Government Savings Bank.

A Committee has been appointed by the Secretary of State for the Colonies to carry out investigations in economic entomology, with special reference to Africa. Its work will be to discover the relations which exist between insects and disease in man, animals and economic plants. Trained entomologists are to be sent to East and West Africa for the purpose of encouraging the collection and observation of noxious insects, and to give instructions in the use of scientific methods. Collections will also be made on behalf of the Committee, and the results will be published from time to time.

STUDENTS' CORNER.

OCTOBER.

SECOND PERIOD.

Seasonal Notes.

During this month, preparation should be made in the Northern Islands for grafting cacao. The method to be followed is given full description and explanation in Pamphlet No. 61 of the Department, entitled *The Grafting of Cacao.* For the purpose, the Calabacillo variety has been found most suitable as a stock, though there is no reason why some other variety should not prove to be superior. The plant providing the scions will, of course, have been selected on account of the possession by it of desirable characters which it is required to perpetuate. During the time in which the union of the stock and scion is taking place, the stocks must be kept well supplied with water and the soil in the pots containing them should be mulched. The union may be completed in thirty days, but the average time for this is about six weeks, in the growing season. The whole time occupied from the commencement of the growth of the stock from the seed to the attainment of sufficient growth for the grafted plant to be sold or planted out should not be more than fifteen months, and it may be less if healthy stocks are used. The cacao for the Christmas crop will have begun to ripen early in this month. The work during the present quarter will consist chiefly in gathering the crop, fermenting and preparing the beans for market, keeping down suckers, and preventing drains from becoming filled. Where cacao is being established, care should be taken to thin the shade-plants in order that the young cacao plants may obtain sufficient sunlight for their development to take place properly.

The gathering of limes is now in full swing, and will continue to the end of the year. The ripe fruits should be collected as soon as possible after they fall to the ground, in order to prevent the decay of the skin, which quickly arises where it is in contact with the ground. At this time of the year, beside the harvesting of the crop, little can be done except cutlassing the weeds and keeping the drains open. The student should gain as much information as he can in connexion with the following subjects: the gathering of the crop, the crushing of the fruits, the care of mills, tayches, and stills, the preparation of raw and concentrated juice for export, the preparation of hand-pressed and distilled lime oils for export, the manufacture of citrate of lime. Where there is an opportunity, observe the method of obtaining the essential oil by means of the 'écuelle', and note the way in which the manipulation of the lime causes the oil glands in the skin to burst. How is the oil that is obtained in this way enabled to compete with that which is yielded by distillation?

Make observations on the yield of lime trees and the state of their health, and note that a heavy crop on a tree is accompanied by the production of small fruits. Isolated trees often show freedom from pests. Why is this? Cut a lime into two pieces, making the cut halfway between the point of attachment of the stalk and the opposite end of the fruit. What do you notice in connexion with the structure of the fruit and the way in which the seeds are borne in it. Compare such a fruit with the pod of the bean and the fruit of the mango, with the object of determining the essential differences between them.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the conditions (a) of the soil, (b) of the air, (c) of the structure of the leaf, which regulate the amount of evaporation from this organ?

(2) Why does an animal not thrive if it is fed entirely on grass?

(3) Describe any parasitic plant that you have examined. What measures would you adopt to get rid of it?

INTERMEDIATE QUESTIONS.

(1) Compare the mode of growth in length of a stem with that of a root. What is the chief significance of the differences between them?

(2) Give an account of the arrangements that should be made in connexion with the picking of a crop of cotton.

(3) What is Paris green, and what test affords some indication as to the purity of a sample?

RUBBER IN THE FEDERATED MALAY STATES.

The information which is given below appears in the *Annual Report* for 1908 of the Resident General of the Federated Malay States:—

According to the Report of the Director of Agriculture, Mr. J. B. Carruthers, for 1908, the agricultural acreage of the Federated Malay States, excluding padi lands and horticulture, was planted with staple products as follows:—

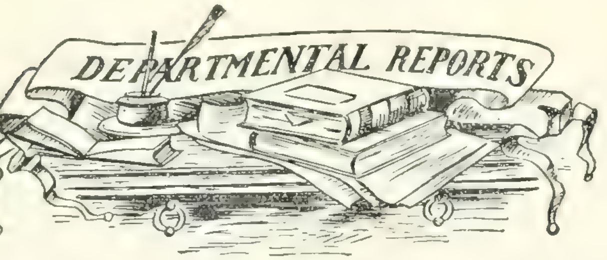
Cocoa-nuts	118,697	acres
Rubber	168,048	,,
Coffee	8,431	,,
Other forms of cultivation, chiefly tapioca	24,546	,,
Total	319,722	acres

The lands under rubber in the several states were:—

Perak	56,706	acres
Selangor	82,246	,,
Negri Sembilan	27,305	,,
Pahang	1,791	,,
Total	168,048	acres

A feature of rubber cultivation is the extent to which Para rubber holds the field to the almost entire exclusion of rambong (*Ficus elastica*), which, as being indigenous, as growing freely, and as yielding a rubber of excellent quality, was regarded with favour by many a few years ago.

The yield of rubber trees is, of course, a matter of the first importance, and in this connexion the Director gives some interesting figures. The average yield for 1908 over the whole Peninsula, the Director puts at 1lb. 15¾ oz.—an increase of 11 per cent., as compared with the preceding year. This, he considers to be a satisfactory yield, having regard to the fact that most of the trees that were tapped were in the first year. In Negri Sembilan the average was 3 lb. 2¼ oz., and as this is the average yield of nearly a million trees, he regards it as extraordinarily high. Negri Sembilan trees show a higher average than other trees because of their greater age, but the figure in question is satisfactory as showing what may be expected in respect of trees that have been tapped for two or three years. (*Malay Mail*, July 10, 1909.)



ST KITTS: REPORTS ON THE BOTANIC STATION, ECONOMIC EXPERIMENTS AND AGRICULTURAL INSTRUCTION; ALSO ON AGRICULTURAL EDUCATION, 1908-9.

The total expenditure during the period 1908-9 was £1,142 15*s.* 8*d.*; of this £721 6*s.* 11*d.* was from the Imperial Grant-in-aid, and £421 8*s.* 9*d.* from local funds. The receipts from the sale of plants, etc., were £201 13*s.* 4*d.*

In St. Kitts, the number of plants distributed was 876. These consisted of cacao, Castilloa, and trees for wind-breaks and ornamental purposes. In addition, many thousand young hedge-plants and seeds were sent out, as well as 34,000 cuttings, 5,600 plants and about 50 lb. of seeds from La Guerite Experiment Station. Those distributed in Nevis included 8,766 plants and 10,893 lb. of seeds and cuttings.

Among economic plants, success has been obtained both in St. Kitts and Nevis in growing onions. The raising of these would prove to be a promising minor industry, but for the fact that difficulty is met with in finding a market for them. As regards cacao, the attempts which were begun in St. Kitts five years ago to introduce the cultivation of this plant, on a commercial scale, into the island are meeting with success. In Nevis, neglected plants already exist which only require proper attention and care to bring them into profitable bearing. In both islands, especially in Nevis, an increasing interest is being shown in the cultivation of limes.

The rainfall at the Botanic Stations in St. Kitts and Nevis for the year 1908 was 44·62 inches and 50·50 inches, respectively. In both cases this was higher than that for 1907; by 8·21 inches in the former and 7·05 inches in the latter. In these islands, heavy rains were experienced toward the end of the year, which did a certain amount of damage to the maturing cotton.

At the Stations, economic experiments were carried out with yams, cassava, ground nuts, limes, cotton and broom corn. In St. Kitts, there were, in addition, experiments with sweet potatos, velvet beans, tobacco, sesamum and woolly pyrol; and in Nevis with eddos, Indian corn, Guinea wheat, cowpeas and onions. The manurial experiments with cotton in St. Kitts have shown, so far, that the application of manures to this crop is unremunerative, and this experience has been repeated in Nevis; but trials have only been made for one year in the latter island. Experiments in St. Kitts still continue to show that cotton planted 4 feet by 2 feet gives a better return than when the plants are farther apart than this.

As regards the cotton industry, the Report shows that the total area planted in this crop in the islands of St. Kitts, Nevis and Anguilla was approximately 4,000 acres, the areas being 1,500, 1,200 and about 1,300 acres, in that order. Of the amount in St. Kitts, 1,200 acres were planted as an intermediate crop with cane, and 300 acres as an independent crop. The returns of lint per acre over the whole area were 140 lb. in St. Kitts and 100 lb. in Nevis, though these have, of course, been much exceeded in some individual instances. In Anguilla, the weather was very unfavourable, so that a return of only 60 lb. of lint per acre was obtained.

The number of plots in which sugar-cane experiments were conducted in St. Kitts during the season was 532; of these, 340 were devoted to experiments with varieties, plants and ratoons, and 192 to manurial experiments with ratoons. The results of these are published in the Official Reports on Sugar-cane Experiments in the Leeward Islands, 1907-8, Parts I and II, issued by the Imperial Department of Agriculture, and in Pamphlets Nos. 56 and 57. The interest that is taken, in the island, in the new varieties of sugar cane is shown by the fact that, of a total area of 7,493 acres, 5,900 are in the newer varieties. Of these, B. 147 and B. 208 occupy the greatest area, with 3,726 and 2,074 acres, respectively.

At the Grammar School, there were eleven agricultural pupils holding scholarships from the Department during 9 months of the year, and ten during the other 3. The science teaching is conducted along the lines of previous years, being arranged to cover the requirements of the Cambridge Local Examinations. Of eleven pupils who took science subjects in those examinations, eight passed, one obtaining the mark of distinction in Senior Agricultural Science.

JAMAICA: REPORT ON THE DEPARTMENT OF AGRICULTURE, 1908-9.

At the time of writing the Report, it was a year since the Department of Public Gardens and Plantations, the Experiment Station, and the Government Laboratory had been amalgamated to form a Department of Agriculture. One consequence of this change has been that the expenses of administration of the gardens have been decreased; while their utility has been increased by a rearrangement, to a certain extent, of their contents; so that they have been brought into line with the policy of paying strict attention to the development of the agricultural interests of the colony.

The number of plants distributed from the Hope Gardens was 225,040, of which 210,208 were economic, and 214,832 ornamental, plants. Free grants of 60,837 plants were made, of which 26,133 were cane tops. Of the economic plants that were sold, the chief were tobacco, cacao, sisal and rubber. From Castleton Gardens, 28,586 plants were distributed, of which 5,018 were sold, 14,072 were cacao plants granted free of charge to small settlers, and 9,496 were sent to Hope Nursery.

The chief crops which figure in the agricultural experiments are sugar-cane, coffee, bananas, citrus fruits, mangos, pine-apples, cacao, cassava and tobacco. Among the cane seedlings, B.208, B.147 and D.625 have been in demand. The first of these is gaining increased favour among planters, while B.147 seems to be specially suited to certain soils, and D.625 appears to be useful in wet situations. None of the varieties of coffee and bananas that have been tried have shown themselves superior to the ordinary ones under cultivation in Jamaica. The drought of the past two years has caused serious damage to the citrus trees of Jamaica from the attacks of the white scale, but a recovery is hoped for on the return of more favourable conditions. Trial shipments of mangos to America have shown that the best variety to grow for export is the 'Bombay'. (This is the same as the 'Peters' mango of Trinidad: see *Agricultural News*, Vols. II, pp. 22, 276; III, pp. 132, 204; V, p. 148; VII, p. 388; VIII, p. 312.) Only one of the seedling pines obtained by the cross-fertilization of selected varieties has been found to be of any use; this is a cross between the 'Queen' and 'Smooth Cayenne' varieties. As regards cacao, the production of this is increasing in Jamaica, and it is suggested that its cultivation should be extended to districts which at present raise little that is of any export value. Cassava is attaining an increased commercial importance, and there has been a good demand for cuttings of the best kinds. Experiments with tobacco have shown that this is not a crop for the large planter in Jamaica, as the local market is readily glutted.

The work of the Agricultural Instructors has been continued. At the Government Laboratory four students have attained the higher course of training in agricultural science. In the future, agricultural education will cease to be carried on at the Laboratory, but will be continued at the Farm School which it is proposed to establish. The usual work has been done at the training colleges, and for the primary school teachers.

The total number of analyses that were conducted at the Government Laboratory during the year was 306, of which 121 were official, 75 agricultural, and 110 general. The number carried out at the Sugar Experiment Station was 656, and there were 120 bacteriological examinations. The last have shown that the water-supply of Kingston has rarely been contaminated by polluting bacteria. On the other hand, all the samples of fresh milk examined showed the presence of objectionable bacteria and dust.

WEST INDIAN PRODUCTS.

Drugs and Spices on the London Market.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of September:—

As was anticipated, the first month of Autumn, namely September, started with a marked improvement in the drug trade—an improvement that was not only maintained, but gradually increased throughout the month. Beginning as it did on a Wednesday and ending on a Thursday, September practically covered a period of five weeks to report upon, the spice auctions being held weekly on Wednesdays, and the drug auctions on alternate Thursdays.

In most of the articles which come under our review there were good supplies, and a fairly brisk demand.

GINGER.

There were no quotations for ginger at the spice sale on the 1st; but on the 8th, some 400 packages of Jamaica were offered, and sales were effected for about 150, at prices of 1*s.* to 2*s.* decline on previous rates, bold lean fetching 60*s.*, good common 52*s.*, good ordinary smale 50*s.*, and ordinary mixed ratoon 46*s.* to 46*s.* 6*d.* per cwt. On the 15th, no Jamaica was brought forward, but good supplies of Calicut and Cochin were offered, and bought in at the following rates:— 85*s.* for good bold cut, 55*s.* for unsorted native cut, 43*s.* for washed rough Cochin, 42*s.* for bright brown rough Calicut, and 40*s.* for slightly wormy. At the last auction on the 29th, the offerings amounted to 165 barrels of Jamaica, of which 100 were sold, dull to fair bright washed fetching 52*s.* 6*d.* to 56*s.*, and common ratoon 42*s.* to 43*s.* Five cases of Calicut were sold, out of a total of 55 offered, at 78*s.*, and 50 bags out of 668 offered, realized 41*s.* 6*d.* per cwt. for rough mixed small.

NUTMEGS, MACE AND PIMENTO.

At the auction on the first of the month, West Indian nutmegs were in steady demand; 317 packages were offered, and 130 sold at about previous rates. No further quotations occurred during the month. At the same auction, mace met with but little attention; 9 packages of West Indian were disposed of at the following rates: fair palish 1*s.* 6*d.* to 1*s.* 7*d.*, fair red 1*s.* 4*d.* to 1*s.* 5*d.*, and pickings 1*s.* to 1*s.* 2*d.* Java and Macassar were bought in at 1*s.* 1*d.* per lb. On the 15th, West Indian was represented by 72 packages, which were sold at slightly varying prices, namely 1*s.* 9*d.* for good, 1*s.* 7*d.* to 1*s.* 8*d.* for fair, 1*s.* 4*d.* to 1*s.* 6*d.* for ordinary, and 11*d.* to 1*s.* 3*d.* for broken. There was again a steady sale on the 29th at similar rates to the above. At this auction, some fine bold flat Java was offered, and bought in at 2*s.* per lb. Pimento did not appear at the first sale, but on the 8th, $2\frac{1}{4}d.$ per lb. was realized for fair. On the 22nd, some 226 bags were brought forward, and 50 bags disposed of, at $2\frac{1}{4}d.$ per lb. At the last sale, on the 29th, the offerings were bought in at $2\frac{5}{16}d.$ to $2\frac{3}{8}d.$

ARROWROOT.

The unsatisfactory position of the arrowroot production in St. Vincent has recently attracted some attention in commercial circles, owing to a statement in the *West India Committee Circular* that over production has resulted in the low prices now prevailing in the market, and that at 2*d.* per lb. the arrowroot plant scarcely pays for growing. It will be seen from the following prices, ruling during the month, that this figure has but rarely been attained at any of the auctions. On September 1, 67 barrels of St. Vincent were brought forward, and the whole bought in at 3*d.* per lb. A week later, the quantity offered had increased to 277 barrels, but no sales were effected, even at the lower figure of 2*d.*, at which price the entire quantity was bought in. At the third sale, namely on the 15th, the offerings amounted to 307 barrels and were sold without reserve, 102 barrels fetching $1\frac{5}{8}d.$ per lb., and the remaining 205 from $1\frac{3}{8}d.$ to $1\frac{1}{2}d.$ per lb. On the 22nd, 336 barrels were brought forward, only 47 of which found buyers at $1\frac{7}{8}d.$ to 2*d.*, for good manufacturing. For fine, $3\frac{3}{4}d.$ was the price wanted, but no sales were effected. At the last auction, on the 29th, 134 barrels, all that was offered, were bought in at $1\frac{7}{8}d.$ to 2*d.* for fair manufacturing.

SARSAPARILLA.

At the auction on September 9, large consignments of this drug were brought forward. Of grey Jamaica, there were 32 bales, which were disposed of at the following rates: 1*s.* 1*d.* to 1*s.* 2*d.* for fair, and 1*s.* 1*d.* for ordinary rough and part dark; of 23 bales of native Jamaica, 1 bale, only, was disposed of, at 1*s.* for fair red, while 13 bales out of 19 brought forward, of Lima-Jamaica, sold at 1*s.* per lb. Two bales of Honduras were bought in at 1*s.* 8*d.* per lb. On the 23rd, native Jamaica was represented by 26 bales, and 14 were sold at 10*d.* to $11\frac{1}{2}d.$ for dull red, and yellowish to fair red. There was no grey Jamaica offered. At this auction, for a large consignment, consisting of 123 bales of fair rolled Guatemala character, which had arrived via Havre, $6\frac{1}{2}d.$ per lb. was offered, and as the limit was 9*d.*, no sales were made.

KOLA, LIME JUICE, AND TAMARINDS.

On the 8th, 13 bags of good dried Jamaica kola, realized $3\frac{1}{4}d.$ per lb. The same price was paid for 37 bags of Ceylon. On the 22nd, 46 packages of good bold, bright, dried Jamaica were offered and all sold, at from $3\frac{3}{4}d.$ to 4*d.* Three packages of small African quarters fetched $3\frac{1}{2}d.$ per lb. Raw West Indian lime juice was brought forward on the 15th, realizing 1*s.* 3*d.* for fine pale, and 1*s.* 2*d.* per gallon for fair pale. On the 29th, the quotation for West Indian concentrated lime juice was £17 5*s.*, and a fair business is said to have been done, though the price was considerably high. Of tamarinds, on the 8th, 17 packages of fair, rather dark, Barbados were offered; 14*s.* in bond was the price asked.

MARKET REPORTS.

London,—The West India Committee Circular, October 12, 1909; Messrs. E. A. de Pass & Co., September 17, 1909.

Arrowroot—1⅝d. to 3⅜d.
Balata—Sheet, 2/6; block, 1/11.
Bees-wax—£7 12s. 6d. to £7 17s. 6d. for fair to good.
Cacao—Trinidad, 52/- to 62/- per cwt.; Grenada, 49/6 to 54/6 per cwt.; Jamaica, 47/6 to 52/-.
Coffee—Quiet; Jamaica, 38/- to 120/-.
Copra—West Indian, £23 per ton.
Cotton—St. Croix, 12½d. to 14½d; Antigua, 13¼d. to 15¼d.; Barbados, 12½d. to 15½d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet; common to good common, 45/- to 49/- per cwt.; low middling to middling, 50/- to 54/-; good bright to fine, 57/- to 65/-.
Honey—23/6 to 28/6.
Isinglass—No quotations.
Lime Juice—Raw, 1/- to 1/3 per gallon; concentrated, £15 5s. to £17 10s. per cask of 108 gallons; Otto of limes, 5/9.
Logwood—No quotations.
Mace—Steady.
Nutmegs—Quiet.
Pimento—Common, 2⅜d. per lb.; fair, 2¼d.; good, 2⅜d.
Rubber—Para, fine hard, 8/10 per lb., fine soft, 8/6; fine Peru, 8/8.
Rum—Jamaica, 2/9 to 7/-.
Sugar—Crystals, 14/6 to 17/9; Muscovado, 12/- to 15/-; Syrup, 10/9 to 11/6; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., October 1, 1909.

Cacao—Caracas, 11¼c. to 12½c.; Grenada, 11⅝c. to 12c.; Trinidad, 11½c. to 12c.; Jamaica, 9½c. to 11c. per lb.
Cocoa-nuts—Jamaica, select, $30·00 to $32·00; culls, $17·00; Trinidad, select, $30·00 to $32·00; culls, $16·00 to $17·00 per M.
Coffee—Jamaica, ordinary, 7½c. to 8c.; good ordinary, 8½c.; and washed. up to 10½c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, 58c.; Barbados, from 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 47c. to 50c. per lb.; Antigua, 48c. to 50c., dry flint.
Grape Fruit—$3·00 to $4·50 per box.
Limes—Dominica, $4·50 to $5·00 per barrel.
Mace—32c. to 35c. per lb.
Nutmegs—110's, 8¾c. per lb.
Oranges—Jamaica, no quotations.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 4·23½c. per lb.; Muscovados, 89°, 3·73½c.; Molasses, 89°, 3·48½c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., October 16, 1909.

Cacao—Venezuelan, $11·60 per fanega; Trinidad, $11·50 to $11·75.
Cocoa-nut Oil—72c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—$3·75 per 100 lb.
Dhal—$4·00 per 2-bushel bag.
Onions—$2·50 to $3·00 per 100 lb.
Peas—Split $5·50 to $5·75 per bag.
Potatos—English, $1·40 to $1·60 per 100 lb.
Rice—Yellow, $4·60 to $4·80; White, $5·00 to $5·25 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., October 23, 1909; Messrs. T. S. Garraway & Co., October 25, 1909.

Arrowroot—St. Vincent, $3·60 to $3·75 per 100 lb.
Cacao—$12·00 to $13·50 per 100 lb.
Cocoa-nuts—$14·00.
Coffee—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb.
Hay—$1·00 per 100 lb., unsaleable.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—Strings, $2·50 to $3·00 per 100 lb.
Peas—Split, $6·00 per bag of 210 lb.; Canada, $4·20 per bag of 120 lb.
Potatos—Nova Scotia, $2·20 to $2·50 per 160 lb.
Rice—Ballam, $4·85 to $5·00 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, October 16; Messrs. Sandbach, Parker & Co., October 15, 1909.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 to $9·00 per 200 lb.	$9·00 per 200 lb.
Balata—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	50c. per lb.
Cacao—Native	11c. to 12c. per lb.	12c. per lb.
Cassava—	60c. to 72c.	No quotation
Cassava Starch—	$6·00 per barrel of 196 lb.	No quotation
Cocoa-nuts—	$12 to $16 per M	$16 per M, peeled and selected.
Coffee—Creole	12c. to 13c per lb.	12c to 13c. per lb.
Jamaica and Rio	13½c. per lb.	13½c. per lb.
Liberian	10c. per lb.	7c. per lb.
Dhal	$4·10 to $4·15 per bag of 168 lb.	$4·25 to $4·40 per bag of 168 lb.
Green Dhal	$5·25	
Eddos	$1·08 per barrel	
Molasses—Yellow	21c. to 22c.	
Onions—Teneriffe		No quotation
Madeira	2[illegible]c. to 2[illegible]c. per lb.	2½c. to 2¾c. per lb.
Peas—Split	$6·[illegible]5 per bag (210 lb.)	$6·40 per bag (210 lb.)
Marseilles	$4·00, over stock	$4·85 to $5·00
Plantains	12c. to 40c. per bunch	
Potatos—Nova Scotia	$2·25 to $2·40	$3·25 per barrel.
Lisbon	$2·00 per 100 lb.	No quotation
Potatos-Sweet, Barbados	$1·08 per bag	
Rice—Ballam	$4·50	$4·75
Creole	$4·30 to $4·60	$4·25 to $4·50
Tannias—	$1·92 per bag	
Yams—White	$2·16 per bag	
Buck	$2·28 per bag	
Sugar—Dark crystals	$2·30 to $2·45	$2·35
Yellow	$2·90 to $3·00	$3·00
White	$3·70 to $3·80	$3·60 to $3·80
Molasses	$1·80 to $1·90	$2·00 to $2·30
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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OF THE

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CONTENTS.

Agriculture at the Recent British Association Meeting.

At the recent meeting of the British Association for the Advancement of Science, held at Winnipeg, the opening address in the sub-section Agriculture of Section K, Botany, was given by the Chairman, Major P. G. Craigie, C.B., F.S.S. This was commenced by a presentation of the claims of Agricultural Science to the grant of a division to itself among the sections of the Association, instead of its being, as is the case at present, included under Botany as a sub-section. The chief points in the address form the subject-matter of what follows.

Although agriculturists may have been tardy in taking advantage of the teachings of men of science, they are in earnest now in their applications for instruction. Again, the appeals which agriculture makes to other sciences for aid in the solution of its problems are so many and varied, that it cannot be classed as a subsidiary section of any one of them. The mathematician and physicist can formulate rules which must be followed, if successful results are to be obtained; and can supply meteorological information which will be a guide to the future conduct of operations. The aids which are given by the chemist are manifold, and not the least among them is that of affording information as to the different methods for the treatment of soils, in order that these may be made to give their best yields, both in quality and quantity. The geologist is called upon to give the benefit of his knowledge of the contents and capacities of the soil itself. Both the production and care of those animals which are useful, and the methods for the destruction of such of them as are inimical come under the attention of the zoologist. Those who have studied geography, in its widest sense, will be approached by the agriculturist when he wishes to know about the distribution of crops which already exist and the regions which are awaiting agricultural development. The economist can give information which may be used to prevent over-production and, for the same purpose, to enable new markets to be found. The tendency for the engineer to be called in to aid the agriculturist has become rapidly greater, not only for the production of crops, but for the proper preparation of the saleable part of the latter for the market. In the province of the anthropologist, there is the study of different races of mankind in relation to their needs and the resources of different parts of the globe. The physiologist can throw light on the life-processes in both plants and animals which have important bearings on agriculture, and the botanist has such an intimate connexion with that subject that no explanation of his relation to it is required. Finally, those who have a special interest in educational methods are being called upon more and more to benefit agriculture by their knowledge, so that the best methods of instruction shall be available for those who practise it, in order that they may become capable of appreciating and applying in the right manner the information which is placed at their disposal by the agricultural investigator.

In considering, in the broadest way, what are the chief circumstances that govern the changes in the industry of agriculture throughout the world, the greatest attention must be undoubtedly given to population. The growth and rapidly varying distribution of this, and its changing and diversified needs, both have a close bearing upon the kind and extent of new agricultural introductions, as well as on the continued local existence and extension of the kinds of production that have been already undertaken. Crops are raised for man, in the first instance, either directly or indirectly, and whether what they produce is required for food, clothing, shelter, the provision of requirements in connexion with quick transport, articles of luxury or drugs for the practice of the healing art, it is the distribution of man and the circumstances of his needs that will determine how they shall be provided, and when and where that provision shall take place.

Until a comparatively recent period, man has lived in small communities, each of which obtained what it required from the soil on and near which it existed. Up to a hundred years ago, even, the nations drew their supplies largely from their own territories, and there are still large areas where production is limited by local needs. This will all change, however, and is changing rapidly, the chief factors in the causation being increase of population, the provision of rapid and cheap means of transport, and the more varied desires and wants which have arisen from the latter circumstance. The very methods which have been devised for the purpose of bringing necessary articles to the consumer's door have themselves served to introduce others, which, at first luxuries, have now become indispensable to him. The stream of agricultural products from almost every part of the world has, during the last half century, been chiefly directed towards Europe; but even the Asiatic or African agriculturist will not continue indefinitely to find the first necessaries of life close at hand, so that new possibilities, even as to the provision of these, will undoubtedly arise.

The original impulse was for man to move into new regions in order to find the food that those which he was inhabiting could no longer give him. Later, when the great industrial centres arose, large communities were formed, which had to draw the materials of their food, and often for their handicraft, from distant parts of the world. The former would appear to be the healthier condition and, indeed, it seems that a tendency is arising to return to it, to a certain extent, at any rate. The economic state of a country like Canada, for instance, will surely be better if it is enabled to achieve, over its wide area, a steady settlement by a population which will exist by means of a diversified farming, rather than if that population simply continues to produce grain for export. It would not be true to say, however, that no effort has been made to provide the food required for an increased population from long-settled countries. Thus the wheat acreage of Hungary has increased from over seven million to more than nine million acres in twenty years, to 1906; France has in recent years, raised the average of her production, so that she now turns out more of that cereal from a smaller surface: while a similar state of affairs exists in Germany, with a fairly constant wheat area.

The consideration of the ultimate effects, in relation to the supply of food, of the large increase of the population of the world that is taking place, has led, since the question was raised by Sir William Crookes in 1898, to a fear on the part of some that the available foodstuffs would eventually become insufficient for the needs of man. It was prophesied then, by the same authority, that means of rendering the nitrogen of the air available for plants on a commercial scale would soon be found, and this has, of course, been done. It is not to this alone, however, that recourse is being had for the purpose of averting such a catastrophe. Far greater in importance are the methods that are being discovered and employed, by the investigator and by the practical agriculturist, in the direction of the conservation and improvement of the fertility of the soil, and in the production of more prolific, more disease-resistant varieties of plants, as well as of varieties which will be specially adapted to the climatic conditions under which they are required to grow.

SUGAR INDUSTRY.

The Fermentation of Hawaiian Molasses.

Bulletin 28 of the Division of Agriculture and Chemistry of the Hawaiian Sugar Planters' Association gives the results of work that has been undertaken in a general way for the purpose of gaining information in regard to the possibilities of Hawaiian molasses as a source of alcohol. The following are the conclusions reached, and in considering them, regard must be had to the fact that the product in Hawaii contains much less fermentable matter than molasses from most other countries :—

(1) The average content of sugars of twenty-five Hawaiian molasses for the crop of 1908 was 51·68 per cent.

(2) Of the sugars, 83 per cent. can be converted by fermentation into alcohol.

(3) An unfermentable body, which has the same reducing power on copper solutions as glucose, is present to the extent of 6·13 per cent. of the sugars, or 3·17 per cent. of the molasses.

(4) The United States revenue regulation governing molasses distilleries is based on an estimated yield of from 80 to 95 per cent. of proof spirit from the molasses. The yields of Hawaiian molasses vary from 62 to 93 per cent., the averages being 77 per cent. A modification of the regulation would be necessary before a molasses-distilling enterprise could be profitably installed in these islands.

(5) Molasses contains a sufficiency of nutrients for the development and action of yeast.

(6) Mineral stimulants give no apparent increase in the yield.

(7) The molasses contain no non-sugars which have a deleterious action on the fermentation.

(8) Aeration shortens the time of fermentation, without any increase in alcohol yield.

(9) Attenuation is not as great in molasses of Hawaii as in those of most countries where molasses is fermented, on account of the smaller quantities of sugars therein.

(10) Fermentation under pure culture increased the yield in alcohol 22 per cent. over that when working under the usual factory conditions with adventitious fermentation.

(11) The lees or residue from fermentation gives a fertilizer containing potash, nitrogen, and a small quantity of phosphoric acid.

(12) Molasses as a source of alcohol and fertilizer has a value of about 8·3c. per gallon, exclusive of freight and interest.

(13) Of the yeasts from various countries where the molasses is fermented, most are budding yeasts of the type *Saccharomyces Vordermannii*; that from Peru, however, is a fission yeast.

(14) Most of the yeasts worked well in sugar concentrations up to 14·6 grams per 100 c.c., the fermented wash containing up to 7·85 per cent. alcohol by volume.

(15) A *Monilia* was isolated from the yeast from Natal which gives an aroma resembling that of the best Jamaica rum.

Sugar Manufacture in St. Croix.

The island of St. Croix, D.W.I., has a total area of 51,000 acres, only 16,479 of which are in cultivation. The sugar-cane has been grown in this island for many years, in fact it is one of the principal West Indian islands which grow cane. When the latter was introduced into Louisiana, the supply came from this island and Santo Domingo.

The island is divided up into plantations of about 300 acres each, and up to a few years ago each place had its own set of muscovado works, and ground its own cane. At the present time, only seven of these places are still in existence; all the other plantations deliver their cane to a central factory.

Lower Love factory has a capacity of 600 tons of cane per day. Its grinding plant is composed of a Krajewski crusher and two 3-roller mills (size of mills, 28 inches by 66 inches, and 30 inches by 66 inches). It turns out about 4,000 tons of sugar yearly. This factory is one of the few sugar factories in existence to-day that burns no other fuel than megass ; this fact is contributed to by the fine steaming qualities of the Babcock and Wilcox boilers, also to the green megass furnaces designed by Capt. A. F. Blackwood and his chief engineer, L. F. Hansen.

Bethlehem factory has a capacity of 500 tons of cane per day. Its grinding plant is made up of three 3-roller mills (size of mills, 30 inches by 60 inches). It has an output of about 3,500 tons of sugar annually.

Central factory has a capacity of 600 tons of cane per day. It has two grinding sets, one being a 9-roller mill and crusher (size, 24 inches by 48 inches), and the other three 3-roller mills and crusher (size of mills, 30 inches by 60 inches). It turns out about 3,000 tons of sugar per year.

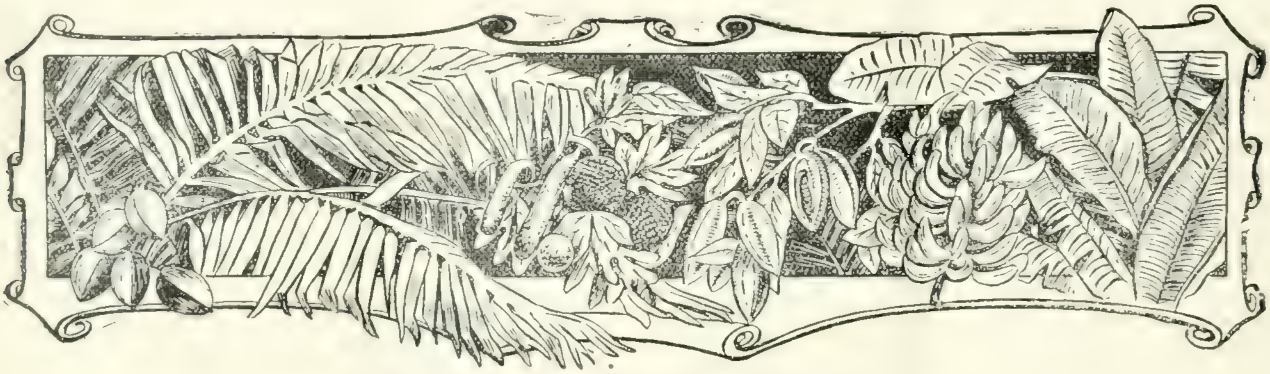
La Grange factory handles about 250 tons of cane per day. Its grinding plant is composed of three 3-roller mills and crusher (size of mills, 26 inches by 42 inches). Its output is about 1,200 tons of sugar per year.

These factories are up-to-date in every sense of the word, and are doing just as good work as any other factory in the world.

The island of St. Croix has passed through a period of seven years' dry weather, and, together with the high duties and low price of sugar, it has been a trying time for the planters.

The outlook for the coming year is very promising as there have been fine rains for the month of August, and everything points to a large crop. (The *Porto Rico Horticultural News*.)

The Seeding of Spathodea campanulata.—The statement is made, on page 332 of the current volume of the *Agricultural News*, that one of the trees of *Spathodea campanulata* at the Botanic Station, Grenada, has, during this year, set viable seed for the first time, although the plants have flowered for several years, and the question is asked as to whether specimens of the plant at other Botanic Stations in the West Indies have produced seeds. In reply to this, the Curator of the Botanic Station, Dominica, writes that the trees of this species which are established at that Station produce good seed annually. It is interesting to note, in connexion with this, that Dr. H. Trimen, F.R.S., late Director of the Royal Botanic Station, Ceylon, states in his *Handbook to the Flora of Ceylon* (1895) that this plant has been much employed in that island as an ornamental quick-growing tree, and that he had known it to fruit once only, in 1892, in Kandy. This function would thus appear to be dependent on climatic conditions.



WEST INDIAN FRUIT.

MANURIAL EXPERIMENTS WITH CACAO IN GRENADA.

Interesting details of experiments in connexion with the manuring of cacao that have been conducted by Mr. W. M. Malins-Smith at Diamond estate, St. Mark's, Grenada, have been received from him. The results are given here for the benefit of readers of the *Agricultural News*. While this is done, the Department does not hold itself responsible for the statements which are made with respect to any proprietary chemical manure.

The manurial treatment (according to the table supplied by Mr. Malins-Smith) on the different sections was as follows:—

Section 1: 1907.—Basic slag, 8 cwt. (April); sulphate of potash, 2 cwt. (May); sulphate of ammonia, 2 cwt. (September).

Section 2: 1907.—Swift's tropical manure, 10 cwt. (June).

Section 3: 1907.—Sheep manure, 2¼ tons (April).

Section 4: 1907.—Wood ashes, 4 hogsheads (April); sulphate of ammonia, 2 cwt. (September).

Section 5: control: no manure.

Section 6: 1907.—Lime, 1¾ hogsheads (April). 1908.—Pen manure, 20 tons (May).

Section 7: 1907.—Lime, 1¾ hogsheads (April); sulphate of ammonia, 1½ cwt. (September). 1908.—Basic slag, 4 cwt. (May).

Section 8: 1907.— T.S.G. cacao manure, 10 cwt. (June).

These experiments in manuring were begun in 1907 for the purpose of testing the relative value of several complete manures and combinations of fertilizers on large areas of excellent bearing cacao which had not been manured or forked for several years, and which at the time was giving a yield of 5 bags of 180 lb. each per acre.

In March-April 1907, the plots were carefully forked and all dead leaves, weedings, etc. were buried. The manure was then applied broadcast on the surface, evenly distributed throughout the plots. The trees were then carefully, but lightly, pruned, the prunings being left on the ground to serve as a mulch over the manure. In June, the plots were weeded and all dead leaves and prunings were carefully buried near the surface of the soil. From June to September, all suckers were removed from the trees and the drains in the field cleaned out. In 1908, the manurial treatment was not repeated, and the only manure applied that year was that used in completing the combinations in sections 6 and 7. Cultural work done in 1908 comprised the burying or 'bedding' of all weedings, dead leaves and prunings in the month of June; light pruning; removing suckers; cleaning drains; weeding, etc. These plots were established on a basis of equality in cost of manures and area. Each plot was carefully measured to one acre; they are all adjacent to one another. A sum of £5 was spent in manures on sections 1, 2, 3, and 8.

The wood ashes applied to section 4, being a by-product of the estate, cost nothing. The same may be said of the pen manure applied to section 6, except that it cost £2 for application. The cost of applying manure to the other sections was only 2*s.* to 2*s.* 6*d.* per acre. In section 7, only £3 15*s.* was spent on manures. The same amount was spent on every section for cultural work, i.e., £8 10*s.* for the period from April 1907 to August 1909. The figures given in the table of results are for the period of 2 years' crop—September 1907 to August 1909, inclusive.

It will be observed that the yield of the control section increased by 1⅓ bags in the first year over the previous average yield of the field. This, presumably, was due to the forking and bedding. With the exception of Nos. 1 and 7, all the sections dropped 1 bag in the second year.

These experiments tend to prove the great advantage which accrues from manuring even good, bearing cacao, and that an average yield per acre of 5 bags of 180 lb. each, which most planters agree is excellent, can be easily increased by 50 per cent., leaving a big increase in profits to the planter. They also prove the superiority of T. S. G. cacao manure, and show that it is the most profitable complete manure that can be used for cacao.

RESULTS.

Section.	Cost of manure.	Cost of cultivation.	Yield in bags. 1st year.	2nd year.	Total.	Increased yield, in bags.	Profit (on no manure). (At £4 per bag.)
1	£5	£8 10*s.*	5½	5½	11	− ⅓	− £ 6 6*s.* 8*d.*
2	£5	,,	7⅔	6⅔	14⅓	+3	+ £ 7 0*s.* 0*d.*
3	£5	,,	8	7	15	+3⅔	+ £ 9 13*s.* 4*d.*
4	£1 12*s.*	,,	7½	6½	14	+2⅔	+ £ 9 1*s.* 4*d.*
5	—	,,	6⅓	5	11⅓		
6	£4 5*s.*	,,	8¼	7¼	15½	+4⅙	+ £12 8*s.* 4*d.*
7	£3 15*s.*	,,	5¾	5¾	11½	+ ⅙	− £ 3 1*s.* 8*d.*
8	£5	,,	9	8	17	+5⅔	+ £17 13*s.* 4*d.*

THE RELATION OF THE SAWING AND USE OF TIMBER TO ROTS.

The following extracts are taken from Bulletin No. 6 of the Division of Pathology and Physiology of the Hawaiian Planters' Association. They show how the tendency of wood to be attacked by fungi has a relation to its power of absorbing water, and how this property depends on the way in which it is cut. Investigations were made in connexion with the travel of the water in three directions: (1) along the grain (longitudinally), (2) along a line extending from the centre to the circumference (radially), (3) in a direction at right angles to this (tangentially).

The relative action of the timber rots on a piece of timber is partly a function of the internal moisture of the timber; and the advent and residence of moisture in the timber, are functions of the structure. A few examples will illustrate this.

It will be noticed that shingles sawn radially, or nearly so, last longer than those that are sawn tangentially. The reason for this is apparently that these shingles dry out more evenly and quickly, so that they are less liable to warp and crack. The tangential shingles keep the moisture underneath from evaporating, so that while their upper surface is nearly dry, and hence shrunken, the lower surface is still wet and expanded or swollen. On the other hand, in a shower of short duration, the tops of tangential shingles become wet and expand, while the lower surfaces are still comparatively dry, so that here, again, they warp or curl. In the course of time, this mechanical action works changes in the wood, and it will be found that such shingles crack and rot away fastest. On the other hand, shingles sawn radially get wet and dry evenly and quickly, with least tendency to crack. This cracking is a matter that is largely mechanical, and, of course, must not be confounded with the direct action of fungi.

Later on, however, the fungi take advantage of the cracks due to the mechanical action of the moisture. In the cracks that have been established by the warping and uneven evaporation, the spores of rots find a protected place in which to germinate.

The position in which a timber should be placed is also complicated by the fact that what is called sap wood, that is to say, wood composed of the outside and youngest layers of the tree's growth, is more susceptible to the action of timber-rotting fungi than are the layers of what is called the heart wood. The younger the wood, the more likely it is to rot. This materially modifies the way that timber should be placed, in all cases where such susceptible parts are present. For instance, in the case of a square piece of timber, of which two sides are tangential and two sides are radial, the outer tangential side is more likely to be sapwood, and hence more susceptible than the inner. Thus, in a case where a timber is so placed in a structure that one of its sides cannot be painted, the unpainted side will probably be subject to fungus attack; for instance, in the case of the lower rail of a fence, there is a choice in the way it should be placed.

It is easy to see that these mechanical features of the weathering of timber have much to do with the facility with which timber rots obtain an entrance, and secure protection while doing their destructive work. In this connexion, the following experiments are interesting and instructive.

Blocks about 15 mm. across were prepared, all of the same shape and size. In one, the grain was longitudinal, in a second, the same dimension was tangential, and in the third it was radial. These three blocks were placed simultaneously in absolute alcohol 1 mm. deep. The object was to see at what relative rates the alcohol would penetrate the wood along these three lines. Previous to immersion in the alcohol, all the faces of the blocks, except the lower and upper, were covered with wax, so that the fluid should not creep round the ends of the 'grain' in the case of the two latter specimens. With the grain, the alcohol traversed the block in four and a half seconds. Tangentially, the alcohol penetrated 2 mm. in three hours. Radially, the alcohol had made little, if any, progress in three hours.

Water in pieces of the same length moved longitudinally much more slowly. It traversed the length of the piece, with the grain, in from five to ten minutes. Adjacent layers of summer wood showed marked differences in the rate of progress. Radial and tangential directions not tried.

Two square pieces of wood, 1 mm. thick, were prepared with the aid of sharp planes, one piece tangential, the other radial. One of these pieces therefore presented the edge of the grain, the other its face. The object of the experiment was to test the relative rapidity of water percolation through these two pieces.

To this end, all four of the edges of each piece were sealed with hot paraffin. Ordinary watch glasses were now sealed to these pieces of wood with the aid of hot wax. Under each watch glass was a small piece of sponge saturated with water. To counteract the warping of the wood, the watch glass and the wood were bound about with thread. The watch glasses were accurately paired, and the paraffin was prevented from entering beyond the required limits by previously ringing the pieces of wood with hot paraffin on a turntable.

The diameter of the circle of wood exposed to the action of the water inside the watch glass was 36 mm. or an area of about 113·2 sq. mm., being the same in each case.

The percolation took place at a temperature of 50° to 55° F. in a rather dry air. The results after eighteen hours were as follows:—

Percolation through wood in radial direction, 0·335 grams.

Percolation through wood in tangential direction, 1·005 grams.

From this it will be seen that the amount which passed through the wood in the tangential direction (through the wood when the edge of the grain was presented) was about three times as great as through the wood in a radial direction, that is through the wood when the face of the grain was presented. These relative rates of percolation were maintained for several days. It will be noted that these results are in accord with the rate of penetration of alcohol.

The facts brought out by these experiments are highly suggestive, and have an intimate relation to the sawing and use of timber in general.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, returned from St. Lucia to Barbados by the R.M.S. 'Berbice' on November 2.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 25, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, no business is reported in West Indian Sea Island cotton, owing to the absence of stock.

American Sea Island cotton of all descriptions continues to harden gradually. For 'Fine' Island they are asking 16½*d.* and 'Fully Fine' 17½*d.*, but no business is passing at these rates, buyers' ideas being rather lower. The best Floridas are worth 13¾*d.* to 14*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 23, is as follows:—

The market has been quiet throughout the week, without any sales being reported. There was some demand at the prices at which the opening sales were made, viz: Fine 28c., Fully Fine 30c., and Extra Fine 32c., which if factors had consented to accept would have resulted in fairly large sales; but factors advanced their prices 2c., which buyers refused to pay. Should the market remain quiet, with no demand at the advance asked, with the accumulation of stock, factors may in time have to recede from their advanced views.

COTTON EXPORTS FROM THE WEST INDIES.

The amounts of cotton exported from Grenada, St. Kitts, Nevis and Anguilla, during the quarter ending September 30, 1909, were as follows:

Origin.	Number of bales.	Weight. lb.	Estimated value. £	s.	d.
Grenada					
Sea Island	24½	7,366	429	13	8
M. Galante	60½	18,198	561	2	1
St. Kitts	3	600	32	10	0
Nevis	13	3,070	166	5	16
Anguilla	1	200	10	16	8

All this cotton was sent to the United Kingdom; that from the three last-mentioned places was all Sea Island.

The export of cotton from Antigua for the same period is given on page 326, and those from Barbados, St. Vincent, Trinidad, Tobago, Montserrat and British Guiana will be found, similarly, on page 342, of the present volume of the *Agricultural News.*

THE WORLD'S COTTON SUPPLY.

An article in the London *Daily Mail* on the world's cotton supply, written by Sir Alfred Jones, K.C.M.G., has formed the material for a pamphlet entitled 'Our Greatest Industry', which has just been issued. As this contains interesting statistical information in connexion with the supply of, and demand for, cotton, the following excerpts from it are given here:—

The estimated number of spindles in work in Great Britain for 1908 was 53½ millions, and taking the value of each spindle at 30*s.*, we get a cost of nearly £80,000,000 for spinning mills alone, and to this must be added the cost of looms, printing, dyeing, and bleaching works, which are worth as much again. A spindle requires from 30 lb. to 35 lb. of cotton per annum, which gives a total of about 3½ million bales of 500 lb. weight, nearly 3 million bales of which are American cotton.

The United States of America during the last few years have produced from 10 to 13 million bales of cotton, and, to the man in the street, the 3 million bales required by Great Britain would seem easy to obtain, but we must not forget that America has some 28 million spindles, which number is increasing rapidly, and she requires over 4½ million bales for her own consumption, for, although the spindles are fewer in number, more cotton is used, the counts being coarser. In England, finer counts are spun, consequently less cotton is used, but more labour is put into the manufacture of the goods.

In addition to Great Britain and America, Germany wants 1¼ million bales, Russia, France, Austria, and Italy over half a million each, and other countries a million between them. Thus we have accounted for about 12 million bales of American cotton. India produces about 3 million bales, the bulk of which is used by Japan, Germany, France, Russia and India. Egypt also produces three-quarters of a million, half of which is used by Great Britain. In addition, some 1½ million bales are produced in Russia, Brazil, and Japan, where the cotton is chiefly used.

We have seen that a crop of about 12 to 13 million bales of American cotton is required to satisfy these demands, and if the crop falls short, England suffers from a shortage of the raw material. The result is short time, and consequent distress. In 1904, when Lancashire mills were on short time, it is estimated that capital and labour in the cotton trade alone lost some £150,000 a week, to say nothing of the losses in other trades directly connected with the industry. Some 10 million people are dependent, either directly or indirectly, on the cotton industry of Lancashire, which is a trade dependent on a single foreign country for its supplies of raw material, and is at the mercy of the climate and the speculator.

Already in the West Indies, sufficient Sea Island cotton has been grown to prevent the 'cornering' of this quality of cotton. Moreover, the cotton grown is superior to the American variety, and some bales have been sold to America. Something like £200,000 sterling has been spent in wages to the natives. Some of the islands whose administration formerly required grants from the Imperial Treasury are now able to support themselves, and, indeed, have a surplus.

In West Africa the quantity of cotton grown has rapidly risen from 500 to 12,000 bales, of a value of £120,000. All this cotton has been grown by the natives, and their spending power has been increased by this amount. They are consequently able to buy imported goods from this country, so that the work of the Association is two-fold—that of growing the raw material, and that of finding new outlets for the manufactures of this country.

The Government benefits through the duty levied on these goods and the railway freight paid on cotton and cotton seed. In fact, the Colony of Southern Nigeria will benefit by some £30,000 from the 12,000 bales this year. To open up the African cotton fields, several million pounds are being spent on railways, and here again, of course, the ironfounders and engineers will benefit.

Cotton in Barbados, 1908-9.—The area of cotton in Barbados during the season 1908-9 was 5,768 acres. From this there have been exported 1,713 bales, weighing 838,749 lb., and of the estimated value of £41,937. During the season, the yield per acre has been at the rate of 145 lb. of lint, as compared with 137 lb. for the season 1907-8, and 170 lb. for that of 1906-7.

Area of Cotton in Antigua.—The area that has been planted in cotton in Antigua during the present season is 252½ acres. All this was reported to be in a promising and healthy condition at the middle of last month, but rain was beginning to be required in the southern and western districts.

THE GERMINATION OF CEARA RUBBER SEEDS.

The following hints on a method of germinating the seeds of the Ceara rubber plant (*Manihot Glaziovii*) are given in the *Philippine Agricultural Review*. The method should be applicable to the seeds of the Jequié Maniçoba and Remanso Maniçoba (*Manihot dichotoma* and *M. piauhyensis*), as well. The description of the procedure applies to the conditions where planting out takes place almost immediately after the seeds have sprouted; but it seems to be capable of modification to suit those of the nursery:—

Select a moist, but not too wet, spot in the field where the rubber seeds are to be planted; dig a hole about 3 or 4 feet in diameter and about 2 feet deep: take out all the dirt and make the bottom smooth: then scatter about 1 inch of dirt evenly over the bottom. Take the rubber seeds and scatter them thickly all over the loose dirt in the hole, then take a basket, or a box with a perforated bottom, and place it over the seeds, bottom upward; take an empty sack and place this over the basket or box, whichever the case may be; when this has been done, cover the basket or box with the dirt that was taken out of the hole, so that there is about 12 inches of dirt all over and around the basket. The seeds must be filed, and it is a good plan to soak them in water for about twenty-four hours before sowing them in the hole.

After three days, uncover the basket or box, being careful to remove all dirt before taking it away. You will find that a large percentage of the seeds has sprouted; that is, the sprouts are just coming through the seeds; some of them may have already taken root. You can then pick out all those that have sprouted, and plant them in their permanent place in the field; the ants will not harm them after they have reached this stage. The seeds that have not sprouted must be covered up again, and after twenty-four hours repeat the operation, and so on until all the seeds have been planted. The field should be previously prepared, the hole should be dug, that is, the soil should be loosened up 3 or 4 inches deep, and a stick placed at each hole where the seeds are to be planted. The planting of the sprouted seeds is very simple. Make a hole about 1 inch deep in the loosened earth, put the seed in with the sprout down, cover lightly, being careful not to step on or press down on the newly planted seed with your hand; the first rain will do that much better, and without injury to the sprout. If the above-described method of sprouting and planting the seeds is followed, three or four men can plant a large field in a day, and every seed will grow.

WORKERS IN SCIENCE AND THE PRACTICAL FARMER.

During the absence of the Commissioner of Agriculture in England, an address was given by him before the Buckinghamshire Chamber of Agriculture, on the relationship that exists between workers in science and the practical farmer.

Dr. Watts first drew attention to the keen competition that exists between different countries in relation to the supply of agricultural products, and to the fact that, if the English farmer is to hold his own, he must be supplied with what he is already demanding—that is, advice and education in agricultural matters. He then gave an outline of the work that is being conducted in the West Indies by the Imperial Department of Agriculture, with special reference to its relation to the planters and to agricultural education, showing how many of the matters of his experience had their parallel in English conditions. The chief efforts of scientific advisers were directed into two channels: that of the presentation of facts of interest in a form to attract and appeal to the older men, and the direction of agricultural education of such a kind as to gain the attention of those who are younger. In the first, the observations of the farmer were of the greatest value, and it was the business of the scientist to classify these and collate them with his own experience and knowledge in such a way as to identify himself with all that is best and most advanced; he should not content himself with merely elementary matters and trivialities. After reviewing the problems that would have to be attacked in consequence of the adoption of this attitude, Dr. Watts went on to show how its natural corollary would be the formation of research and cooperative experiment stations, a central advisory department and agricultural societies, and the appointment of agricultural inspectors.

Finally, in dealing with the second direction in which the efforts of the scientist would be made, Dr. Watts showed how agricultural education for the younger men should accompany the other work, but should not be confused with it. It would entail the arrangement of knowledge in an orderly form, the maintenance of classes for the purpose of imparting it, and the holding of examinations for indicating the rate at which progress was being made.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial deals with the address of the Chairman at the opening of the sub-section Agriculture at the British Association meeting at Winnipeg.

Interesting general results of work that has been recently undertaken for the purpose of finding out what possibilities as a producer of alcohol are shown by Hawaiian molasses appear on page 355

Page 356 contains particulars of manurial experiments with cacao that have been carried out on a private estate in Grenada.

An abstract of an article which deals with the way in which timber should be sawn and used in order to lessen the chance of its being attacked by fungi is given on page 357. At the same time, it is suggested that a little powdered copper sulphate, placed in or near the joints of timber where it is likely to become wet, would often delay, if it did not prevent, rotting.

Notes of a lecture on the relationship of the scientific worker to the practical agriculturist, which was given by the Commissioner of Agriculture while in England recently, will be found on page 359.

The Insect Notes (page 362) of this number contain the continuation, as Part II, of the series of articles on the Natural History of Insects, under the heading 'Structure and Growth.'

In the Students' Corner, on page 365, will be found a critical review of the answers given to the questions set in the recent Preliminary Examination, in connexion with the Reading Courses Scheme.

The Manurial Value of Gypsum.

In Bulletin No. 5 (1908) of the Colorado Agricultural Experiment Station are given the results of pot experiments in which observations were made on the effects of gypsum in use with other manures. It was found, generally, that gypsum decreased the yield when used with acid manures, and increased it with alkaline manures. It therefore appears that gypsum would give good results with a manure such as sodium nitrate, but that it would decrease the yield with superphosphate and ammonium sulphate. The experiments also showed that gypsum lessens the injurious effect on plants of an excess of magnesia in the soil.

Implemental Tillage in Egypt.

The *Diplomatic and Consular Reports,* Annual Series, No. 4,324, states that the use of steam ploughs is extending in Egypt, over 150 sets of one British make having been imported in the last six years. The larger engines and agricultural implements are only being used at present on the big estates. The difficulty of transport and of finding skilled mechanics for the machines, together with the high price of fuel, causes progress to be slow, though the last circumstance may be ameliorated if it turns out that the recent discoveries of oil springs on the shore of the Red Sea give the means of providing cheap fuel.

In Upper Egypt, associations are being formed, for the purpose of purchasing agricultural machinery, among the smaller agriculturists, in order to enable the smaller cultivators to hire such implements.

Extraction of Wax from Sugar Scums.

Much interest is being taken at the present time in the utilization of the waste products from the sugar-cane industry. Many of the ways of doing this are, of course, familiar. In a recent issue of the *Journal des Fabricants de Sucre,* an account is given of an article in *Die Deutche Zuckerindustrie,* which deals with a recent thesis on the wax of sugar-cane and its technical extraction. From this it appears that the scums resulting from the defecation of the juice of the cane contain at least 10 or 12 per cent. of wax, reckoned on the solid matter. When such scums are exposed to the action of the air for some time, changes take place in them by which the greasy matters are destroyed, and the extraction of the wax is facilitated. This is performed in the following way. The scums are allowed to remain in heaps until the changes which have just been indicated have taken place. They are then dried, either artificially or in sunlight, broken into small pieces, and the wax is extracted with benzene.

From estimates given, it is shown that this wax can compete profitably with carnauba wax, which is obtained in commercial quantities from the leaves of a palm (*Copernicia cerifera*) in Brazil. (See *Agricultural News* Vol. VII, p. 261.) The removal of the wax from the scum cake would not, of course, affect its manurial value.

The Manufacture of Nitrates from Air.

The British Consul-General at Berlin states that the manufacture of nitrates from air in Germany is still in its first stages. The principal German works can produce about 21,500 tons of nitrate of lime per annum ; but this quantity will be increased to over 40,000 tons when the new works that have been projected are in operation. A factory has also been built in the Tyrol, which is capable of producing about 7,000 tons of nitrate of lime.

At the rate at which nitrate of lime is being sold in Germany, the sales for the whole year will amount to over 7,500 tons ; this is about 1½ per cent. of the total quantity of nitrate of soda annually consumed in that country.

Agricultural Instruction in California.

A new departure has been made in the direction of agricultural instruction in California during 1908. In this, a special train, supplied without charge by the Southern Pacific Railroad Company, made a tour of the northern part of the State, carrying a body of horticultural and agricultural instructors for the purpose of giving information to farmers on agricultural subjects. The University of California and the State Horticultural Commission equipped a car with exhibits, which was attached to the train carrying the instructors to serve as an illustration of the results that could be obtained by the adoption of scientific methods.

In the event of the experiment proving successful, the train will make visits to all parts of the State, and these will be repeated at intervals.

Times for Tapping Rubber Trees.

Information that has been supplied to the Department of Agriculture of the Federated Malay States shows that, in some cases, the continuous tapping of rubber trees causes the amount of latex that is obtained from each tree to decrease to such an extent that it becomes of less value than the cost of tapping, while in other cases the amount obtained only varies slightly, never steadily decreasing. The variation in the latter case is caused by climatic conditions, chiefly rainfall.

Some planters cease tapping when the trees are leafless. Experiments have been carried on for eighteen months by the Department, on seventeen-year old trees, which show that there is a slight decrease of yield during the leafless period. There is also a similar decrease during the fruiting period, but this is not sufficient to increase seriously the cost of tapping. As a matter of fact, the cutting of the bark which takes place when a tree of 20 inches or more in girth is tapped causes so slight an injury as to be negligible.

The same Department suggests a simple way of deciding how long tapping should be continued. This consists in keeping a record of the amount of latex from each tree, from 1,000 trees, or from a field. If no serious and continuous decline is shown by the figures, there is no need to stop tapping. If, however, after a series of tappings, say forty or fifty, there is a marked constant decrease in the amount of latex obtained, it is then advisable to let the trees rest for a month at least, and not to begin to tap them again until it is found by trial that the rate of flow has been restored.

West Indian Exhibits in Canada.

The *Morning Chronicle*, of Halifax, N.S., states that the West Indian exhibit at the Provincial Exhibition was among the most interesting and instructive of the displays there, and that it has excited much favourable comment. It states further: the collection was an extensive one, occupying a space 45 feet by 28 feet in area, and arranged in such a manner as to allow a thorough inspection of each article ; besides being a great attraction, the exhibit gave the thousands of visitors to the Exhibition a fairly thorough idea of the resources of the various British West Indian islands; the arrangement of the exhibit is one of neatness and utility ; most of the exhibits are in glass, and all are plainly labelled.

Particulars of the exhibits from the various West Indian islands have already been given in the *Agricultural News*. (Vol. VIII, pp. 233, 285 and 318.)

The Relationship of Manuring to Meat Production.

A paper on this subject was read by Professor Somerville before the agricultural sub-section of the British Association this year. It presented results of experiments which have been conducted over a period of nine years. They show that the manuring of pastures with lime does not lead to profitable increase in the amount of meat produced. When lime and superphosphate were used there was a small profit. By the use of basic slag, in the first year only, a large gain was obtained, and even at the end of nine years, the effects of the manure were not exhausted. This result has been obtained in other, duplicate, experiments; it shows that it is better to stimulate the growth of the best plants in a mixed pasture by a large initial application of phosphate than to apply it year after year. With superphosphate, the annual profit was reduced. No monetary gain resulted from the employment of potash and phosphate.

Nitrogen in the form of sulphate of ammonia increased the yield of hay, but actually reduced the annual production of meat. This result shows that the weighing of the produce of a pasture as a method of determining its value for feeding purposes is not reliable.

Further trials with basic slag show that as good results were obtained from an application when the herbage is growing vigorously as from an application given several months before the growing period.

It seems to be indicated by the experiments that no crops offer better opportunities for the employment of artificial manures that those on poor, worn-out pasture.

INSECT NOTES.

NATURAL HISTORY OF INSECTS.

PART II. STRUCTURE AND GROWTH.

As has been already stated, insects are animals which, in the adult condition, have never more than six legs, and generally, two pairs of wings (which may be wanting but are never more), and a body made up of three distinct parts, head, thorax and abdomen. The legs are attached to the thorax, one pair to each segment; the fore and hind wings are attached to the second and third segments, respectively. The head and abdomen have no organs of locomotion. To the head are attached the mouth parts, and the antennae which are sensory organs. The abdomen also sometimes has sensory organs. Fig. 43 shows the cockroach and the attachments of wings and legs.

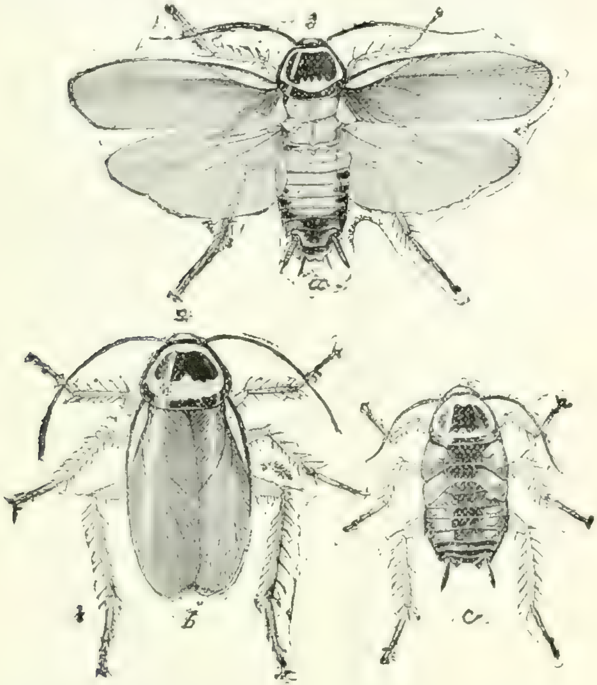


Fig. 43. COCKROACH. (U. S. Department of Agriculture.)

In the case of most insects, the adult deposits eggs from which the young are hatched. There are instances, however, among these animals, in which the young are already hatched from the egg at the time when they are born. That is to say, they are active and free-moving, having accomplished one stage of their existence within the body of the parent.

After the birth of an insect, or the hatching from the egg, it goes through changes and developments before reaching the fully developed or adult condition. This change and development is called the metamorphosis. Metamorphosis may be either complete or incomplete. This does not mean that development stops short of the perfect insect, in the case of insects which have incomplete metamorphosis, but rather expresses a general difference between these two kinds of development.

Insects which have an incomplete metamorphosis are something like the adult when they are first hatched from the egg. (Fig. 43, young (*c*) and adult (*a* and *b*) cockroaches.) They are, of course, much smaller, and without wings, but in general form they give an idea of what they will be like when they are full-grown. Insects which have a complete metamorphosis are very different, when first hatched, from the adult form into which they finally develop. Such insects have four distinct stages, or periods, in their lives. These are, the egg, the larva, the pupa and the imago. The egg is the first stage in the development of a generation, and the larva is the next. The larvae of the butterflies and moths are called caterpillars; of beetles, grubs; and of flies, maggots. This is the portion of an insect's life when all growth in size takes place. The pupa is the state during which the change takes place, in which the larva is transformed into the final and adult condition of the insect's life; the wings are formed and the reproductive organs become complete. The pupa of a butterfly is called a chrysalis; that of a moth is often enclosed in a cocoon. Fig. 44 shows the bean leaf-roller (*Eudamus proteus*) with larva (*b* and *c*), pupa (*d*), and adult (*a*). In the case of insects which have an incomplete metamorphosis, there is not the same distinction between the larva and pupa, as in the case of those having a complete one. There is no quiescent stage during which the insect transforms, as in the chrysalis of the butterfly.

Fig. 44. BEAN LEAF ROLLER. (U. S. Department of Agriculture.)

The growth of insects is accompanied by a series of moults. The chitinous exoskeleton, once formed and hardened, is not capable of growth, and it is natural that it should be shed at intervals, when the limbs and organs have increased in size as much as they can. Before the old skin is cast off, there is formed under it another, which is soft, pliant and elastic. As soon as the old one is shed, the new skin is stretched out by the pressure from within, and it then hardens. The exoskeleton, as it now becomes, is fixed, and does not grow any more. The size of the insect is stationary until the next moult, except that the flexible connective tissues between the segments are capable of stretching a little.

THE SPICES OF THE TROPICS.

The following abstracts are taken from a paper which appeared in the *Tropical Agriculturist* for September, 1909:—

From remote ages the spices of the tropics have attracted traders from distant lands, and formed a lure for adventurous explorers. More especially can this be said of the spices of Southern Asia, as the cinnamon of Ceylon; nutmegs and cloves of the Moluccas; cardamoms, ginger and pepper of Southern India. Some of the ancient cities of Europe are said to have been indebted for a large share of their wealth to the trade in tropical spices during the time of the Romans. Cinnamon, which has long made the name of Ceylon famous, was from the earliest times perhaps the most coveted of all spices. It is mentioned in the Song of Solomon and in the Book of Proverbs; the Arabians supplied it to the Greeks and Romans, but jealousy shrouded in mystery the sources of its origin and the manner of obtaining it. It is supposed that the spice, being first brought from Ceylon to the Western coast of India, was carried to Arabia and Egypt by African and Arabian traders, finally reaching Europe after a journey of very many months. Cinnamon was, for a long period, a State monopoly in Ceylon, and its cultivation was not declared free until 1833. At one time, it is said, cinnamon was sold for £8 per lb., pepper at 10*s.* per lb., while other spices commanded similar fabulous prices. As recently as 1880, cardamoms were sold for over 9*s.* per lb. In 1826, the English import duty alone on pepper was 2*s.* 6*d.* per lb., on nutmegs and mace 3*s.* 6*d.* per lb. each, on cloves 5*s.* 7½*d.*, while vanilla was taxed to the extent of nearly 17*s.* per lb.

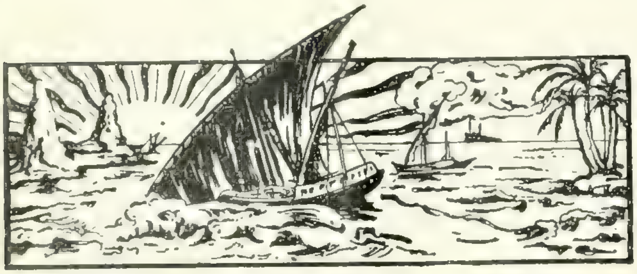
For a long period, the uncultivated or wild trees of the forests furnished the world's supply of spices, which were consequently confined to the natural habitats of the plants. Subsequently, the spread and cultivation of spice-producing plants was, for a long time, retarded by the system of State monopoly established by the Dutch in the principal spice-producing countries. So severe, for instance, was the Dutch censorship in regard to cinnamon in Ceylon that an infringement was, it is said, punishable even by death. The history of cloves, nutmegs and pepper at the hands of the Dutch in the Malay Archipelago might be told in similar language, the plants being either deliberately destroyed, or their cultivation enforced, to suit the circumstances. An amusing story, told in this connexion, is that the Home Dutch Government once despatched orders to their Colonial Governor requesting him to reduce the number of nutmeg trees but to increase the cultivation of mace trees, being of course ignorant of the fact that both spices were produced from the same tree. But this is an error which is not uncommon even nowadays. Sir Hugh Clifford informs us how the clove tree became extinct in the islands of Tidor and Ternate by being deliberately destroyed by the Dutch, in their endeavour to secure their monopoly of the spice by confining the tree to Amboyna. Notwithstanding the severe restrictions of the Dutch, however, the escape of the precious spice plants to other countries gradually took place, both by smuggling and by the agency of migrating birds. Of the latter, the principal culprit was a kind of pigeon, which extracted the nutmeg from its pulpy covering, digested the mace, and voided the seed uninjured. The French succeeded, in 1770, in introducing the clove tree into Mauritius and Réunion, from whence it soon reached Zanzibar, etc. A striking result of this is that the world's greatest supply of cloves now comes from these islands, and not from the native home of the tree, the Moluccas. Similarly, Jamaica obtained ginger from India, and has long practically commanded the supply of that product; and the same may be said of Réunion and the Seychelles in regard to the production of vanilla, whose native home is South America. Now, with the free interchange of plants from one country to another, followed by systematic methods of cultivation, the supply of spices has increased many fold; prices have been reduced so as to bring the articles within the reach of all communities, while the consumption and demand have enhanced in proportion.

Spices form one of the most important classes of vegetable products. Not only do they contain valuable medicinal properties, but their presence renders agreeable articles of food which are otherwise unpalatable. When used judiciously in cooking, they aid the digestion by their effect in increasing the secretion of the gastric fluids; to the confectioner they are particularly essential, and are largely used for his purpose, more especially on the Continent of Europe; while in the preparation of superior beverages, they are also important. In medicine, certain spices, especially ginger, cardamoms, and cloves, hold a very important place, and doctors also find them indispensable in disguising nauseous decoctions. The antiseptic properties of spices, especially cloves, due to their volatile oils, is well known, and for preservative purposes both in domestic and scientific uses, they are often unsurpassed. The appropriateness of spices to sacred uses has long been recognized, as they were always a favourite ingredient for burning in incense, while in certain social customs of oriental countries spices are to this day used as an emblem of happiness. It is recorded, I believe, that spices were used in the funeral piles of the Egyptian Kings and that the extravagant Nero burnt, at the obsequies of his wife, 'a quantity of cinnamon and cassia exceeding in amount the whole importation into Rome for one year'. Finally, not the least virtue of certain spices is their effect in sweetening the breath of persons who are addicted to masticating habits, popularly known as betel-chewing. For this purpose, cardamoms especially are esteemed in India and Ceylon, star-anise in China, while the disguising effect of cloves is well known in other climes. Certain authorities consider that the presence of spices has a beneficial effect on climate, their volatile oils acting as a preventive against mosquitos and other germ-carrying insects.

WILD IPECACUANHA AND STOCK.

Information as to the possible poisonous effect of wild ipecacuanha (*Asclepias curassavica*) on cattle has already been given in the *Agricultural News* (Vol. VIII, pp. 222 and 261), and a request has been made for information in regard to the matter. In response to this, Mr. E. J. F. Campbell, Superintendent of the Botanic Station, Belize, British Honduras, has supplied the following facts:—

About two years ago, one of the large landowners in British Honduras lost, quite suddenly, several animals (mules and horses) that he had in a pasture where there was a large amount of wild ipecacuanha growing. At the time of the occurrence, a post mortem examination was made by the Colonial Surgeon in the district, and this weed was found in the animal's stomach. Mr. Campbell further states that specimens taken from the examined animal were identified by him as *Asclepias curassavica*, and that he is therefore certain that this plant is a poisonous weed, and ought to be killed out of stock pastures. He also says that the caterpillar of *Archippus* (see *Agricultural News*, Vol. VIII, p. 261) uses it as a food plant in Honduras.



GLEANINGS.

A demand for Jamaica bananas has recently arisen in Finland, and it is expected that the trade in this fruit will rapidly increase.

By instruction of his Honour the Administrator of Grenada, the Morne Rouge Swamp has been stocked with millions, which were supplied from the Botanic Station tank.

In Mexico, during the season November 1908 to April 1909, the coffee crop was expected to reach a quantity of 81 million, as against 33 million pounds for the preceding season.

The value of the exports from the Seychelles in 1908, exclusive of specie, was £99,275. In the same year, the value of vanilla exported was £17,632; this is a large decrease from that of 1907, which was about £66,000.

Sir Alfred Jones has offered to give £25,000 to the funds of the British Cotton Growing Association, on condition that the Lancashire Cotton Spinners collect subscriptions to the amount of £150,000 within the next half-year.

The area in cocoa-nuts in the native Malay States at the end of 1908 was 118,697 acres; this is an increase of over 6,000, or 5 per cent., since the same date in 1907, when the area was 112,550 acres. (*Agricultural Bulletin of the Federated Malay States*, Vol. VIII, No. 9.)

The Chabarra Central Factory in Cuba holds the record for the largest amount of sugar made during the past season. This was 68,292 tons. The weight of cane ground was 702,000 tons, so that, on the average, 217 lb. of sugar was obtained from each ton of cane.

In the *Manchester Guardian* of September 29, 1909, the statement is made that the demand for cotton and other textile goods in the West Indies shows signs of a revival, after a long depression, although the trade in some of the smaller islands is still in a somewhat unsatisfactory condition.

According to the *Allahabad Pioneer Mail*, an Agriculture Association is being formed in Poona, with the object of aiding the progress of agriculture in the Deccan. Its work will chiefly include the holding of an annual show in one of the districts of the Deccan; the publication of agricultural information, chiefly in the vernacular; the encouragement of cattle breeding; and the extension of agricultural education in the vernacular schools.

The grants awarded by the Board of Agriculture and Fisheries in aid of agricultural education in England and Wales amounted to £12,100 in the year ending March 31, 1908; while in addition, special grants amounting to £380 were made for experiment and research.

In the *Journal of the Jamaica Agricultural Society*, Vol. XIII, No. 7, zinc sulphate is suggested as a remedy for brittle hoofs. A solution containing 1 oz. of the zinc sulphate to 1 quart of clean water should be applied immediately after shoeing, and once every other day for a week or two afterwards.

In the recent storm which passed over Louisiana, the cane which seems to have suffered most severely was D.74. In view, however, of the value of this cane, and of the comparatively small amount of damage done, it has been decided by the Louisiana Sugar Experiment Station to advocate its adoption even more strongly than heretofore.

The formation of an Italian National League against malaria has recently taken place, and the first meeting has been held at Milan. At this, papers relating to the present state of knowledge in regard to malaria, the prophylaxis and pathology of malaria, its treatment, and little known forms of the disease have been read.

According to the *Diplomatic and Consular Reports*, No. 4,312, Annual Series, extensive experiments were made by the Zanzibar Government in cotton-growing during 1907-8. The results have been entirely negative, not a single success having been recorded, and the Director of Agriculture is of opinion that the soil and climatic conditions are such as to preclude any hope of its successful introduction.

In the report on forest administration in Southern Nigeria for 1907, there is an account of the tour which was made through the West Provinces by the Conservator of Forests. During this, mahogany trees were found which had a circumference of more than 10 feet. This, and observations made on trees planted in the Botanical Gardens, make it likely that mahogany trees show three or four 'annual' rings of growth each year, depending on the season.

Where there is an objection to concrete floors in horse stables, this may be easily overcome by putting false wooden floors in the stalls where the horses stand. These may be made of slats 2 inches wide, set 1 inch apart. They are hooked to the sill in front, in order to hold them in place, so that they may be raised up from behind when desired, or even unhooked and removed altogether, for the purpose of cleaning the floor. (The *Natal Agriculture Journal*, Vol. XIII, No. 2.)

The recent United States Tariff Bill allows the free introduction of 300,000 tons of sugar from the Philippines during each fiscal year. The provision is made, however, that preference in the right of free entry of sugar into the United States from the Philippine Islands shall be given first to the producers of less than 500 tons in any fiscal year, then to producers of the lowest output in excess of 500 tons in any fiscal year. This will make it impossible for the large producers to prevent the small producer from getting the benefit of free introduction.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

In accordance with the statement in the last number of the *Agricultural News*, further particulars are given in this issue in regard to the recent Preliminary Examination, in connexion with the scheme of Reading Courses established by the Imperial Department of Agriculture, which was held on October 11 in Antigua, Barbados, Dominica, Grenada, St. Kitts, St. Lucia, and St. Vincent. The results of the examination were given in the number of the *Agricultural News* to which reference has been made already.

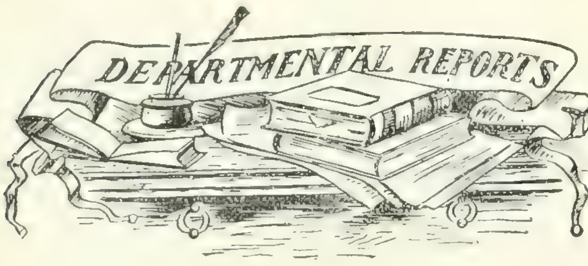
The number of questions set in the written part of the examination was thirteen, and of these not more than nine were to be attempted by the candidates. They were as follows:—

1. Describe the structure of a bean and a grain of corn (maize).
2. Give an account of the germination of two of the following seeds:—Corn (maize), Pigeon Pea, Bonavist bean, Onion, Guinea Corn, Castor, Cotton. When sowing seeds such as beans, corn or onions, should you press the earth firmly round the seeds, or leave it loose. Give the reasons for your answer.
3. Mention three crops grown from seed and three from cuttings. What particular advantages result from the use of cuttings?
4. Describe carefully how you would bud or graft one of the following plants:—Orange, Mango, Cacao. What is the object of budding or grafting?
5. What results are sought in (a) deep ploughing, (b) surface tillage? When should these operations be performed in connexion with such a crop as corn (maize)?
6. What is farmyard or pen manure? What precautions should be taken in preserving this material before it is used?
7. Mention two artificial (or chemical) manures, and give their origin or mode of preparation. State whether they are used for crops in your neighbourhood, and if so, why?
8. In what ways are weeds harmful to field crops?
9. Describe the functions of a leaf.
10. Describe the means (or structure) by which certain plants are protected from excessive loss of water. Mention as examples at least two cases, and not more than three
11. What do you understand by rotation of crops, and what are the advantages from this practice?
12. Describe the difference between the stomach of the horse and that of the ox. What bearing has this on the feeding of these animals?
13. State what element contained in the air is always necessary to animals, and describe the process by means of which they are able to procure and make use of it.

Generally speaking, the questions were answered fairly well, with the exception of numbers 8, 10, 11, 12 and 13. Taking them in order, the first question brought forward some good answers, but illustrative diagrams were weak or, most generally, absent; in fact, this remark may be made in connexion with all the questions in which such illustrations would have been useful. Several good answers to the second and third questions were given, but, in regard to the former of these, there seemed to be a good deal of uncertainty as to the question of pressing earth upon sown seeds, and in the latter, in connexion with the particular advantages that result from the use of cuttings. It should be remembered that the latter, in addition to their giving a plant which is true to type, in most cases, often yield plants which reach maturity comparatively early, and that they sometimes form the only convenient means of propagation. Weakness was often shown in the latter parts of the sixth and seventh questions; some candidates paid attention to the loss of plant food substances from manure by their being given off into the air, and did not remember that they may be washed out of the manure, while others paid attention to this circumstance and took no notice of the other.

In dealing with the question of the manures used in the candidate's district, the fact of the employment of these was generally known, but this was not the case in regard to the reasons why such manures are used. When making observations as to different facts, do not forget to provide yourself with answers to the question 'why?', or at least to the question 'how?'. The eighth question involves, in addition to the consideration of the interference of weeds with the supplies of air, light, water and food to cultivated plants, that of their effect in forming cover, and possibly food, for pests. Leaves (question 9) often have special functions, in addition to the three chief and most general ones. Examine as many leaves, leafy structures, and structures borne where you would expect to find leaves, as you can, with a view to discovering any special use or uses in each case. In question 10, the various means by which certain plants are protected from excessive loss of water were not generally known, and the descriptions of stomata given were feeble. The rotation of crops (question 11) was sometimes confused with the employment of catch crops; the more obvious advantages of rotation were appreciated fairly generally, but those which consist in the facts that such a method entails the raising of plants with different root systems and that it causes the soil to gain the benefit of several different kinds of cultivation, as well as the circumstance that it often simplifies the matter of employment of labour, were generally ignored. Question 12 provided a good opportunity for neat sketches, but advantage of this was not usually taken. The fact that the lining of the horse's stomach is divided into two very distinct portions, of which the one on the left is merely an extension of the lining of the gullet, while the one on the right differs from the former by the fact that it is capable of secreting digestive juices, did not appear to be known. In answering the second part of question 13, most of the candidates did not realize that they should have included a general description of the circulatory system; for the provision of oxygen to the blood is only one of the stages in the transfer of that element from the air to the tissues.

The 'Students' Corner' has now appeared in the *Agricultural News*, without intermission, for a year; that is since the issue of October 31, 1908 (Vol. VII, No. 170). It therefore now contains, in its complete form, hints connected with every stage in the growth of the plants which yield the chief crops of the West Indies, and will thus be found to be full of useful and suggestive matter for those who may wish at any time to undertake a revision of the work, as well as for those who are passing through the preliminary stage of the Reading Courses. It is not intended, however, to cease to devote part of every issue of the *Agricultural News* to the more immediate interests of agricultural students, and the 'Students' Corner' will therefore continue to appear in every number. The continuation will, of course, entail a certain amount of repetition, but this will not be a disadvantage, as most agricultural matters are capable of treatment from several different standpoints, and an opportunity will be afforded for giving more attention (while still keeping the interests of the Preliminary Student in mind) to the requirements of those who are preparing for the Intermediate and Final Examinations.



ST. VINCENT: REPORT ON THE BOTANIC STATION, AGRICULTURAL SCHOOL, STOCK FARM AND LAND SETTLEMENT SCHEME, AND OF THE VETERINARY SURGEON, 1908-9.

The ordinary expenditure (not including that on the Agricultural School), which was entirely met from local funds, was £665 12*s.* 2*d.* In addition, the sum of £34 3*s.* 8*d.*, from the unexpended balance on March 31, 1908, of the Imperial Grant-in-aid of the Agricultural Department was devoted to special services. The receipts for the sale of plants, seeds and produce amounted to £21 16*s.* 6*d.*

The total number of plants distributed was 6,660 (exclusive of various cuttings). They included 5,489 economic plants and 1,171 plants for shade and decorative purposes. An interesting table is given which shows how this distribution has decreased, owing to lessened demand, with the increase in the area of cotton cultivation. Thus, in the period 1904-5, when the area in the island that was planted with cotton was small, the number of economic plants distributed was 26,256; while, in the year under review, the latter number has become a little more than one-fifth of the value just mentioned, in correspondence with an increase of the area under cotton to 3,000 acres.

The total estimated value of the cotton, arrowroot, cacao and sugar-cane products that were exported was £67,314, those of cotton and arrowroot being the highest, with £29,878 and £29,517, respectively. The Sea Island cotton industry has made satisfactory progress; although, owing to the receipt of lower prices for the lint in 1907, a somewhat smaller area was planted. The prices obtained for white cotton during the past year varied from 15*d.* to 21*d.* per lb. The Marie Galante type is still cultivated in Union, Canouan and Mayreau, of the St. Vincent Grenadines, and obtains a price ranging from 6*d.* to 8*d.* per lb. Of the other islets, Bequia, Mustique, Battowia and Balliceaux, cultivate the Sea Island variety successfully. The total export of cotton has, since 1903-4, become more than ten times as great as it was during that period, namely 459,303 lb. The average yield of lint per acre during the last four years has been 152 lb; it is hoped to increase this by means of improved methods of cultivation, notably by the introduction of implemental tillage.

Of the other main industries, namely the production of arrowroot and cacao, the former has received a set-back owing to the low prices which resulted from increased production, and it is hoped to increase the outlet for this product by finding additional markets for it. Cacao is raised, for the greater part, in scattered plots throughout the island, with the result that the product from these is poor. The efforts of the Agricultural Instructor are being directed toward the improvement of the methods of production on the small cultivations.

The expenditure at the Agricultural School and Stock Farm, exclusive of that on the upkeep of live stock, was £510 0*s.* 2*d.* The receipts from the sale of cotton, plants and seeds were £26 13*s.* 6*d.* Twenty-four names of boys were on the books on March 31, 1908. Four completed their full course of training during the year. The half-yearly reports on the examinations held in June and December indicate satisfactory progress. The prize awarded to the best boy among the senior pupils of the three Agricultural Schools, namely Dominica, St. Lucia and St. Vincent, was again won by a St. Vincent boy Of the stock kept at the School, the thoroughbred stallion and the Ayrshire bull were disposed of, the former on condition of its being retained for service in St. Vincent for a definite period. The receipts for sales of animals and of milk, and for services, amounted to £139. The number of cane cuttings distributed was 31,000, while 5,000 cuttings of Madura (*Gliricidia maculata*) were sent out to be grown as shade for cacao.

The report of the Agricultural Instructor gives particulars of the work that has been done in connexion with the land settlement scheme. Improvement is indicated in the matters of the provision of wind-breaks for cacao, the use of leguminous green dressings, the mulching of cacao and general cultural methods. A fairly large proportion of the arrowroot plants that were grown were disposed of, as planting material, to the neighbouring estates. A good return was not obtained from cotton, owing to heavy rains in December.

The report of the Government Veterinary Surgeon shows that the amount spent in connexion with measures of precaution against anthrax was £597 4*s.* 3*d.* Examinations of 499 ears of animals and 145 blood smears were made, and 3,433 head of stock were vaccinated with anthrax vaccine. Eight tables are given, showing the number of deaths from anthrax (in relation to districts, annual periods, the same period in different years, the different months of the year, and the total mortality), the numbers and destinations of animals exported, and the numbers of different animals vaccinated.

TORTOLA: REPORT ON THE EXPERIMENT STATION, 1908-9.

The expenditure on the Station proper during the period was £499 4*s.* 5*d.* The receipts from sales of produce, etc., amounted to £44 6*s.* 10*d.* Several useful additions and repairs to buildings have been made.

The experiment plots were employed for investigations in connexion with cotton, cacao, coffee, pine apples, limes, seedling canes, sweet potatos, cassava, arrowroot and tous-les-mois (*Canna edulis*). The experiments with cotton showed the value of early planting; those with seedling canes indicate that B.147 should do well on low-lying land in Tortola.

In regard to industries, that of the production of cotton shows very satisfactory growth. The estimated total crop for the season was 265 bales of 200 lb. each, as against an actual yield of 162 bales of the same weight for last year. The amount paid to peasant growers for raw cotton during the season closed was £1,902. During the years 1904 to 1909, 108,282 lb. of lint, having a value of £5,365, has been shipped. In May 1908, the Department began to buy limes, similarly, from the peasantry, and purchased 40,273 lb. for making juice; part of this was shipped raw, and part after being concentrated. A favourable report on the product was received from the Brokers in London, and it is hoped to establish a flourishing lime industry in Tortola. At the small muscovado sugar works at the Station, where sugar is made from cane raised there, and from that grown by neighbouring peasantry, about 50 barrels of sugar was made.

The rainfall registered at the Experiment Station during the period was 55·41 inches, which is 2·23 inches above the average for the eight years 1901-8.

PRESERVING BOOKS IN THE TROPICS.

Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Entomologist to the Government of India (sometime Entomologist to this Department), gives, in *The Eastern Printers' Yearbook*, several precautions against the destruction of books and papers by insects in the tropics. As some of these are comparatively new, the following extracts are taken from his article :—

The most destructive insect to books is the book beetle (*Sitodrepa panicea*). This is a small brown beetle, which is only one stage of this insect's life, the greater part of the destruction being caused by the small white grub, which is one of the earlier stages. The grub eats tunnels in the books, feeding upon the paper or binding, eating straight ahead through the pages, but always keeping inside; naturally it can feed undisturbed only in a book which is not in use, and it is in books that are left neglected on the shelf that this insect is found. The grub is white, with the head brown, and the body is clothed with short, brown hairs. It hatches from eggs laid by the beetle, and after some weeks of active life, transforms into the dormant chrysalis, from which, after a little time, comes the beetle. It is the beetle that starts the mischief, by eating into the book and laying eggs there, the grubs then continuing it. The insect is probably an introduced one, having been brought most likely in books or merchandise from Europe: it is common practically all over the world, and feeds not only in books, paper, cardboard, and similar materials, but in dry wood, in the cane that furniture is made of, and in dried foodstuffs.

Where books or papers are constantly in use, or being moved, the insect is not generally found; when it is found, there is only one radical cure, which is to go over all the books or stocks of papers and search out the insects: in bad cases of attack, where this is not possible, it is necessary to clear out all infested articles, clean the room thoroughly, and putting the articles in a tight box or cupboard, put sufficient carbon bisulphide or benzine in to thoroughly impregnate everything with the fumes, and kill the insects. At least one pint of the fluid used must be put into every 200 cubic feet of space, and it is necessary to keep the infested articles exposed for twenty-four hours, and to take precautions that no light is brought near while the fumes can be smelt.

The above procedure is necessary only with very bad cases ; as a rule, it is sufficient to deal with each attacked book separately. Prevention is of course better than cure and the general precautions suggested below are the best for this insect, as for others.

Another injurious insect is the common cockroach ; the commonest cockroach in Indian houses is *Periplaneta australasiae*, the big brown cockroach; but there are several other household species. These have a fondness for the colouring matter of cloth bindings, especially of certain reds and other tints ; they feed at night and nibble off the surface of the binding, greatly disfiguring the books. The preparation given below is a certain preventive of damage ; where cockroaches are, however, very plentiful, a liberal application of borax, or the provision of plenty of a mixture of borax (one part) and syrup (two parts), smeared thickly on pieces of card or tin and put under furniture and in dark corners, is a great check on their numbers. Borax is a specific poison to cockroaches and should be used freely.

We know of only one other class of insect injurious to paper and books ; these are the curious shiny insects known as 'silver fish' which are so common in cupboards and in dark, dusty places. They cannot injure books or papers except by destroying the glaze, which they nibble, spoiling the surface of the better classes of glazed papers ; they are also fond of starch and eat the starch used in binding books or papers where they can reach it. Against these insects, the following general precautions are desirable :—

(1) Add a little blue stone (sulphate of copper) to all starch paste; about half an ounce to a pound of paste is sufficient. It makes the starch distasteful to silver fish and to beetles.

(2) If possible, keep books and papers in clean cases, with plenty of flake naphthalene or naphthalene balls. We use flake naphthalene liberally with all valuable papers and drawings, and it is always put in book shelves and cupboards.

(3) Where paper cannot be stored in cases, it should be in good, tight packages, to which insects cannot get access.

(4) If possible, take down every book on a shelf at least once in three months, dust and wipe it, open it, and if there are no beetles, replace it.

(5) All books should be painted yearly with one of the solutions given below : it is best to do this before the rainy season begins. Every part that can be reached when the book is tightly closed should be painted, the back especially, as well as the inside of the covers.

A.	Spirits of wine (methylated spirit)	1 quart.
	Carbolic acid	1 ounce.
	Corrosive sublimate	1 ounce.

This mixture is very poisonous and should be applied with a long-handled brush. It is the best, as it also checks mould; but if used, the room in which the books are, must be thoroughly aired once daily in hot weather as the sublimate is volatile, and poisons the air. (See also *Agricultural News*, Vols. I, p. 140 ; II, p. 42; VI, p. 346.)

B.	Kerosene, best white	1 pint.
	Naphthalene	2 ounces.

Rub on lightly with a cloth, or brush.

C.	Spirits	1 quart.
	Camphor	1 ounce.
	Burnt alum	$\frac{1}{2}$ ounce.
	Corrosive sublimate	1 ounce.

This mixture is used in the Pusa Library. It is as poisonous as A.

RICE IN BRITISH GUIANA.

The last fortnightly report of Messrs. Sandbach Parker & Co., of Georgetown, on the rice industry of British Guiana, dated October 28, 1909, gives information as follows :—

The weather during the fortnight has continued fairly dry and suitable for harvesting and milling. Reaping is going on all over the colony and quality of paddy is good.

Rice is coming into town freely, and a few shipments have been made to West Indian Islands during the fortnight, amounting to 600 bags all told.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally 18*s.* 9*d.* to 19*s.* 9*d.* per bag of 180 ℔. gross.
17*s.* 3*d.* to 18*s.* 3*d.* „ „ „ 164 ℔. „

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, October 26, 1909; Messrs. E. A. DE PASS & Co., October 15, 1909.

ARROWROOT—1¾*d.* to 3*d.*
BALATA—Sheet, 2/6; block, 1/11.
BEES-WAX—£7 15*s.* to £8 for fair to good.
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 49/6 to 55/- per cwt.; Jamaica, 47/- to 52/6.
COFFEE—Quiet; Jamaica, 37/6 to 53/-.
COPRA—West Indian, £23 10*s.* per ton.
COTTON—No quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet; common to good common, 43/- to 45/- per cwt.; low middling to middling, 49/- to 54/-; good bright to fine, 55/- to 65/-.
HONEY—24/6 to 31/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/1 per gallon; concentrated, £15 5*s.* to £16 per cask of 108 gallons; Otto of limes, 5/9.
LOGWOOD—No quotations.
MACE—Quiet.
NUTMEGS—Steady.
PIMENTO—Common, 2⅛*d.* per lb.; fair, 2⅜*d.*; good, 2½*d.*
RUBBER—Para, fine hard, 8/9 per lb., fine soft, 8/-; fine Peru, 8/8.
RUM—Jamaica, 2/9 to 7/-.
SUGAR—Crystals, 14/9 to 15/9; Muscovado, 12/- to 15/-; Syrup, 11/6 to 15/-; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., October 15, 1909.

CACAO—Caracas, 11¾c. to 12c.; Grenada, 11⅝c. to 12¼c.; Trinidad, 11⅝c. to 12c.; Jamaica, 9¼c. to 10½c. per lb.
COCOA-NUTS—Jamaica, select, $35·00; culls, $19·00; Trinidad, select, $32·00; culls, $19·00 per M.
COFFEE—Jamaica, ordinary, 8c. to 8½c.; good ordinary, 9c.; and washed, up to 11c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, no quotations; Barbados, from 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 47c. to 50c. per lb.; Antigua, 48c. to 50c., dry flint.
GRAPE FRUIT—$1·87½ to $2·62½ per box.
LIMES—Dominica, $4·00 to $5·00 per barrel.
MACE—32c. to 35c. per lb.
NUTMEGS—110's, 9½c. to 9¾c. per lb.
ORANGES—Jamaica, $1·75 to $2·50 per box.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 4·27c. to 4·30c. per lb; Muscovados, 89°, 3·77c. to 3·80c.; Molasses, 89°, 3·52c. to 3·55c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., October 30, 1909.

CACAO—Venezuelan, $11·65 per fanega; Trinidad, $11·50 to $11·75.
COCOA-NUT OIL—77c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 8c. to 9c. per lb.
COPRA—$3·75 per 100 lb.
DHAL—$3·85 per 2-bushel bag.
ONIONS—$3·00 to $3·50 per 100 lb.
PEAS—SPLIT $5·75 to $6·00 per bag.
POTATOS—English, $1·25 to $1·60 per 100 lb.
RICE—Yellow, $4·60 to $5·00; White, $5·00 to $5·25 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., November 5, 1909; Messrs. T. S. GARRAWAY & Co., November 8, 1909.

ARROWROOT—St. Vincent, $3·60 to $3·75 per 100 lb.
CACAO—$11·00 to $12·00 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
HAY—$1·00 per 100 lb., unsaleable.
MANURES—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, $2·50 to $3·00 per 100 lb.
PEAS—Split, $6·00 per bag of 210 lb.; Canada, $3·40 per bag of 120 lb.
POTATOS—Nova Scotia, $2·25 to $2·75 per 160 lb.
RICE—Ballam, $4·85 to $5·20 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, October 30; Messrs. SANDBACH, PARKER & Co., October 15, 1909.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·25 to $8·50 per 200 lb.	$9 00 per 200 lb.
BALATA—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	50c. per lb.
CACAO—Native	11c. to 12c. per lb.	12c. per lb.
CASSAVA—	96c	No quotation
CASSAVA STARCH—	$6·00 to $6·50 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$12 to $16 per M	$16 per M, peeled and selected.
COFFEE—Creole	12c. to 13c per lb.	12c to 13c. per lb.
Jamaica and Rio	13½c. per lb.	13½c. per lb.
Liberian	10c. per lb.	7c. per lb.
DHAL—	$4·10 to $4·15 per bag of 168 lb.	$4·25 to $4·40 per bag of 168 lb.
Green Dhal	$5·25 to $5·50.	——
EDDOS—	$1·44 per barrel	——
MOLASSES—Yellow	22c. to 25c.	——
ONIONS—Teneriffe	——	No quotation
Madeira	2½c. to 2¾c. per lb.	2½c. to 2¾c. per lb.
PEAS—Split	$6·25 per bag (210 lb.)	$6·40 per bag (210 lb.)
Marseilles	$4·00, over stock	$4·85 to $5·00
PLANTAINS—	24c. to 50c. per bunch	——
POTATOS—Nova Scotia	$2·40 to $2·50	$3·25 per barrel.
Lisbon	No quotation	No quotation
POTATOS-Sweet, Barbados	$1·00 per bag	
RICE—Ballam	$4·50 to $5·25	$4·75
Creole	$4·25 to $4·40	$4·25 to $4·50
TANNIAS—	$1·44 per bag	——
YAMS—White	$2·40 per bag	——
Buck	$2·40 per bag	——
SUGAR—Dark crystals	$2·35 to $2·45	$2·35
Yellow	$2·90 to $3·00	$3 00
White	$3·70 to $3·80	$3·60 to $3·80
Molasses	$1·80 to $1·90	$2·00 to $2·30
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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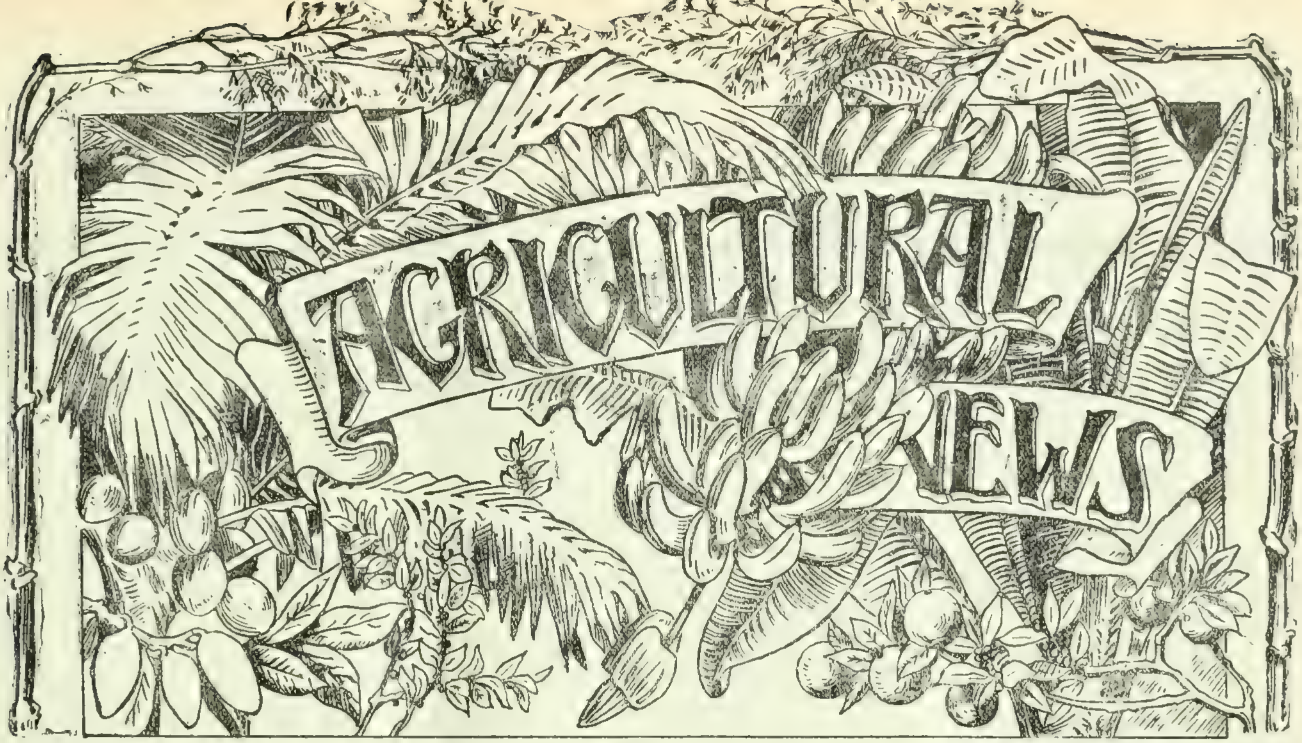

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AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW OF THE IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Value of the Results of Field Experiments.

IT is a well recognized fact that, in experiments which have to be made in the field, there is a large number of sources of error which arise directly from the conduct of such experiments on a scale which precludes the possibility of complete control. The duty, therefore, of the investigator is to devise ways by which such errors may be minimized, as far as possible, and by which he may ascertain their magnitude, and so put himself in a position to make allowance for them when deducing results. An able paper dealing with this subject, by A. D. Hall, M.A., F.R.S., Director of the Rothamsted Experimental Station, appears in the *Journal of the Board of Agriculture*, August 1909, in which the following are the main points that are brought forward.

No one who does work which entails the measurement of quantities, whether dimensional or in relation to weight, expects to obtain absolute accuracy. A joiner or carpenter is satisfied if his measurements are within an eighth or a sixteenth of an inch; the mechanical engineer requires accuracy within one-thousandth of an inch, while the scientist, who makes observations with the aid of a microscope, must possess certainty within the simpler fractions of one twenty-five thousandth of an inch. For all these, there is a method available for increasing the accuracy of their work; that is, not to rely on the result of one observation, but to repeat it several times, and to take the average as being sufficiently correct for their purpose. They can do more than this. By a suitable mathematical process, they can determine, from the direct measurements, what the error in the final result is likely to be, and will thus have the means of allowing for it in subsequent work.

An illustration of this may be useful, for the better apprehension of the principle. If, for example, the area of a piece of land is found, by several measurements, to be near 184·0, 184·3, 183·5, 184·6 and 183·3 square yards, the average, 184 square yards, which is easily deducible in the ordinary way, may be taken as the true result. Further, the 'probable error' of this result, that is the limiting quantity by which it is probably incorrect, on both sides of the true value, is given when we take the total range ($184·6 - 183·3 = 1·3$) and divide it by the number of observations (5); it is 0·26, so that the probable error of the average result is a quarter of a square yard, either way. In other words, for ordinary purposes, the piece of land measures 184 square yards, though it may be anything down to $183\frac{3}{4}$, or up to $184\frac{1}{4}$, square yards in area, as a matter of fact; and we must not use this result (184) in connexion with any observations that are of such a delicacy that they would be affected by a difference of a quarter of a square yard in the area.

The author of the paper which forms the basis of this discussion also gives an illustration from a series of agricultural experiments which were carried out at Rothamsted. In this, the results given, in two similarly treated plots, over a period of fifty years, are considered. Theoretically, these should have given exactly similar yields, but it is demonstrated that, at the end of the time mentioned, one showed an increased superiority over the other of 10 per cent. A calculation of the probable error gives this as 2 per cent., so that, from the fifty years' results, it may be concluded that this superiority is certainly more than 8, but less than 12 per cent. In a similar way, the mean error of a single year's result is 10 per cent. The author states that, as the general result of the examination of many series of experiments, it has been found that the mean error attached to the yield of a single plot is about 10 per cent. above or below. This is, of course, a figure obtained from a consideration of the Rothamsted results only,and does not necessarily apply to other soils under different conditions. The important fact to remember is that differences of treatment which can only cause variations of yield within the limits of the mean error are worthless in the matter of making deductions from the results.

As to the question of the size of experimental plots, increased accuracy is not obtained by making this large. It is very likely that the effect would be, on the contrary, to increase the magnitude of such errors as exist already, and to introduce others. No minimizing of this inaccuracy of the large plot can be obtained, either, by selecting and weighing the produce from small areas within it, for this, in the words of the author, ' introduces the most fatal error of all, a selection by the preconceived opinion of the experimenter'. Another mistake that is likely to be made when large plots are employed is to count the number of holes and to calculate what the yield ought to have been, had a plant been obtained in every one of them. 'Most manures affect the texture of the soil, and therefore the number of plants which establish themselves is one of the factors in the result that is directly affected by the manure.'

These and other considerations, such as those of variations in its properties in different parts of a given area of soil, convenience in working, similar treatment of the plants at simultaneous periods in their development, all point, then, to the superiority of the small plot for agricultural experiments. It is best that this should be at least $\frac{1}{40}$-acre in area. By the utilization of such plots, the only certain guide to accuracy, namely the multiplication of the number of experiments by their repetition in space or time, or in both, can be most conveniently employed. It is, in fact, a matter of necessity if accurate results are to be obtained in places where only small areas of land are available for experimental purposes. Reference to publications of the Department, such as the *Report on Sugar-cane Experiments in the Leeward Islands*, 1905-6, Part II, p. 1; 1906-7, Part II, pp. 1 and 2; *Report on Agricultural Experiments in Barbados*, 1898-1900, p. 137, will make it clear that this policy has been adopted by it for exactly the same reasons as are enunciated above.

In expressing the results from small plots in terms of a yield per acre, care must be taken to avoid an error, or better, a pretended accuracy, by including fractional parts of the expressions obtained as a result of the necessary multiplication, which are only the product of experimental error and the factor which is employed to get the return per acre. An appreciation of the importance of this will lead to the employment of the expression, 14·8 tons, instead of the false statement, say, 14 tons 16 cwt. 48 lb. The latter would be recorded by the experimenter, of course, but the former would appear in his report.

In any set of experiments, then, the investigator must know the extent of the probable error involved. Without this knowledge, he cannot rightly interpret his results,and he will probably waste time in attempting to explain apparent discrepancies which really arise from the attribution of results to differences of treatment, while they are actually caused by unavoidable errors in experiment. With this knowledge, and the avoidance of a factitious accuracy, he will present results that have the self-recommendation of concordance; and, what is almost as important, a knowledge on the part of his readers, of the facts that have just been dealt with, will enable them to profit by the power of discrimination which it gives them.

SUGAR INDUSTRY.

SUGAR FACTORY RESULTS IN JAVA.

The tenth *Annual Report* on the statistics of a large number of sugar estates in Java, which has been prepared by H. C. Prinsen Geerligs, is abstracted in the *International Sugar Journal*, Vol. XI, No. 127, and from this the following information is taken. An interesting comparison of mill-work and the fibre-content of canes in Java with those in the West Indies can be made by referring to an abstract of a paper by the Commissioner of Agriculture which appears on page 179 of the current volume of the *Agricultural News*.

The general averages of a great many figures are set forth in the table given below, which allows us to get a good idea of the results in the different years, and also shows the steady progress in the output of sugar from the raw material.

Year.	Sucrose on 100 cane.	Fibre on 100 cane.	Quotent of purity of the raw cane juice.	Available sugar on 100 cane.	Relation between sugar available and actually received.
1899	13·99	—	88·66	11·98	96·4
1900	12·26	10·65	84·18	10·21	96·5
1901	12·68	10·95	84·66	10·61	98·2
1902	13·43	10·91	84·65	11·33	—
1903	12·40	11·21	84·00	10·26	98·0
1904	13·04	11·29	84·69	11·06	98·6
1905	12·66	11·61	83·30	10·62	98·8
1906	12·38	11·78	83·04	10·34	97·7
1907	13·11	12·00	84·61	11·09	98·4
1908	12·30	12·01	83·74	10·30	99·1

The content of sucrose in cane has not varied very much during the last ten years. This seems rather strange when we consider what pains have been taken to increase the sugar content of the cane coming to the mills. Much attention has been paid to the raising of canes having a higher sucrose content, both by chemical selection and by the propagation of highly promising seedling cane varieties. Then, the tops used for planting material were carefully selected in order to ensure a sound seed, which was afterwards disinfected to keep off parasites and germs of disease, very cautiously planted and cultivated, and protected against damage. Further, on most estates, the canes from the different fields are constantly sampled and analysed, starting from a couple of months before the grinding season and continuing during same; all this with a view to ascertaining the exact period of maturity of each of the cane-fields, and so to harvesting the cane always at its highest sucrose content. Finally the transport of the cut cane is considerably accelerated, and good care is taken to grind every day all the cane which has been cut the previous day, thereby preventing any lying over of cut cane, and its deterioration and consequent loss of sucrose.

Notwithstanding all these precautions, it appears that the sucrose content of the cane crushed in the majority of the sugar mills has practically remained the same, although the tonnage per acre has very considerably increased. It is evident that the care and attention bestowed on the raw material have benefited its quantity more than its quality.

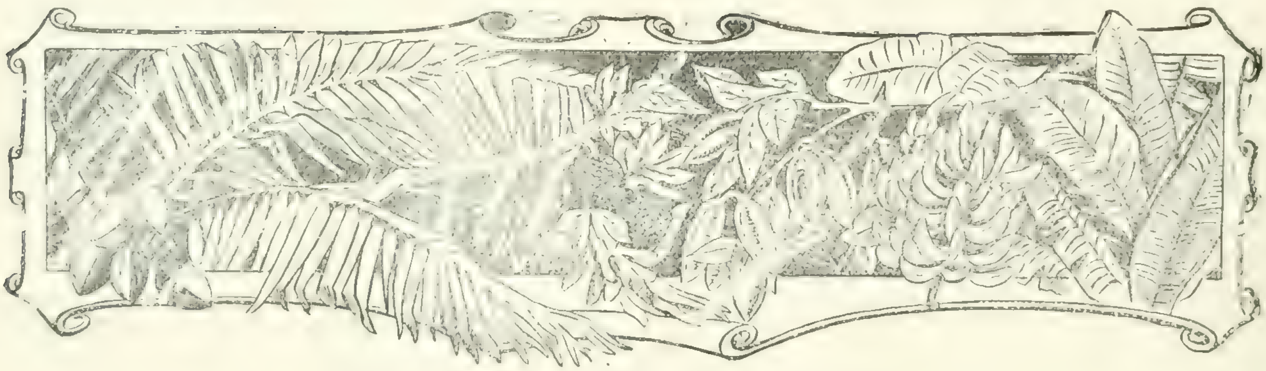
The fibre content of the cane has considerably increased in the last ten years, and doubtless amounts to 1 per cent. on the cane more than before. This is not due to a change in climate, nor in cultivation, but exclusively to the fact that the Black Java or Cheribon cane, which was, some ten years ago, well-nigh the universal variety in cultivation, has since that time gradually been supplanted by the descendants of seedling canes, of which one of the most valuable is distinguished by a very high fibre content.

The high fibre content of the seedling canes now in vogue in Java has often induced planters to consider this property as a special characteristic of seedling canes, but we see at once that this is not the case. As a consequence of the choice of parents, a couple of the most popular varieties of seedling canes happen to be remarkable for their high fibre content, and this has been the reason why the average fibre content of the crushed cane increased when these varieties were more extensively planted; but the reverse might very easily have occurred. If by accident a couple of varieties of the No. 100 type had been obtained, which possessed the other favourable properties of No. 247 cane, the propagation of seedlings would, on the contrary, have given rise to a decrease in the fibre content instead of an increase. But as matters stand now, we are in the happy possession of a cane which contains about 10 per cent. more fibre than previously, and yet the same amount of sucrose, which means an increase in the fuel supply of 10 per cent., or a very appreciable profit.

The quotient of purity of the juice stands in some relation to the sucrose content of the cane, inasmuch as a low saccharine content of the cane is usually accompanied by a low quotient of purity, and vice versa. A low quotient is unfavourable to the manufacturer for two reasons. Firstly, juices having a low purity already contain but little sucrose, and next, less of this is obtained as marketable sugar owing to the large amount of molasses which is the consequence of the many impurities.

We notice a gradual drop in the purity simultaneous with the decrease in saccharine content. It is perhaps not superfluous to mention here that we could not expect any strict agreement, since the purity of the juice observed is that of the juice which was extracted, and not of the juice as it was present in the cane. We know that the greater the power of the mill which extracted the juice, the lower will be its purity, and since the pressure of the mills has become more efficient of late years, a much less pure juice will nowadays be extracted from the very same cane than would have been the case ten years before.

Generally speaking, the statistics reviewed here give every reason for satisfaction. Although neither the sucrose content of the cane nor the purity of the raw juice shows any improvement, indeed the latter has actually diminished, yet we have succeeded in Java in obtaining from that raw material not only a better sugar but also a better return of that improved product. This happy result is obtained both on extraction of the juice and on working it up into sugar, so that it is due as well to an improved mechanical mode of working as to a better and more rational and careful clarification and further treatment of the juice. This improvement is steadily going on, and there is nothing in the statistics to suggest that we have now come to a standstill. It is therefore quite possible that statistics published ten years hence will furnish us figures with which those now given (which appear to us as very satisfactory) will again contrast unfavourably.



WEST INDIAN FRUIT.

THE GROUND NUT.

Attention is drawn to *Farmers' Bulletin*, No. 356, of the United States Department of Agriculture, which gives a very useful account of the ground nut. Some of the information that is contained in the Bulletin is abstracted here:—

The value of the commercial ground nut crop of the United States for the year 1908 was estimated at $12,000,000. During recent years, the area of production of ground nuts has greatly increased, especially throughout the warmer parts of the country. The value of the ground nut, both as a money crop and for feeding on the farm, renders it especially desirable as a part of the rotation, wherever conditions suitable to its development exist.

The soil best suited to the ground nut is one of a sandy, loamy nature, preferably light or grayish in colour, rather than dark. Soils that are dark, and those carrying a considerable percentage of iron or other mineral, are likely to stain the shells of the ground nuts, thus rendering them less desirable for the trade. For agricultural purposes, however, the staining of the shells is of little consequence, as it does not materially injure them for stock-feeding. In fact, soils that contain considerable clay and lime, or which are loamy in character, produce heavier nuts, and sometimes greater yields, than do lighter soils. As a rule, the ground nut does best on a sandy loam, with a well-drained clay subsoil, but the crop may be grown under a wide range of soil conditions. Soils that become hard or compact are not adapted to ground nut growing, owing to the inability of the pod stems to penetrate the surface. Those that are poorly drained or sour are not suited to the ground nut. The ideal soil consists of a sandy loam, containing a reasonable amount of humus, or vegetable matter, together with an abundance of lime. A soil having a suitable mechanical consistency is the first essential. Soils lacking in fertility can be improved by a proper cropping system, or by the judicious use of manures.

The climatic requirements of the ground nut are a long season without frost, a comparatively light rainfall during the growing period, abundant sunshine, and a high temperature. The Spanish ground nut will mature in ninety days under the most favourable conditions, but 110 to 120 days should be allowed. The large-podded varieties require a longer period for best results.

Ground nuts should be grown in rotation with other crops, rather than as a specialty. The cropping system will depend somewhat upon the area of other crops grown, but the arrangement should be such that the land will be planted in ground nuts one year in each three or four. Stable or barnyard manure should not be used as a fertilizer the same year that the land is planted in ground nuts. The use of manure has a tendency to cause the plants to produce abnormal tops and a large percentage of poorly filled pods. The proper time for applying stable manure is with the crop grown during the previous season, thus giving it time to become incorporated with the soil and reduced to the proper condition for the ground nut crop.

In order to ensure the proper filling and ripening of the pods, ground nuts require an abundance of lime in the soil. Where the soil is of a calcareous nature, containing limestone, shells, or lime in its more active form, it may not be necessary to make a regular application, but on soils that are deficient in lime, or inclined to be in the least sour, from 1,000 lb. to 2,000 lb. of freshly burned lime should be applied to an acre every four or five years. The ground nut plant, in common with other leguminous plants, has the power (with the aid of certain bacteria) of collecting the free nitrogen of the atmosphere and storing it in little nodules upon its roots. For this reason, it is one of the more desirable of our soil-renovating and soil-improving plants. It should be borne in mind, however, that in order to benefit the soil, the nitrogen so gathered should not be removed, but that the main portion of the roots should be left in the soil.

The seed should not only be selected from plants that are mature, but from those producing a large number of mature pods, as well. By doubling the number of well-filled pods on each plant, the yield for each acre will also be doubled. In planting the large-podded varieties it is desirable for several reasons that the seed be shelled. For planting, a common distance between rows is 36 inches, but this varies somewhat according to the soil and variety. For the Virginia Runner variety, on good soil, the distance between rows should be at least 36 inches, and 12 inches between the plants in the rows. Virginia Bunch ground nuts may be in rows as close together as 30 inches, and 7 to 9 inches apart in the rows. The Spanish and Tennessee Red varieties are planted in rows from 28 to 36 inches apart, and 7 to 9 inches apart in the rows, according to the fertility of the soil. On rich soils, where the spread of vines will be great, the maximum distance between rows as well as between plants in the row should be allowed. Cultivation of the ground nut crop should begin as soon as the rows can be followed, and should continue until the vines begin to occupy the ground. The work of cultivation should be pursued very much as for corn, beans, and all similar crops. Frequent shallow cultivation that will keep the soil loose, and prevent the loss of moisture, is essential. Shortly after rains, the surface soil should be stirred, and during dry weather, a dust mulch maintained. After the first cultivation, it will be desirable to work the soil toward the rows to provide a bed of loose earth in which the pods may form. After the ground nuts begin to form pods, they should not be disturbed, or given further cultivation.

The standard of excellence in the ground nut markets is always based upon hand-picked stock. Ground nuts that are picked by hand now bring a higher price than those picked by machinery, but with the present scarcity of labour, and rapid improvement in ground-nut-picking machinery, the time will soon come when a uniform price will be paid for a given quality of seed, regardless of how the picking is done. At no time after the curing process should the ground-nut pods be exposed to water, or even dampness, as the shells invariably become darkened and discoloured by the addition of moisture. When properly cured, the shells will be covered with a fine, dry dust, and where this dust becomes moistened it adheres and forms a brownish spot. If the ground nuts show the least trace of dampness after their removal from the vines, they should be spread on a floor, or stored in a well ventilated building, until thoroughly dry. Many of the larger growers have provided narrow cribs, similar to those employed for the storage of corn, and the ground nuts are kept in bulk until sold. When the pods are thoroughly dry, they may be put into bags as they come from the machine, and either hauled direct to the cleaning factory or stored in small lots.

The following is a description of American varieties :—

Virginia Bunch.—Large-podded variety, plant rather dwarf, stems upright, foliage rather light; pods clustered about the base of plant; usually two, sometimes three, seeds in a pod; pod bright and clean; colour of seeds light brown; pods adhere well to plant in digging. The customary weight per bushel of this variety is 22 lb.

Virginia Runner.—Large-podded variety, strong grower, stems creeping, foliage heavy; pods scattered along procumbent stems; pods and seeds very similar to those of the Virginia Bunch; pods do not adhere well in digging. The customary weight per bushel of this variety is 22 lb.

North Carolina.—Similar to Virginia Runner, except that the plant is not so large or vigorous, and the pods and seeds are both smaller. This variety contains a high percentage of oil.

Spanish.—Small-podded variety, strong grower, stems upright, foliage abundant and heavy; pods clustered about base of plant; usually two seeds in a pod, entirely filling it; pods rough and inclined to be darkened in colour; colour of seeds light brown; pods adhere well to plant in digging. This variety frequently yields 60 bushels of marketable seeds, and 2 tons of hay, to the acre. Its seeds are rich in oil content. The weight per bushel of Spanish ground nuts is 28 lb.

Tennesse Red.—Small-podded variety, similar to Spanish, except that the pods are longer, sometimes containing five or six seeds crowded together; seeds dull red in colour. It is well adapted to stock feeding, but does not sell upon the market owing to the colour and the quality of the seeds.

Dixie Giant.—The variety known as Dixie Giant is so called owing to the great size of its pods. It is distinctly a novelty; does not yield well, and requires a long season for the pods to mature. Recommended only for southern part of the Gulf Coast States. The seeds are very large, and are desirable for the manufacture of fancy blanched nuts.

Among the more important uses of the ground nut for human food are the following : It is eaten from the shell, as salted shelled seeds, as blanched seeds, in the so-called 'pea nut candies' and 'brittle', in combination with pop corn and puffed rice, in the form of ground nut butter, and as an ingredient of ground nut and vegetable meats, ground nut meal, and salad oils.

The oil of the ground nut belongs commercially to the same class as do cotton seed and olive oils. Ground nut oil is of a higher grade than cotton seed oil, and of somewhat lower value than first-class olive oil. The quantity of it that may be obtained from the ground nut will depend upon the variety, the maturity of the seeds, and the apparatus with which the extraction is made. The Spanish meats, when shelled and thoroughly cleaned, frequently contain as much as 45 per cent. of oil, as shown by chemical analysis, although not more than 34 per cent. can be expressed by the best of present methods, and perhaps about 28 per cent. by ordinary machinery. The greater portion of the ground nut oil of commerce is manufactured at Marseilles, from ground nuts that are bought very cheaply along the coast regions of Africa, and transported by ships as return cargo. The African-grown ground nuts are very rich in oil, often containing as much as 50 per cent. With a coming shortage of cotton seed from which to manufacture oil in this country, there is a great possibility of building up a ground nut oil industry throughout the cotton belt of the Southern States. The process of expression is very similar to that for cotton seed oil, and the greater portion of the machinery of the present oil mills is adapted to the manufacture of ground nut oil. It would be necessary, however, to add special appliances for shelling, cleaning and macerating the meats of the ground nut.

The tops of the ground nut plant, when cut and cured in the same manner as other legumes, will produce a hay that is almost equal in feeding value to the best clover hay. By planting the Spanish ground nut in rows from 24 to 30 inches apart, and quite closely in the row, and by giving the crop about two cultivations, it is possible to produce from one to two tons of hay to the acre. The ground nut vines and seeds, when chopped or ground together, form almost a balanced ration for a dairy cow.

THE CARE OF COCOA-NUT PALMS.

The first item to be considered by those who have cocoa-nut trees is that the drainage is good, and that any trees that are standing in poor soil get a dose of good manure to stimulate them. We have in mind a number of cocoa-nut trees, every one of which was apparently about to die out; the leaves yellowed, and dropped so much that there was only a tuft left at the top. As the soil was gravelly and the drought severe, it was evident that there was no lack of drainage. The cabbage, too, had not gone wrong. As the trees were worth saving, the grass was clean weeded around them and cows tethered to each tree as the most convenient way of conserving manure and moisture. Of course, all the trees were not dealt with at one time, and this method could not be so easily carried through on a very large estate. The cattle were hand-fed, and after being a week at each tree the ground was loosened and mulched. The effects were marvellous; there was soon no sign of disease about the trees; they put out fresh leaves and soon bore, and bore well all the time. Even though the cabbage may rot, the trouble may not always be the bud-rot disease. The true bud-rot is a very serious trouble, and one prominent cocoa-nut grower thought so seriously of it, that he asked the Jamaica Agricultural Society to recommend to the Government the compulsory burning of all dead cocoa-nut trees. All cocoa-nut growers in their own interests, should never allow a dead cocoa-nut tree to stand rotting, as these trees soon become the home of cocoa-nut pests of various kinds. (The *Journal of the Jamaica Agricultural Society*, September, 1909.)

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 8, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, American Sea Island cotton has continued to advance, and they are now asking $19\frac{1}{4}$*d.* for Fully Fine Island and $16\frac{3}{4}$*d.* for the best Floridas, but buyers are holding off, thinking the advance has been too rapid.

During this period, about 30 bales Barbados have been sold at 16*d.* to $17\frac{1}{2}$*d.*, as promptly as it arrived.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 6, is as follows :—

The market has been firm and dearer throughout the week, and factors succeeded in securing their asking prices for the larger proportion of the sales, showing an advance of 3c. per lb. over the prices last quoted.

The buying has been for England and the northern mills.

The market opened with sales of Fully Fine 33c. to 34c., Extra Fine 36c. to 37c., and closed firm at the following quotations, viz: Fine 33c., Fully Fine 35c., Extra Fine 37c. There is no accumulation of odd bags, classing as above, the receipts to date having been sold, so that the factors continue firm in their views.

SELECTION OF COTTON VARIETIES FOR UNIFORMITY.

It is a well-known fact that the introduction of a good variety of cotton into a locality often leads to the exhibition of a large amount of diversity among the plants, and that, in addition, they may appear to possess very different characteristics from those presented by them in their old surroundings. This effect has been shown, in Bulletin No. 159 of the Bureau of Plant Industry of the United States Department of Agriculture, to be different from other types of variation, such as the ordinary fluctuating differences, changes due to accommodation, direct effects of environment, and diversity due to hybridization, and is there termed a 'new-place effect'. The remedy suggested is selection for 'local adjustment', that is selection for uniformity by rejecting all lines of descent in which changes from the best type occur; it is a natural concomitant of selection for improvement, and it seems that any properly organized scheme for this would automatically include it; thus its consideration only forms another argument for the continuous practice of selection. As many of the conclusions reached in the above-mentioned bulletin are applicable to West Indian conditions, they are given here :—

The growing of a variety of cotton in a new locality is likely to bring about a distinct reduction in the yield, as well as in the quality, of the fibre. This deterioration has been found to be connected with an increase of diversity among the individual plants. Even when a carefully selected, uniform stock is used for the experiment, a much greater amount of diversity may appear in a new place than when the same stock is grown under the accustomed conditions of the previous locality, where the variety was improved by selection.

The diversity that reappears in the first season, when a variety of cotton is grown in a new place, can be greatly reduced in later seasons by selecting seeds from the plants whose characteristics have been least disturbed by the transfer to the new place—those that are the most fertile and have the best lint. This process of selection to restore the uniformity of a variety in a new place is called local adjustment.

Selection for local adjustment is distinct in objects and methods from breeding for improvement or for originating new varieties. The object of local adjustment is to preserve varieties already existing and to guard them against recurrence of diversity. Practical advantages can be secured by simple selection for local adjustment without the separate testing of individual lines of descent, as is required in breeding for improvement of a variety, or when new breeds are to be developed.

The phenomena of local adjustment are of general scientific interest as illustrating one of the influences of external conditions upon the expression of characters in organisms. The recurrence of diversity in a previously uniform variety serves with other facts to show that ancestral diversities continue to be inherited, even when their expression is avoided by efficient selection. That changes of conditions can induce a return to diversity shows that the environment is able to influence the expression of characters, and that its influence is not limited to characters that vary directly and regularly with changes of environment.

Apart from the effects of conditions which limit or inhibit the growth of the plants, two kinds of changes are found to follow transfer to new places : (1) Changes of accommodation to different conditions and (2) diversification, or loss of uniformity. Changes of accommodation do not directly increase diversity, for they are shared by all the individuals, but changes of accommodation are often accompanied by changes of other characters which render the individual plants much more unlike than before

It is not necessary to believe that the diverse characteristics that appear in the new place come into the plants from the external environment, or that they represent direct effects of the environment upon the plants. It is more reasonable to suppose that new conditions induce diversity in an indirect manner by disturbing the processes of heredity, and thus allowing ancestral characters that had been transmitted in latent form to return to expression, or characters previously expressed to become latent. Recurrence of diversity may be quite independent of hybridization, although some of the results are very similar.

The phenomenon of local adjustment only strengthens the many other evidencies that the uniformity of a variety of cultivated plants can be maintained only by persistent and vigilant selection. The decrease in the agricultural value of a variety that results from a return to diversity is as real and important as the agricultural improvement that is made when diversity is reduced by selection.

The facts of local adjustment go far to explain the apparently capricious behaviour of cotton varieties in comparative tests, the same varieties often standing in entirely different relations to one another in different seasons. It becomes evident that the adaptation of a variety to a new place cannot be fairly tested in a single season. Not until a new stock has passed through the process of local adjustment and returned to a normal degree of uniformity can the extent of its adaptation to the new place be definitely ascertained.

The facts of local adjustment indicate that our superior varieties may be found adapted to much wider regions than they now occupy. Varieties of real value should have their range extended through local adjustment, instead of being discarded because they fail to show their superiority in the first season. The wider extension of a few superior types of cotton would make it possible to abandon many local varieties, and would constitute an important step in the progress of the cotton industry. Greater uniformity in the crop over large areas would increase its commercial value, and simplify commercial problems of grading and marketing.

THE PERINI FIBRE PLANT.

In the *Agricultural News*, Vol. VIII, p. 235, an account of the industrial importance of the Perini fibre plant appeared. The *Kew Bulletin*, No. 8 (1907) p. 338, gives the following information concerning the plant, under the name 'Canhamo Braziliensis Perini'. (*Hibiscus radiatus*, Sims) :—

CANHAMO BRAZILIENSIS PERINI.—The *Board of Trade Journal* for September 7, 1905, records the receipt by the Board of a pamphlet describing, under this name, a Brazilian fibre plant, together with a sample of its fibre, forwarded by H. B. M. Consul at Rio de Janeiro. Subsequently Messrs. Knight, Harrison & Co., of Rio de Janeiro kindly forwarded to Kew copies of this pamphlet, which was written by Dr. V. A. de Perini for the *Brazilian Review* in 1905, and is entitled 'Canhamo Braziliensis Perini or Brazilian Linen': with these were sent samples of the fibre and of cloth woven from it in Italy.

The pamphlet states that the plant was discovered by Dr. de Perini in the northern part of the province of Minas Geraes at about 1,000 feet above sea-level. The writer of the pamphlet claims that the plant possesses the qualities of European hemp or flax; that it is quite hardy both in the dry and in the rainy season; that it thrives alike in dry and in wet soil; and that it does not suffer from insect attacks or from mildew. No care or special cultivation is needed; a crop can be gathered three months after sowing; and three crops can be harvested in one year. The fibre possesses the desirable qualities of strength, fineness, flexibility, and adaptability for bleaching or dyeing. From it a fabric can be prepared which is equal to European linen; this so far has not been possible in America.

From the illustrations given in the pamphlet referred to and from a comparison of the fibre with the material in the museum at Kew, it was clear that the plant under discussion is a *Hibiscus* (Malvaceae), nearly allied to *H. cannabinus*, Linn., which is widely grown in most warm countries, and is best known as the source of Deccan or Ambari Hemp, the fibre of which has been exported to England from India for over a century. The differences, however, were such as to indicate that the Brazilian plant is probably not exactly *H. cannabinus*.

In April, 1907, specimens of the dried plant and of its seeds were received from the Board of Trade. Plants have been raised from the seeds, and from these it has been possible to ascertain that the species is *Hibiscus radiatus*, Sims, not of Benth., doubtfully of Cav.

The *Kew Bulletin* also gives an abstract from the *Board of Trade Journal*, February 28, 1907, which shows that the Brazilian Government has subsidized the industry of the preparation of fibre from this plant, and that Dr. Perini was forming a limited liability company for its exploitation.

Seeds of the Perini fibre plant have been received from Kew by the Imperial Department of Agriculture, and are being distributed for trial among the Botanic Stations.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Tuesday, November 23, by the R.M.S. 'Berbice', on an official visit to Grenada. Dr Watts will probably return to Barbados by the R.M.S. 'Esk' on the 30th instant.

Mr. W. Biffen, B.Sc., Scientific Assistant on the staff of the Imperial Department of Agriculture, left Barbados for England, by the R.M.S. 'Thames', on Tuesday, November 16, on leave of absence owing to ill health.

Mr. J. C. Moore, Agricultural Superintendent at St. Lucia, returned from England by the R.M.S. 'Oruba' on November 22 last, after six months' leave of absence.

Mr. Gilbert Graham Auchinleck, B.Sc., of Mc Gill University, Agricultural and Science Master, St. Kitts, has been appointed by the Secretary of State for the Colonies to the post of Agricultural Superintendent in the colony of Grenada.

On the recommendation of the Imperial Commissioner of Agriculture, Mr. C. R. Kirton, Manager of Halton estate, Barbados, has been appointed to act as Agricultural Instructor, on the staff of the Local Department of Agriculture, St. Lucia, for a period of six months.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. VIII. SATURDAY, NOVEMBER 27, 1909. No. 198.

NOTES AND COMMENTS.

Contents of Present Issue.

The subject of the editorial in this number is The Value of the Results of Field Experiments. It deals chiefly with the limitation of deductions from such experiments, the knowledge that is necessary for their clear interpretation, and the methods of eliminating sources of error and making corrections for them.

An interesting account of the sugar factory work in Java during the last ten years is abstracted on page 371.

Very useful information for those who are interested in ground nuts will be found on pages 372 and 373.

The attention of those whom it specially concerns is directed to the article on the Perini Fibre Plant, on page 375.

In the Insect Notes (page 378) of this number, the series of articles on the Natural History of Insects is continued. The subject of Growth is concluded, and those of Senses and Circulation are discussed.

The Fungus Notes, on page 379, contain important information showing that thoroughness and care are required in spraying experiments and treatment.

The Students' Corner will be found on page 381. It contains the results (with the exception of those for St. Lucia) of the recent Intermediate Examinations in connexion with the Reading Courses Scheme, as well as information in regard to the scope of the papers that were set at that examination.

Experiemntal Breeding of Cotton in India.

In a second paper by Mr. H. M. Leake, published in the *Journal and Proceedings* of the Asiatic Society of Bengal (Vol. V, No. 1), the author records the constancy of the fact that certain Indian cotton plants regularly produce the accessory bud to the right, others to the left, of the main bud, but that this character does not follow Mendelian laws. In the same way, the branches of the main stem continually arise behind the growing point, but the branching of the branches thus formed may take place in this way, or the terminal bud may cease to grow and the new branches may arise lower down; of these two forms of branching the latter is dominant. Further, it is shown that early flowering is a feature of this latter type of branching, so that importance is given to a classification of Indian cottons according to their way of forming branches.

Hand-stripped and Machine-stripped Fibres.

An account of experiments, which were undertaken to determine whether the hand-stripped or the machine-stripped fibre from Manila hemp is the stronger, is given in the *Philippine Journal of Science*, Vol. IV, No. 2. They show that the latter is very considerably stronger than the hand-stripped variety. It is not easy to give a reason for this difference; microscopic examinations showed that both kinds of fibre were quite clean, and revealed no differences between them. It is probable that the difference is due to the fact that, in the machine, the pull on the fibre is a steady one, while in stripping by hand it is intermittent, so that a loss of tensile strength takes place. This theory is confirmed by the fact that hand-stripped hemp shows a large number of broken fibres, so that a bundle of it consists of a series of shorter and longer fibres, while that from a machine has practically no broken fibres, and they are all of the same length.

Manurial Experiments with Young Rubber Trees.

The *Tropical Agriculturist* for September 1909 gives an account of experiments which have been carried out for the purpose of ascertaining the manurial requirements of young rubber trees. Before manures were applied, the trees were well weeded for 3 feet around the base of each, and the soil was lightly hoed. In each case, the manures were sprinkled in a shallow trench 3 inches deep, and surrounding the tree at a distance of 2 feet from the trunk; the earth taken out of the trench was subsequently put back to cover the manure.

It was found that the employment of a complete manure increased the girth of each tree by 1 inch more, in a year, than that of a manure containing nitrogen and phosphorus, but no potash. The effect of the application of nitrogen, only, was very small, so that it is doubtful if this is profitable, especially in view of the fact that the use of this element alone would tend to retard growth later on, owing to the consequent exhaustion of the other plant food constituents. In the upshot, complete manures are advised in this connexion, and further similar experiments are promised.

An Aid in Selection and Breeding.

In the *American Naturalist*, July 1909, the difficulties that are met with by breeders of plants and animals are discussed, with a view to suggesting methods for minimizing them as far as possible. Among these, the proposal is made to adopt a system of 'selection index numbers', for use when it is desired to improve more than one characteristic of the plant or animal under experiment. In such index numbers, the values of a series of important characteristics would be combined, and they would not only prove of value to breeders, but to judges of stock, as well.

The Imperial Malaria Conference.

The Imperial Malaria Conference, which has just finished its sittings at Simla, has made its chief conclusions and recommendations under the following heads:—(1) the appointment by the Government of India of a Scientific Investigation Committee, which will work together with special organizations in each province, in investigations relating to (a) the distribution of malaria in India, (b) the ways in which it originates and spreads in different districts, and (c) the effects of quinine and other remedies; (2) practical measures, including (a) the discovery of a cheap and effective means of destroying Anopheles, (b) minor drainage operations, (c) the restriction of cultivations, such as that of rice, in towns where these give rise to Anopheles, (d) the use of fish against mosquitos, (e) the use of oil for small collections of water in places that can not be filled up; (3) (a) that means be taken to spread knowledge among the people regarding malaria, and the measures which it is possible to employ against it, (b) that the subject be taught in schools; (4) that local governments should be invited to assign funds annually for the matters of the investigation and prevention of malaria.

The Tonkin Rubber Tree.

A paper appears in the *Comptes Rendus de l'Académie des Sciences*, Paris, which gives an account of a rubber tree which is found in Tonkin called Teonon (*Bleekrodea tonkinensis*). The latex of this plant contains a high percentage of a rubber which is not very inferior to Para rubber. It grows well on soils which do not contain much water, but on which rain falls after prolonged drought. This ability to stand dry conditions for some time arises from the fact that the roots are swollen and store water, and that there are external mineral incrustations on the leaves, which prevent excessive transpiration.

The swellings on the roots vary in size, being largest in calcareous soils. They grow along the length of the root, and from them smaller roots are given off. Though they are round and smooth when young, their form changes as they become older, and a layer of cork forms on the outside of them. This is cracked through as the swelling increases in size, and its place is finally taken by another, which remains when growth inside is complete.

The mineral deposit on the leaves consists of calcium carbonate; it develops in the outer skin, and remains on the surface in the form of clusters.

Lemon Grass and Citronella Oils in Indo-China.

A report by the Director of Agriculture on the experiments conducted in Indo-China in 1908 gives an account of investigations with the oils of lemon grass (*Cymbopogon citratus*) and citronella grass (*Cymbopogon Nardus*). In regard to the former, distillations were made, following the same manner of operation, in the dry and wet seasons. Plants dried by exposure to the air, and not containing more than 13 to 18 per cent. of water for the dry season crop, and 20 to 25 per cent. of water for that of the wet season, were distilled. The average of the distillations gave a yield of 7·9 to 8·5 of oil per thousand leaves in the dry season, and from 6 to 7 per cent. in the wet season. On the other hand, the oil obtained from the dry season crop appeared to contain a larger proportion of citral; that is, 78 to 80 per cent., instead of 70 to 72 per cent.

In the case of the citronella grass, the leaves were obtained from a plantation made in 1904, which had flourished without any care on a soil impregnated with salts, and unfit for the cultivation of rice. The plants cut in the period of vegetable growth, before the appearance of the first flowers, produced an average yield of 16 per cent. from the dried leaves, while the plants which had flowered only gave a yield of 5 to 6 per cent. The flowering stalks themselves only contained 4 per cent. of essential oil. The fact of the partial disappearance of the oil from the leaves during the flowering period has been noticed as well in France, in the case of several different essential-oil-yielding plants.

The Sicilian Green Fruit Trade in 1908.

In 1907-8, a large and rapid fall in the price of green fruit took place, with the result that speculators found themselves burdened with large stocks which they had bought at absurd prices, a dead market and an oversupply of fruit coming in. The result was that they stated that a crisis had arisen in the trade and demanded Government assistance, in spite of the fact that the Messinese importers pointed out that prices had already been lower before, when there was no talk of a crisis. Ultimately the Government passed a law by which a 'Compulsory Association', centralized in in a Green Fruit Chamber, was to be constituted. The exporters had to sell all citrate of lime to this chamber, and also certificates of analysis had to be obtained from analytical chemists employed by it, exportation by individuals being made prohibitive by a tax based on the percentage of free and combined citric acid in the product. The exporters strongly objected to this, as they held that the trade of the island was being crippled, and their livelihood imperilled, for the sake of a few influential speculators. The effect was that the more oppressive clauses of the law were somewhat modified, and the constitution of the chamber altered. Notwithstanding this, it is expected that harm will still be done to the industry, and that the law will not long remain in force.

INSECT NOTES.

NATURAL HISTORY OF INSECTS.

Part III. Growth (concluded), Senses, Circulation.

The body of a caterpillar, which may be considered a typical insect in the larval condition, is composed of thirteen segments, as follows:—the head, which appears as one; the thorax, three; and the abdomen, nine. The segments of the thorax and abdomen are chitinous rings, joined together by means of a flexible connective tissue, which allows for great freedom of movement, and, as already stated, for a certain amount of growth in size. In most adult insects, it is not easy to distinguish the segments which go to make up the thorax and abdomen, because these are often much modified in accordance with the habits or structure of the insect. The growth of insects always takes place during the larval portion of the life-cycle. Caterpillars, for instance, moult, or shed their skin, four or five times during their growth, from hatching to pupation. Adult insects do not grow in size. Once the wings have been developed, the insect is full grown. Small flies do not grow into big flies, small moths do not grow into large ones, nor small beetles into large beetles.

It should be remembered that butterflies and moths, beetles, flies, bees and wasps all develop from a larval stage which is very different in appearance from the adult form, and that the change in appearance is brought about in the period of pupation. On the other hand, such insects as grasshoppers, cockroaches and cotton stainers, which have an incomplete metamorphosis, are somewhat like the adult in general form, but without wings or with developing wings. In the case of any insect, however, the winged individual is the adult.

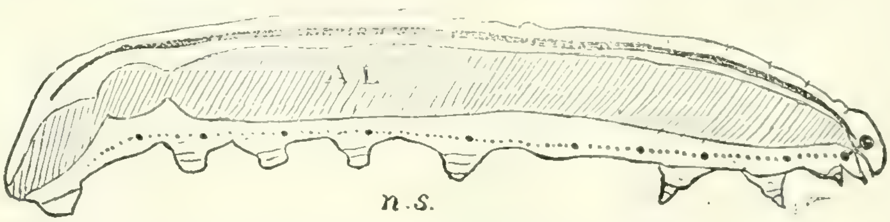


Fig. 45. Longitudinal Section through Caterpillar.

SENSES.

Insects have well developed senses of taste, smell, hearing and sight. They have also well developed digestive, nervous, circulatory, and respiratory systems.

It is next to impossible to determine exactly the functions of certain sense organs in insects. The organs for seeing, hearing and for producing sound can be recognized by their structures, and by experiment, but there are others of which it is not so easy to determine the function

The sense of taste is probably located in the small appendages of the mouth parts, the senses of smell and hearing are, in some insects at least, in the antennae, which are often the most conspicuous appendages of the head. Special organs of hearing are sometimes (in certain Orthoptera) to be found on the abdomen and legs. The sense of sight depends on the eyes, which are of two kinds, simple and compound. The compound eyes are often made up of many facets and are located at the sides of the head, while the simple eyes, or ocelli, are situated between them, either on the top or the front of the head.

The simple eyes of insects are not always present, but when they occur, they are two or three in number. The compound eyes are perhaps the most complex and delicate structure in the insect world.

In many instances, the compound eyes occupy by far the greater part of the entire surface of the head, and the number of elements or 'facets' which go to make up one of these compound eyes often runs to many thousands, although sometimes it is small.

It is not likely that insects have power of vision over long range, or that they see distinctly. They are all conscious of light and darkness, and some of them distinguish certain colours; many of them distinguish moving bodies, and others, perhaps, recognize at greater or less distances those insects on which they prey, or insects or birds to which they are likely to fall a prey.

CIRCULATION.

The arrangement of the circulatory, digestive and nervous systems in insects is a typical characteristic. The alimentary canal is central in position; the organ of circulation is dorsal, and on account of its position, has received the name of dorsal vessel; the nervous system is ventral. The diagram (Fig. 45) represents a median longitudinal section through the body of a caterpillar. The dorsal vessel is represented by the dark line, the digestive section (A L) by the cross-shaded portion, and the nervous system by the dotted lines. The blood of insects is not confined in veins, arteries and capillaries, as is the case in the higher animals; it fills the body-cavity and bathes all the organs, even penetrating into the legs and wings. It is usually colourless, but is sometimes inted yellowish, green, and even red, but does not get its red colour from red corpuscles, and it is not red blood in the same way as is the blood of the higher animals.

The organ of circulation is the heart or dorsal vessel. It is, as has been said, called the dorsal vessel because of its position in the body, lying as it does along the median line of the back, just under the body wall. The heart is a straight, unbranched, tubular organ provided with muscles extending from the hind end of the body to the head; it is generally closed at the posterior end and open at the anterior one. The portion lying within the abdomen is constricted at intervals, and at each constriction there is a valve. These valves divide the dorsal vessel into compartments or chambers. By means of a rythmic contraction and expansion of the walls of the dorsal vessel, accompanied by a regular opening and closing of the valves, the blood is forced from the rear toward the head, to the long aorta-like portion of the dorsal vessel lying within the thorax. The chambers are provided with small openings which communicate directly with the body cavity, and through which the blood in the body cavity is taken into the heart and put into circulation.

The pulsations of the dorsal vessel and the movement of the blood in the body cavity can easily be observed in certain caterpillars The arrowroot worm, or canna leaf roller (*Calpodes ethlius*), is the best of our common West Indian insects for the purpose.

FUNGUS NOTES.

HOW FUNGICIDES SHOULD BE EMPLOYED.

The substance of the following article is taken from Bulletin No. 155 of the Bureau of Plant Industry of the United States Department of Agriculture entitled *The Control of Black Rot of the Grape*, by C. L. Shear, G. F. Miles, and L. A. Hawkins.

The disease is caused by a fungus, *Guignardia Bidwellii*, which produces dirty white spots on the grapes; these spread until the whole berry is shrivelled and becomes covered with minute black pustules which are the spore-bearing organs of the fungus. When the grapes are attacked in the early stages, they turn black and soon drop off. The disease also attacks the leaves and young shoots. The fungus can produce itself in two ways. During the summer small black pycnidia are formed under the skin of the diseased portions. These are more or less spherical, with a small beak-shaped opening, and in them white unicellular spores are produced, borne on the end of fine thread-like stalks. During the winter, an ascigerous form of fructification is produced.

One of the obvious methods to be employed for the control of this disease is the removal of all the fallen pieces of vine, leaves branches or fruits, during the winter, either by raking them up and burying them, or ploughing them in with a deep plough. The other is to keep the vines covered with a fine layer of fungicide until the grapes have reached maturity; that is to spray them well at suitable intervals.

Experiments were undertaken, in Pennsylvania, from 1906 to 1908, New York and Michigan, 1907 and 1908, and in New Jersey in 1908. The object of the experiments was to determine the best fungicide to employ under any given set of conditions, and the minimum number of applications that would keep the vineyards more or less entirely free from black rot. In addition to this, a careful account was kept of the increased profits obtained on sprayed plots, as compared with those obtained from unsprayed plots, and of the total cost of the spraying, in material and labour. By subtracting the cost of spraying from the gross additional profits, the net increase in profit derived from the sprayed plot was obtained.

Various strengths of Bordeaux mixture were tried, from a mixture containing 6 ℔. of copper sulphate and 3 ℔. of lime to every 50 gallons of water, to one containing 3 ℔. of copper sulphate and 2 ℔. of lime to the same quantity of water. In addition, rosin and whale-oil soap compound was added in some cases, in order to determine if the extra adhesive quality which it gave to the weaker mixtures was sufficiently effective to justify the additional trouble and expense. Various modifications of Bordeaux mixture made with sodium carbonate, and a mixture of sodium carbonate and sodium benzoate, instead of lime, were also tried, as well as other insecticides, such as various forms of lime-sulphur wash.

The percentage of rot present was determined by actually counting the number of diseased grapes in 1,000 average bunches from each of the plots under observation, and comparing this number with the average number of berries usually produced upon the same number of bunches.

On some of the plots, eight applications of fungicide were made, and on others five. Where eight were made, the first spraying was carried out when the vines were quite dormant, and continued at intervals of about ten days to a fortnight, until the grapes were nearly full grown. When there were only five applications, the first was made when the shoots were about 8 inches long, and the fungicide for the first application, was not quite so strong as that used when the vines were dormant. In all cases, a weaker Bordeaux mixture, or a non-staining fungicide such as neutral copper acetate solution, was used in the final spraying, to avoid injury to the grapes.

The following were some of the conclusions arrived at, as a result of these experiments. The Bordeaux mixture prepared with 4 ℔. of copper sulphate and 3 ℔. of lime to 50 gallons of water was quite as effective in preventing this disease as mixtures contain larger proportions of copper sulphate and lime. It was also found that when fresh stone lime is used, 3 ℔. of lime is ample to more than neutralize 4 ℔. of copper sulphate, and this quantity is preferable; as, according to recent investigations, excess of lime is likely to prove a disadvantage. None of the other mixtures tried were as successful as Bordeaux mixture, though neutral copper acetate and ammoniacal solution of copper carbonate were valuable as non-staining fungicides for final spraying. The first of these is made by dissolving 1 ℔. of neutral copper acetate in 50 gallons of water, and the second by mixing 5 oz. of copper carbonate and 3 pints of ammonia solution with 50 gallons of water. The addition of rosin and whale-oil soap compound to weaker Bordeaux mixtures was not of sufficient advantage to justify the extra expense. Lime-sulphur washes in the proportions generally employed were not as effective as Bordeaux mixture, and were found to cause severe scorching of the foliage.

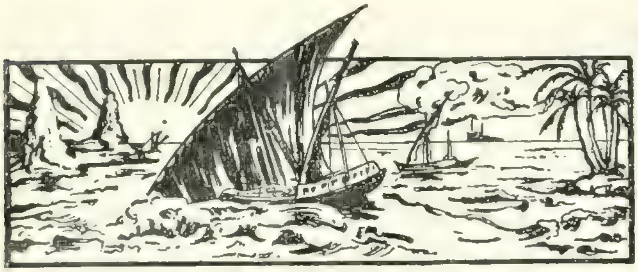
Five applications of fungicide were sufficient, beginning after the shoots were about 8 inches long. There was no additional advantage to be derived from an earlier application.

Where unsprayed grapes were a total loss in 1907, the rot on sprayed plots was reduced to 28·3 per cent. In the next season, when the rot was equally bad on unsprayed vineyards, the rot on sprayed plots was reduced to much less than 1 per cent. This indicates the cumulative effect of the spraying. The net profits, after deducting the expenses of labour and materials, showed an increase of \$10·60 to \$62·30 per acre over unsprayed plots, and this does not take into account the very considerable improvement in the general health of the vines which would become more manifest in succeeding seasons.

In carrying out such experiments, the materials must be thoroughly and carefully mixed, the best method being to well mix the lime, and to completely dissolve the copper sulphate before adding them to one another.

Another very important point is the necessity of thoroughly covering the plants sprayed with a thin film of the fungicide. This necessitates careful application, and when the plants are leafy, a movable nozzle on the end of a hose pipe must be employed, so that it can be manipulated by hand and directed on to all parts of the plant. It is only by very careful attention to these points that reliable results can be obtained.

The chief conclusion to be drawn from the above experiments is that, if spraying is to be successful, definite knowledge is necessary on the following points: (1) the best fungicide to employ, (2) the best proportions in which its ingredients should be mixed, and (3) the minimum number of applications that can be profitably made. These points can only be determined by carefully organized field-work.



GLEANINGS.

The number of bales of cotton imported into the United Kingdom during the present year, to September 23, was 24,867. This included 6,158 bales of British West Indian cotton.

During the year ending March 31, 1909, 91 packages of seeds, bulbs, cuttings, etc., as well as 12 bags of Sea Island cotton seed were fumigated at the St. Lucia Botanic Station.

An International Agricultural Exhibition is advertised to be held at Buenos Aires in June and July, 1910. Communications relating to this should be addressed to the Secretary, 316 Florida, Buenos Aires.

The cultivation of Sea Island cotton has been introduced into the French possessions in the Society Islands. It is now proposed to grow a certain amount of Egyptian cotton, as well. The amount of the former kind produced in these islands last year was 300 bales of 400 lb. each.

According to a recent Colonial Office Report on the Trade of Sierra Leone, it has been shown by experiment that the ochro plant, if cultivated on a large enough scale will yield a fibre which will fetch a higher price than jute. Plants which are cut at the end of two-thirds of their natural life give a fibre which is worth £20 a ton.

At the Botanic Gardens, St. Vincent, live posts of the Madura (*Gliricidia maculata*) have been substituted for the plants of the physic nut (*Jatropha Curcas*) in consequence of the deceased condition of the latter, which was used as a support of the vanilla. The growth of the vanilla has improved in consequence.

The *West India Committee Circular* states that the Burma Sugar Refining Company has been incorporated at Rangoon, under Government encouragement, with a capital of $324,400; it will acquire land for plantations, and erect a sugar refinery. In 1908, 13,452 acres were planted in sugar-cane in Burma, the average yield being 30,000 lb. of cane per acre. The cost of cultivation is estimated at $11 per acre, of which one half is for seed cane.

The present forest area of the United States of America consists of about 550 million acres. Of this, 200 million acres are mature forests, 250 million partly cut or burned over, and 100 million more severely cut and burned over. The annual growth of the forest, taken as a whole, does not exceed 12 cubic feet per acre; this is a total of less than 7 billion cubic feet. (The *Board of Trade Journal*, September 9, 1909.)

The world's consumption of camphor in 1907 was estimated at 10,600,000 lb. About 70 per cent. of this was used in the manufacture of celluloid; 15 per cent. in the preparation of disinfectants; 13 per cent. in medicinal and pharmaceutical preparations; and the remaining 2 per cent. in the manufacture of explosives. To this amount Formosa contributed 5,388,918 lb.; the remainder came from other Japanese islands and from China. (*Agricultural Bulletin of the Federated Malay States*, Vol. VIII, No. 8.)

According to the results of analysis which are given in the *Natal Agricultural Journal*, Vol. XIII, No. 2, the edible portion of the avocado pear has the following percentage composition: water 82·1, protein, 1·2, fat 8·7, sugar 2·9, cellulose and undetermined matter 4·6, ash 0·5. Starch and tannin are not present. It is stated that the fat is a green, aromatic oil, with an odour like that of laurel oil, and that it solidifies at 15° C. A reducing sugar was found in the fruit; that which exists in the seed is not of the same kind.

In the *Bio-chemical Journal*, Liverpool, a note is published by Dr. A. C. Hof on the action of iodo-eosin as a test for free alkalis in dried plant tissues. To obtain the substance required, an alkaline solution of iodo-eosin is treated with an excess of acid, and the resulting dye-acid is dissolved in ether. This indicator gives a red colour in vegetable tissues containing free alkali, and preparations in which it has been employed may be mounted in neutral Canada balsam. It is suggested that it may be found useful in investigations of the alkalinity of the tissues of sugar-cane grown in calcareous soils.

In Ceylon, a great deal of damage is being done to tea plants by a beetle known as the shot-hole borer. An attempt is to be made to reduce the numbers of this by the introduction of a predacious beetle (*Clerus formicarius*), which has been well proved in the United States to be an enemy of such insects. It is not certain, however, that the experiment will be successful, as *Clerus formicarius* belongs to the temperate zone, and there is some doubt as to whether it will thrive in the tropics. An insect similar to the shot-hole borer is also reported to attack camphor plants in Ceylon. (The *Tropical Agriculturist*, Vol. XXXIII, No. 3.)

The death is announced of Professor John Scott, on October 11, 1909, aged 63 years. Professor Scott was well known as a Consulting Agriculturist and an Agricultural Engineer. In 1882, he resigned the Professorship of Agriculture and Rural Economy at Cirencester, and accepted a commission to proceed to the Western States of America to report on the large area of grazing land there. Several useful agricultural hand-books were published by Professor Scott, and for some time he edited the *Farmer's Gazette* (Dublin), the *Scottish Agricultural Gazette* and the *Farming World*, the two latter being now merged in the *Scottish Farmer*. He was one of the pioneers of implemental tillage, using motors, in England, and held several patents in connexion with this.

STUDENTS' CORNER.

INTERMEDIATE AGRICULTURAL EXAMINATION.

The examination was held on November 1 and 2; at some centres, it was found convenient to take part of it on a day after this. The results, which are complete, with the exception of those from St. Lucia, are as follows:—

	Name.	Centre.	Satisfactory Special Subjects.
FIRST CLASS.	J. L. Cozier	Barbados	Sugar Cotton
	C. A. O. Phillips	Grenada	Cacao Provision crops
	W. I. Howell	St. Kitts	Sugar Cotton Provision crops
	H. H. Walwyn	,,	Cane cultivation Cotton
SECOND CLASS.	C. J. A. Hallpike	Antigua	Cane cultivation Cotton
	L. W. D. H. à Court	,,	Cane cultivation Provision crops
	J. T. Gairy	Grenada	Cacao Mus'vadomethod
THIRD CLASS.	W. F. Gore	Antigua	Cane cultivation Cotton
	E. O. Malone	,,	Cane cultivation Cotton

The number of candidates who sat for the examination was eleven. Of the two whose names do not appear in the above list, one is required to pass a satisfactory examination in one additional crop subject, and the other must do the same for General Agriculture and one crop subject, before being granted a certificate.

It is to be clearly understood that the different classes, in which candidates have passed, refer alone to the state of their general knowledge; the classes are not intended in any way to designate their standing in regard to any special crop.

The examinations at the different centres were conducted by:—

Hon. A. St. G. Spooner Mr. R. S. D. Goodwin ,, H. A. Tempany ,, T. Jackson	Antigua
Hon. F. J. Clarke Mr. J. R. Bovell Dr. Longfield Smith	Barbados
Hon. W. G. Lang Mr. G. F. Branch	Grenada
,, C. F. Todd ,, R. A. Hardtman ,, G. G. Auchinleck ,, F. R. Shepherd	St. Kitts

In St. Lucia, owing to changes that have taken place recently in the personnel of the Agricultural Department, the oral examination has not yet been held. Now, however, that Mr. J. C. Moore, the Agricultural Superintendent, has returned, arrangements will be made for it. At the written examination, Mr. T. L. Marshall, Acting Agricultural Superintendent, and Mr. S. Moffat, owner and manager of Morne Lazare cocoa estate, Choiseul, presided; while Mr. H. A. Ballou, Entomologist to the Department, was present at its opening.

The paper on General Agricultural Science contained twelve questions, of which not more than eight had to be attempted, including either question eleven or question twelve; both of these related to insects. Broadly speaking, this paper dealt with the following subjects: the preparation or uses of certain manures; the feeding of stock, cultivation of the soil; drainage of soils; the hoof and shoeing of the horse; the life-history of fungi and insects.

In the Special Crop Subjects, there were five divisions: Sugar Industry, Cacao, Limes, Cotton and Provision Crops. Eight questions were set in each (all or any of which might be attempted), with the exception of Sugar Industry. This subject was divided into three parts: General, Muscovado Method and Vacuum Pan Method. In each of these parts, there were four questions, making twelve altogether, eight of which, however, had to be answered. This was in consequence of the arrangement by which candidates had to choose questions either on the Muscovado Method, or on the Vacuum Pan Method; in no case could both be taken.

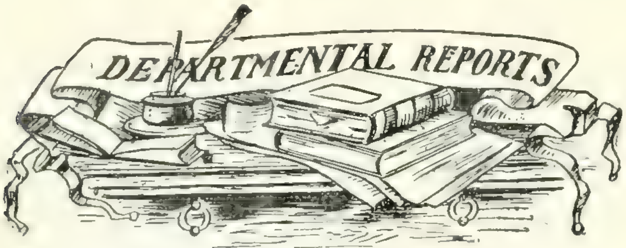
Considering the questions in Sugar Industry alone, these included: cane planting; cane varieties; manuring; root disease; and cane cultivation. In the muscovado method, they dealt with tempering; qualities of the juice; boiling; and general definitions. A knowledge of the following was required for the paper on the Vacuum Pan Method: the construction and work of the triple effect; maceration; the relation between the fibre content of the cane and the extracted sucrose: the outline of the manufacture of 96° dark crystals; and general definitions.

In the papers on Cacao and Limes, information relating to the following subjects was asked for, in the case of one or both of these crops: manuring; treatment of the trees; the treatment and disposal of the product; diseases and insect pests; the picking or collection of the fruit. That on Cotton included: seed selection and disinfection; insect and fungoid pests; the prevention of the spread of disease; the uses of cotton seed; the preparation of land for planting, and the care of the plants until such time as they become established; and the actual examination of the lint for quality. The paper on Provision Crops contained questions on most of the plants that are mentioned in this part of the syllabus, and they were concerned with: varieties; seed selection; preparation and cultivation of land for crops; plant products, their origin and preparation; insect and fungoid pests; and the broad relationships of plant groups.

In all cases, the questions were of such a nature as to give the candidate scope for showing his knowledge of the theoretical considerations underlying the facts, and his ability to benefit in practice by the possession of such knowledge. They could not be answered satisfactorily by the mere acquirer of information.

The price of Broom Corn in the United States.

The trade papers of the United States and Canada announce that the crop of broom corn is short in many of the States from which the supply is secured by broom makers in both countries. It is stated that, whereas the western crop was expected to be 40,000 to 45,000 tons, it may actually reach about 10,000 to 15,000. Buyers are thus alarmed, and prices have gone up from \$85 to \$200, and may even reach \$400, per ton. This suggests that those who are interested in broom corn in the West Indies might quickly put in a crop, and take advantage of the high prices, before another can be raised in the United States.



MONTSERRAT: REPORT ON THE BOTANIC AND EXPERIMENT STATIONS, 1908-9.

The expenditure for the year was £552 11*s.* 6*d.*, of which £541 4*s.* 9*d.* was from Imperial, and £11 6*s.* 9*d.* from local, funds.

The number of plants and cuttings distributed was 9,321 and 117,067, respectively; besides these, a large quantity of seeds was sent out. Chief among the plants were limes and the papaw, and among the cuttings, sweet potato and cassava; the seeds were, for by far the greater part, those of leguminous plants, such as white pigeon peas and cowpeas, horse beans and sesbania.

In the cotton seed selection experiments, trials were made with Rivers, Stirling and Gilbert's seed. A report by Mr. Wolstenholme on the lint from the selected plants showed that the best was from the Stirling variety, which was lustrous, fine and strong, and of fair length; the second best from this variety was said to have a staple wanting in fineness and rather brittle. The best lint from the Rivers type was reported to be strong and of good length, while that from the Gilbert's type had the longest staple, but had a tendency to weakness. The produce from all these has been used to form nurseries in the next year.

The trials with American varieties of ground nuts were not satisfactory; they will be continued, however, as better results are expected after acclimatization. Experiments were made with two kinds of lemon grass—West Indian (*Cymbopogon citratus*) and Cochin (*C. flexuosus*)—and good yields were obtained from most of the plots. The general result of two years' investigations with the local and Columbian varieties of cassava has been that better yields have been obtained with the former than with the latter.

At the Harris's Station, two years' trials with Porto Rico, Dominica and local varieties of eddos have shown that these give very similar yields of tubers per head, though 'Rolliza,' from among the Porto Rico kinds, and 'Barbados', of those from Dominica, show a superiority to all the others. The plots on which bananas have been grown since 1906, without the introduction of fresh suckers, have demonstrated the effect of pen manure in producing an improved yield.

The season was an unfavourable one for the cotton industry, chiefly owing to the weather conditions; the total export of lint amounted to 238,959 lb., of a value of £12,000. The prices received ranged from 1*s.* 0½*d.* to 1*s.* 2*d.*; that they were not higher was due to the depressed state of the market. The crop raised by peasants was represented by 200,719 lb. of seed-cotton.

An experiment is being conducted in one of the lime fields of the Montserrat Lime Juice Company for the purpose of gaining information as to the best method of cultivation for this plant. It is only in its initial state, as one crop of limes has, so far, been reaped. Up to the present, the results are in favour of clean cultivation as against cutlassing alone, forking twice a year and cutlassing, forking twice a year and ordinary cultivation, and ordinary cultivation alone.

The effects of Paris green and lime, and lead arsenate, in relation to their use as insecticides for caterpillars and to their employment on leguminous plants, were tried. Both were successful in destroying caterpillars, but even the weaker mixtures of the former with lime caused more or less 'scorching' of the leaves, while damage from lead arsenate only occurred when it was used in an unmixed state, and then was only slight.

BRITISH HONDURAS: REPORT ON THE BOTANIC STATION, 1908.

The number of plants distributed during the year was 6,157; more than half of these were of logwood. Para rubber seeds to the number of 12,000 were imported from Singapore, in response to a special order. These were sown in the nursery, as well as 2,000 cocoa-nuts from selected trees, for subsequent distribution of the plants. The demand for plants, chiefly those which are ornamental, has fallen off, probably as a result of the recent removal of the Station to a new site.

In spite of the fact that the last two years have been exceptionally dry, good results have been obtained, among minor crops, with pigeon peas (received from the Commissioner of Agriculture for the West Indies), yams, arrowroot, cotton and velvet beans. The Superintendent of the Botanic Station made several visits to estates for the purpose of giving advice, more especially in connexion with cacao, rubber and cocoa-nuts.

The report states that the old logwood industry of British Honduras has now fallen to a very low place in the list of the Colony's agricultural exports, and that careful consideration is required in the matter of finding something to take its place. In the northern districts, the cutting of logwood used to be the chief occupation, and the trees grew wild and plentifully at one time, but are now scarce. This scarcity is simply due to the facts that nothing was done toward raising new plants and that no protection was provided for the self-sown seedlings; thus the trees died out in many places.

The report further states that good land is readily available, high up the Belize river, for the raising of such plants as bananas, cacao and rubber, but that, in spite of the fact that produce can be carried cheaply and easily by motor boat from this district to Belize, there are as yet, no important plantations on the river. Cocoa-nuts have been in good demand, in the American market, for some time, but little has been done to increase the supply, and some of the plantations have suffered from drought.

Colonial Fruit Show in December.

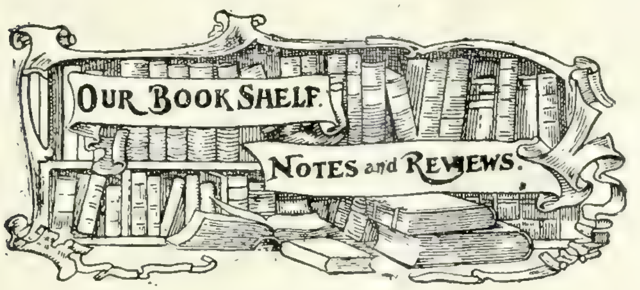
The date of the Royal Horticultural Society's coming Colonial Show is December 1 to 4. The schedule contains many improvements on those in previous years, as a result of the Society's continuous experience in the special requirements of Colonial fruit exhibitions. The chief classes are as follows:—

(1) Collection of fruit and vegetables, fresh and dried.
(2) Collection of fresh fruits and vegetables.
(3) Collection of dried fruits and vegetables.
(4) Collection of nuts, spices, and such-like.

The medals of the Society will be awarded at the discretion of the Council.

Another section of the schedule provides for exhibits of preserved fruits, etc.

A lecture will be given at 3 p.m. on the first day (December 1) by Mr. Robert Newstead, A.L.S., F.E.S., on 'West Indian Insect Pests'. (*Tropical Life*, October, 1909.)



CANE-SUGAR AND ITS MANUFACTURE. By H. C. Prinsen Geerligs, *Norman Rodger, Altrincham.*

The opening sentences of the preface of this book define its scope completely and succinctly. They are: 'The aim of the present work is to compile in one book everything that is known about the chemistry and the technology of the sugar-cane and cane-sugar manufacture.' It is due to the author to say, at once, that he has fulfilled that aim admirably—in a way, in fact, for which there can be nothing but praise. Part of his success is due to the elimination of details of a technical nature relating to machinery; thus the clearness of his treatment of the subject is not lessened by the inclusion of a part of it which has been amply dealt with in other works. This is a small consideration, however, in comparison with the extent to which the value of the book is enhanced as a result of the long experience and the thoroughness of the work of the author himself.

In its general plan, the book is divided into two parts, the first of which deals with the sugar-cane itself, and the second with the manufacture of sugar from its juice. As would be expected, the length of the former of these is the smaller; it contains two chapters, one on the constituents of the sugar-cane, and the other on the proportion and distribution of these in the plant. In the second part, there are five chapters, the first four of which may be said to deal with the history of the juice in the factory, while the fifth is concerned with a side issue—that of molasses. Turning again to the first part, the first chapter naturally consists of statements of facts, with little discussion; and the particularized aspects of these facts are presented in well tabulated form. There is more room for theoretical considerations in the second, and it is here that illustrative tables reach their greatest number in relation to the textual matter of the book. In relation to tables, it may be conveniently said at this stage that these are excellent throughout; their scope is wide, their arrangement handy; they contain few errors, and the publication of them alone would have given a valuable book of reference.

As has been indicated already, the first chapter of the second part commences the history of the juice in the process of the manufacture of sugar; it is therefore concerned with mills, diffusion, and the composition and uses of megass. The second chapter presents the matters relating to clarification and decolourization of juices in a very clear and useful manner, and a strikingly thorough résumé is given of the many methods of effecting these, with the theoretical aspect, and advantages and disadvantages of each. The concentration of the clarified juice for the removal of the sugar forms the subject-matter of the third chapter, and the calculations to which this part of the process necessarily gives rise are made simply and clearly. The curing of sugar and its preservation during storage and transport (Chapter IV) are presented in the spirit of thoroughness that characterizes the book, and there does not appear to be any problem which may arise in connexion with this troublesome part of the process that does not receive due and proper consideration. The same remarks apply to Chapter V, which, as has been stated, is devoted to molasses, the theories in regard to the formation of which, as would be expected from the author's illuminating work on the subject, are presented in a particularly clear and interesting manner.

Readers might, perhaps, have been grateful to the author had he included a few more chemical formulae and equations in the introductory parts dealing with the chemistry of sugar and associated bodies; but throughout the book, the business requirements of the manufacturer have been rather in view, so that there is little ground for complaint. What strikes the reader at every turn is the highly scientific character of the work, coupled with a sound, practical, rational manner of discussing manufacturing processes; the recommendations concerning methods eliminate all those of doubtful utility, leaving the reader in possession of an array of carefully considered suggestions for practical guidance, such as he is unlikely to find elsewhere in so compact and handy a form.

Although the work will find application principally in those countries where sugar is made in large factories (and these embrace by far the greater part of those producing sugar), still there is much that will prove of interest and value to those who are engaged in the manufacture of muscovado sugar in the West Indies. Particularly would we recommend to such readers the study of the effect of lime on the juice, on the sugar, and on the resulting molasses (Part II, Chapter 2), as tending to afford a clear insight into matters of importance, and explanations of some phenomena hitherto obscure. Those who are interested in muscovado sugar will also find instructive reading in connexion with fermentative and other changes of sugar and molasses, and also useful information concerning the puzzling froth fermentation which has recently engaged attention in these islands.

To term this excellent work merely a book of reference would be to do scant justice to its author. It is so essentially readable, so essentially the lucid exposition of the results of the life-work of its authoritative writer, coupled with his discriminating appreciation of the work of others, that no one who is seriously interested in the subject with which it deals can afford to be without it. In such circumstances, it is gratifying to be able to say that the manner in which it is published is clear, useful and attractive, and one which is worthy of its admirable contents.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach Parker & Co., of Georgetown, on the rice industry of British Guiana, dated November 12, 1909, gives information as follows:—

The weather during the fortnight has continued dry, and suitable for reaping and milling.

Rice is coming to town freely, and shipments to West India islands amounted to 1,950 bags during the fortnight.

We quote to-day, f.o.b. Demerara for good export quality:—

Nominally 18*s.* 3*d.* to 19*s.* 3*d.* per bag of 180 lb. gross.
16*s.* 9*d.* to 17*s.* 9*d.* ,, ,, ,, 164 lb. ,,

MARKET REPORTS.

London.—The West India Committee Circular, November 9, 1909; Messrs. E. A. de Pass & Co., October 29, 1909.

Arrowroot—$1\frac{3}{4}d.$ to $3\frac{3}{4}d.$
Balata—Sheet, 2/6; block, 1/11½ per lb.
Bees-wax—£7 15s. for fair.
Cacao—Trinidad, 52/- to 62/- per cwt.; Grenada, 50/- to 55/- per cwt.; Jamaica, 47/- to 52/-.
Coffee—Jamaica, 40/- to 116/6.
Copra—West Indian, £23 10s. to £23 15s. per ton.
Cotton—No quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet; common to good common, 42/- to 48/- per cwt.; low middling to middling, 48/- to 53/-; good bright to fine, 54/- to 65/-.
Honey—25/- to 32/6.
Isinglass—No quotations.
Lime Juice—Raw, 1/0½ to 1/1 per gallon; concentrated, no quotations; Otto of limes, 5/9.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—Quiet.
Pimento—Common, $2\frac{1}{8}d.$; fair, $2\frac{1}{4}d.$; good, $2\frac{3}{8}d.$ per lb.
Rubber—Para, fine hard, 8/4, fine soft, 7/2; fine Peru, 8/3 per lb.
Rum—Jamaica, 2/8 to 6/-.
Sugar—Crystals, 15/- to 16/6; Muscovado, 12/3 to 15/-; Syrup, 14/6 to 14/9; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., October 29, 1909.

Cacao—Caracas, 11¼c. to 12c.; Grenada, 11½c. to 11¾c.; Trinidad, 11½c. to 12c.; Jamaica, 9½c. to 10½c. per lb.
Cocoa-nuts—Jamaica, select, $35·00 to $36·00; culls, $20·00; Trinidad, select, $33·00 to $34·00; culls, $19·00 per M.
Coffee—Jamaica, ordinary, 8¼c. to 8½c.; good ordinary, 8¾c. to 9c.; and washed, up to 11c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, 58c. per lb.; Barbados, 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 48c. to 50c. per lb.; Antigua, 50c. to 52c., dry flint.
Grape Fruit—$1·75 to $2·37½ per box.
Limes—Dominica, $4·00 to $5·00 per barrel.
Mace—36c. to 40c. per lb.
Nutmegs—110's, 9½c. to 9¾c. per lb.
Oranges—Jamaica, no quotations.
Pimento—4⅝c. per lb.
Sugar—Centrifugals, 96°, 4·30c. per lb.; Muscovados, 89°, 3·80c.; Molasses, 89°, 3·55c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., November 13, 1909.

Cacao—Venezuelan, $11·50 per fanega; Trinidad, $11·25 to $11·60.
Cocoa-nut Oil—90c. per Imperial gallon, cask included.
Coffee—Venezuelan, 8c. to 9c. per lb.
Copra—$[illegible]·75 per 100 lb.
Dhal—$[illegible]·25 per 2-bushel bag.
Onions—$3·50 to $3·75 per 100 lb.
Peas—Split $6·00 to $6·25 per bag
Potatos—English, $1·25 to $1·50 per 100 lb.
Rice—Yellow, $5·00 to $5·25; White, $5·00 to $5·25 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 lb.

Barbados.—Messrs. Leacock & Co., November 22, 1909; Messrs. T. S. Garraway & Co., November 22, 1909.

Arrowroot—St. Vincent, $3·60 to $3·75 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Cocoa-nuts—$14·00.
Coffee—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
Hay—$1·00 per 100 lb., unsaleable.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—Strings, $2·75 to $3·25 per 100 lb.
Peas—Split, $6·00 per bag of 210 lb.; Canada, $3·40 per bag of 120 lb.
Potatos—Nova Scotia, $2·00 to $2·75 per 160 lb.
Rice—Ballam, $4·85 to $5·00 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, November 13; Messrs. Sandbach, Parker & Co., November 12, 1909.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·25 to $8·50 per 200 lb.	$9·00 per 200 lb., market dull
Balata—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	50c. per lb.
Cacao—Native	11c. to 12c. per lb.	12c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	$6·00 to $6·50 per barrel of 196 lb. Sales—scarce.	No quotation
Cocoa-nuts—	$12 to $16 per M.	$16 per M., peeled and selected.
Coffee—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	13½c. per lb.	13½c. to 13¾c. per lb.
Liberian	10c. per lb.	7c. per lb.
Dhal—	$4·15 to $4·20 per bag of 168 lb.	$4·25 per bag of 168 lb.
Green Dhal	$5·25 to $5·50	—
Eddos—	$1·32 per barrel	—
Molasses—Yellow	22c. to 25c.	—
Onions—Teneriffe	—	No quotation
Madeira	2¾c. to 3c. per lb.	3c. per lb.
Peas—Split	$6·40 per bag (210 lb.)	$6·40 per bag (210 lb.)
Marseilles	$4·00, over stock	$4·85
Plantains—	24c. to 50c. per bunch	—
Potatos—Nova Scotia	$2·50	$2·40 per barrel
Lisbon	No quotation	No quotation
Potatos—Sweet, Barbados	$1·20 per bag	
Rice—Ballam	$4·50 to $5·25	$4·75
Creole	$4·25 to $4·40	$4·00 to $4·50
Tannias—	$2·40 per bag	—
Yams—White	$2·40 per bag	—
Buck	$2·40 per bag	—
Sugar—Dark crystals	$2·40 to $2·50	$2·45
Yellow	$2·90 to $3·00	$2·80 to $3·[illegible]
White	$3·70 to $3·80	$3·60 to $3·[illegible]
Molasses	$2·00 to $2·30	$2·00 to $2·30
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is fifty-nine. The following list gives particulars of all the pamphlets which are still available. The missing numbers are out of print and can no longer be supplied :—

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Seedling and other Canes at Barbados in 1900. No, 3, price 2*d*.; in 1901, No. 13, price 4*d*.; in 1902, No. 19, price 4*d*.; in 1903, No. 26, price 4*d*.; in 1904, No. 32, price 4*d*.
Seedling Canes and Manurial Experiments at Barbados, in 1903-5, No. 40, price 6*d*.; in 1904-6, No. 44, price 6*d*.; in 1905-7, No. 49, price 6*d*.; in 1906-8, No. 59, price 6*d*.; in 1907-9, No. 62, price 6*d*.
Seedling and other Canes in the Leeward Islands, in 1900-1, No. 12, price 2*d*.; in 1901-2, No. 20 price 2*d*.; in 1902-3, No. 27, price 2*d*.; in 1903-4, No. 33 price 4*d*.; in 1904-5, No. 39, price 4*d*.; in 1905-6, No. 46, price 4*d*.; in 1906-7, No. 50, price 4*d*.; in 1907-8, No. 56, price 4*d*.
Manurial Experiments with Sugar-cane in the Leeward Islands, in 1902-3, No. 30, price 4*d*.; in 1903-4, No. 36, price 4*d*.; in 1904-5, No. 42, price 4*d*.; in 1905-6, No. 47, price 4*d*.; in 1906-7, No. 51, price 4*d*.; in 1907-8, No. 57, price 4*d*.

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British Guiana: THE 'DAILY CHRONICLE' OFFICE, Georgetown.
Trinidad: Messrs. MUIR-MARSHALL & Co., Port-of-Spain.
Tobago: Mr. C. L. PLAGEMANN, Scarborough.
Grenada: 'THE STORES', (Grenada) Limited, St. George.
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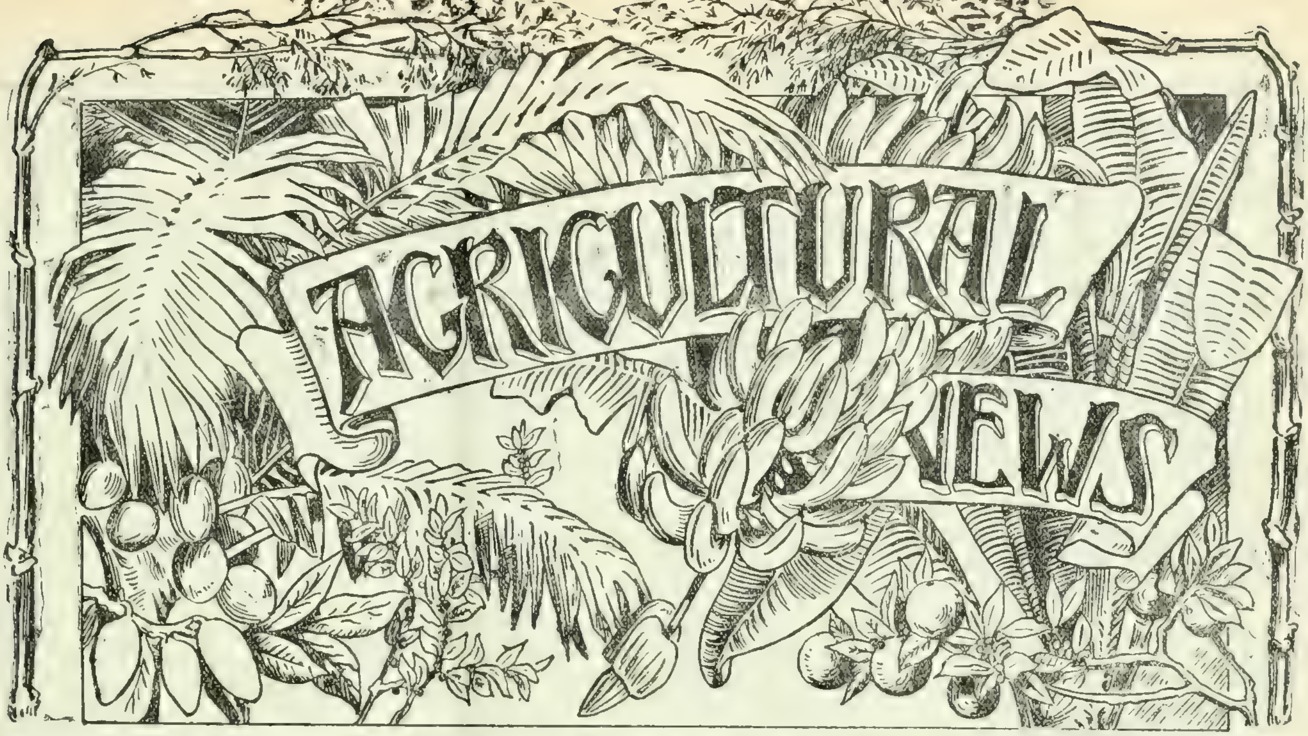

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OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Reading Courses and Examinations in Practical Agriculture.

THE Reading Courses and Examinations in Practical Agriculture, initiated and carried out by this Department, have now shown themselves to be worthy of permanent adoption, and has reached a stage at which two preliminary, and one intermediate, examinations have been held. Sufficient progress has, therefore, now been made to warrant our taking a retrospective view of the situation, and of giving some indication of the way in which the scheme will be planned to take effect in future. Any further advance must be made in the light of past experience, and the knowledge that has been gained will have its effect on future developments.

It will be remembered that the first suggestion for such a project was made by Dr. Francis Watts, C.M.G. (now Imperial Commissioner of Agriculture for the West Indies), at the West Indian Agricultural Conference held in Barbados in January 1908. In July of that year, the suggestion was taken up by the Department in a practical manner, and a scheme of reading courses in practical and scientific agriculture, together with a syllabus of examinations for certificates of competency, was prepared and embodied in a leaflet issued by the Department, the principal contents of which appear in the *West Indian Bulletin*, Vol. IX, pp. 293-6.

This leaflet was designed to be of special use to candidates for the examinations. It contains a detailed syllabus of the subjects that are required to be taken up for each part, together with hints as to what books should be read in connexion with them. In addition, the names of these books are brought together in a list (see also *Agricultural News*, Vol. VII, p. 267), which gives the price and publisher of each. Particular attention is drawn to the leaflet, because it is an indispensable reference guide for candidates.

For the purpose of assisting students in reading and in making the practical observations without which scientific agricultural reading is useless, a small space has been reserved in each issue of the *Agricultural News* since October 31, 1908, under the heading of Students' Corner. Its scope is indicated in the words of the introductory article: 'In this space there will be put forward hints and suggestions concerning the various objects of study and observation together with questions which students should endeavour to answer. Notes on seasonable events of agricultural importance in the different colonies will also be a frequent feature in this column.'

It was evident that this was the limit of the extent to which the Department could put forth efforts for the direct assistance of the students. Circumstances do not admit of the preparation by it of manuscript articles on special subjects, the correction of test papers, or the provision of model answers to questions. The suggestion was therefore made that students should find, at the various centres in the different colonies, persons who would give them assistance in reading and in answering questions. It was also recommended that, in any case, students residing in a particular district should meet together for the purpose of comparing views and experiences of agricultural matters, and of affording mutual aid.

As the scheme was new, and as there seemed to be a need of assistance at its commencement, the Officers of the local Department of Agriculture in some of the islands organized series of meetings, for the benefit of students, at which the proceedings were of the nature of discussions of agricultural subjects, rather than of formal lectures on them. At the same time, students were encouraged to attempt the questions appearing in the *Agricultural News*, and were provided with model answers to those in which the greatest weakness was shown. Much good and useful work has been done in this way by Officers of the Department, assisted willingly by others who are interested in agricultural matters, but, although this voluntary aid has been accepted with gratitude, it is hoped that students, while exercising their claim to obtain help in connexion with any particular agricultural subject from the Officers in the place where they reside, will realize the desirability of arranging their own lines of definite study.

The first preliminary examination was held in Antigua and St. Kitts, on February 15 and 13, respectively, of this year. Altogether, fourteen candidates presented themselves, and, of these, nine were successful in passing the examination (see *Agricultural News*, Vol. VIII, p. 90). The figures, similarly, for the second preliminary examination, held in Antigua, Barbados, Dominica, Grenada, St. Kitts, St. Lucia and St. Vincent on October 11, 1909, were twenty and fifteen. (*Agricultural News*, Vol. VIII, p. 341.) The series of Intermediate Examinations was initiated by one which was held during the first few days of last month. Candidates were presented at five centres—Antigua Barbados, Grenada, St. Kitts and St. Lucia; the total number was eleven. The results, with the exception of those from St. Lucia, where the oral examination has not yet been held, are given on page 381 of the current volume of the *Agricultural News*.

From the information that has just been given, it is manifest that an increasing interest in the scheme is being taken, and that it has shown itself to be useful and valuable. Many of the papers sent up by the candidates at the examinations are of a very encouraging nature, and show that, in their case at least, there was only needed the inducement that has been given by the Department for them to put themselves in the way of gaining an orderly and methodical view of the ideas and principles underlying their work.

The essentially practical nature which has been given to the intermediate examination arises from the desire to make it a useful index of the efficiency of the candidate in the position which he holds, whether on an estate or under an agricultural department. This would not have been possible to such an extent as is the case if the examiners had been none other than the Officers of the Department. It has been made so by the willing co-operatian and aid of some of the planters themselves in the different islands, who have consented to act as examiners and have given the examination a value which is derived from the fact of their practical experience. In this way, a useful check to any tendency to a too academic treatment of the scheme has been provided, and the sympathy of the planter has been gained in an effectual manner.

As has been shown already, the interest in the scheme has quickly increased, so that from a preliminary examination that was held in two islands, only, progress has been made to one which has included most of those which are of importance in the Lesser Antilles; and yet, only two of these examinations have been held. There are indications that the same, or a similar, scheme will be adopted in some of the larger islands in the West Indies, and this fact should help to encourage those who have already been brought into intimate connexion with it to continue their efforts. One of the strongest arguments on its behalf, for the planter, should be that it is a means of adding to the efficiency of the intermediary that he employs to act between himself and the labour of which he makes use. On the part of those who are responsible for its organization, it seems, certainly, worthy of continuation, and their past experience has been useful in suggesting several future modifications which will bring it into still closer correspondence with the needs that it is designed to serve.

SUGAR INDUSTRY.

THE SUCROSE CONTENT OF STORM-BROKEN CANE.

In the last number but one of the *Agricultural News*, (No. 197), reference was made to the behaviour of the cane D. 74 in the storm which passed over Louisiana in September. Further information with regard to the effect of breakage on the sucrose content of the growing cane is given in a report which was made on the subject by the Assistant Director of the Louisiana Sugar Experiment Station. This report appears in a recent number of the *Sugar Planters Journal*, and from it the following abstracts are taken:—

At the time of the severe storm of September 20, there were wild rumours of great disaster to the cane-crop. It is now realized that the damage done was far less than was at first thought. In a report from the Sugar Experiment Station on October 2, based upon actual counts of broken cane in several sections of the sugar belt, it was estimated that the damage to the cane-crop as a whole was slightly less than 3 per cent. Practically all of this 3 per cent. damage occurred in those fields which were planted in the D.74 cane. There were presented, in the same report, data from actual plantation conditions, which showed this seedling to be a vastly superior variety to the Louisiana Purple. Calculations indicated that, even in spite of the hurricane, fields that were this year in D. 74 would give better yields of sugar to the acre than those planted in the home varieties. In making these calculations, where data were available, only thoroughly reliable figures were used. It was necessary, however, to base certain parts of the report on estimates, and in doing this, an effort was made to be as conservative as possible. For instance, the question arose as to what would be the ultimate sucrose content of those stalks which had been broken off by the wind. Some predicted that there would be a significant deterioration in the sugar content held by these canes at the time they were snapped. No figures from past experiences were obtainable on this point; nevertheless, it was thought safe to assume that whereas there might be no increase in sugar, there would be no appreciable diminution of that which was already held. Consequently, these broken stalks were estimated as having 50 per cent. of the value of unbroken ones.

Now, however, it is possible to give data on what has taken place, as regards sugar content, in the canes that were broken. Immediately after the storm, it was decided to conduct a series of laboratory tests which would indicate, from week to week, the increase or decrease of sucrose in juice of the damaged stalks. The results were as follows:—

Date.	Sept. 22.	Sept. 25.	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 26.
			BROKEN PLANT CANES.			
Brix	12·88	12·15	12·97	13·43	12·93	12·50
Glucose	3·22	3·01	2·72	2·51	2·38	2·34
Sucrose	8·60	8·63	9·19	9·85	9·35	9·00
Purity	66·6	71·0	70·8	73·3	72·3	72·0
			SOUND PLANT CANES.			
Brix	12·48	12·15	11·54	13·23	13·93	14·50
Glucose	3·33	3·73	2·66	2·57	2·15	2·02
Sucrose	8·05	8·28	8·88	9·64	10·68	10·80
Purity	64·5	68·1	77·0	72·9	75·9	74·5

Date.	Sept. 22.	Sept. 25.	Oct. 6.	Oct. 13.	Oct. 20.	Oct. 26.
			BROKEN RATOON CANES.			
Brix	13·35	12·89	13·66	13·93	14·03	13·30
Glucose	2·53	2·55	2·19	1·98	2·08	1·90
Sucrose	9·26	9·24	10·06	10·79	10·53	9·9
Purity	67·1	71·8	73·6	77·4	75·0	74·4
			SOUND RATOON CANES.			
Brix	12·35	14·54	14·04	14·50	15·63	13·80
Glucose	2·89	2·55	2·22	2·19	1·86	2·08
Sucrose	8·31	10·59	10·37	11·33	11·73	10·80
Purity	67·3	76·1	73·9	78·1	75·0	78·2

The only practical way of getting these data was to obtain them from small samples of cane taken from the field at intervals. The juice from five representative stalks furnished the material for each sample. Every chemist realizes the variation in sucrose content of individual stalks, and is aware that a small number of stalks only approximately represents the conditions of a field. But even with this to detract from the value of the results, the figures presented give a fair guide to what has taken place. In inspecting the sucrose column under broken canes in the table, it is seen that there was a steady increase up to October 13, twenty-one days after the storm, but that after this there was a decline. There has also been a slight decline in the purity coefficient. It is a significant fact that this decrease in purity has not been proportional to the falling off in sucrose; and that the glucose has also dropped off. This indicates that there has been no great deterioration in the juice of the broken cane.

The increase in sugar with the subsequent decrease may be thus explained. Shortly after the stalks had been broken there was a period of cool weather which checked the germination of the eyes, and promoted the ripening of the cane. With the warm weather which followed, these eyes sent out shoots which derived their food-supply from the juice of the stalk. Both sucrose and glucose have lessened in about proportional quantities. There has been but little increase in solids not sugars. The decrease in degrees Brix may be partially attributed to the dilution of the juice from heavy rains, and partially to a certain amount of solid matter having been utilized by the sprouting eyes.

The data obtained on ratoon cane substantiate in a general way the results obtained on plant cane, and serve to bear out the deductions made.

There are one or two discrepancies which occur in the data on ratoons. For instance, from October 20 to October 26, there is a decline in sucrose in the undamaged canes and at the same time a decline in total solids (Brix). This may be attributable to the rainfall of a little over 2 inches about the twentieth of the month. This would have likewise affected the plant cane, and the fact that a similar decrease is not noted in the plant canes is possibly due to this cane having ripened sufficiently to offset the dilution of juice by water taken from the soil.

No importance should be attached to the slight increase in Brix and glucose on broken ratoons between October 13 and October 20 which occurs simultaneously with a decrease in sucrose, as this discrepancy is certainly within the limits of the accuracy of sampling.

To summarize, there has been a decrease in sucrose in the broken canes since October 13, up to which time there was an increase. Up to October 26, thirty-four days after the storm, this deterioration had not offset the accumulation of sucrose which had taken place up to October 13.

Not only should the data prove of practical benefit, but they should present an interesting study for the plant physiologist to ascertain just what chemical changes occur in these crippled canes in their efforts to survive.

WEST INDIAN FRUIT.

THE RED SORREL.

The *Queensland Agricultural Journal*, September, 1909, gives the following interesting information concerning the cultivation of the red sorrel, roselle, or rosella (*Hibiscus Sabdariffa*). A note on this plant may also be found in the *Agricultural News*, Vol. VII, p. 244.

The rosella (*Hibiscus Sabdariffa*) is one of our most valuable fruits, and, from the standpoint of the thrifty housekeeper, few edibles in the range of domestic cookery lend themselves more usefully to the stocking of a housewife's cupboard. In growing the plants which produce this fruit, the most important matter to attend to, in the first instance, is to procure sound, fertile seed.

Any moderately good soil will grow rosellas well. Land with a clay subsoil, if the latter be near the surface, had better be avoided if cultivating on a large scale: but for a garden, where only a few trees are grown, the plant, with an average amount of attention, can be cultivated well enough to give returns sufficient to fill the cupboard for family needs, though perhaps not on so lavish a scale as if grown under more favourable conditions.

The shrub being hardy and, as a rule, fairly ornamental, given fair treatment, is calculated to adorn, and prove useful in, the kitchen garden no less than in the field.

For the ordinary kitchen garden, it will suffice to mark out a plot a few feet square and lightly cover the seeds, well watering them and keeping the plot free of weeds until the plants are about 6 inches high, and then to set them out in rows about 6 feet apart. If the grower is not disposed to start his seed from beds, the latter can be sown where the bushes are to remain, and thus the trouble of transplanting is saved; but the precaution must be taken to have a few spare plants to meet the contingency of having some destroyed by grubs or other causes, so that the vacant spaces can be filled up.

In the ordinary course of garden work, the transplanting is usually performed by the simple removal of the plants from the seed bed, without unduly tearing the tender root. A small hand fork for loosening the soil, so that the plant can be lifted in good order, is all that is needful. The plants having been raised, set them out in regular rows, and in good, fertile soil, giving due heed to the equal extension of the root fibres: this not only helps to hold the plant firm against strong winds, which often seriously affect the shrub when it is in vigorous growth, as it acquires a head considerably out of proportion to its foothold, but it also enables the roots to find more plant food for the sustenance and early development of the bush—all of which, though apparently trivial precautions, have a very important bearing on the cultivation of this fruit. The propagation of the plant by cuttings is not commonly adopted, and indeed is not as satisfactory as from seedling plants; still there are times when the system will prove worthy of a trial. It may be that from failure of the seed to germinate there are not enough plants to fill the area or to supply the spaces in the rows transplanted. As it is, however, imperative to replace them, propagation from cuttings, or, more properly, branches, will be expedient. When the shrubs are 1 foot or 18 inches high, select from your most vigorous and bushy shrub a couple of the lower branches. Do not cut them, but, with a gentle snatch, break off the wood close to the main stem of the shrub. It will break off very easily, and on examination of the branch you will observe the edging of the break will indicate a strong rim of bark which will, on transplanting, quickly callous and soon provide a good roothold for the shrub.

Most housewives are familiar with the various uses of the rosella. For jam-making it is well adapted, forming a palatable, easily kept product, if put up in earthenware or glass. Unfortunately, rosellas contain an acid principle which precludes putting up this class of fruit in ordinary tin ware, and hence some failures have been experienced in this respect. For pickles the fruit is well adapted, and it makes an excellent condiment. It is not commonly known that in the utilization of the chocho, now fast becoming a popular vegetable, that very pleasant tarts can be made by using that fruit (*Sechium edule*) in conjunction with the rosella. It is well known that many object to what they term the excessive tartness of the rosella. Using it in conjunction with the chocho, this tartness is modified, and tends to make both these fruits more appetising. In fact, rosellas are specially adapted for blending with less sour fruit, as they give a flavour to many fruits and vegetables which otherwise would not be so acceptable for table use.

A New Manure.—H. C. Prinsen Geerligs, in the *Indische Mercuur*, Vol. XXXII, No. 14, gives an account of a new manure which is made in Java, and whose production gives a means of disposing of factory molasses and the ash from the fuel. It consists of a mixture of molasses, furnace ash, filter press mud, and well dried pen manure. An analysis, which is given, shows that this mixture contains: nitrogen 0·42 per cent., phosphoric acid 0·98 per cent., and potash 1·12 per cent. For purposes of comparison, similar figures for a fair sample of pen manure may be given. They are: nitrogen 0·68, phosphoric acid 0·22, and potash 0·51 per cent.

ALFALFA GROWING FOR SEED PRODUCTION.

Circular No. 24 of the Bureau of Plant Industry of the United States Department of Agriculture deals with the raising of alfalfa in cultivated rows for seed production in semi-arid regions. As part of the information is interesting in connexion with West Indian conditions, it is given here:—

In Bulletin 118 of this Bureau, attention was directed to the fact that cultivated alfafa is not a homogeneous species, but is composed of numerous races, strains, varieties, and even sub-species. These vary greatly in many characters, and especially in their seed-producing capacity, no pure varieties of known high value comparable with those we have of corn, wheat and other crops having as yet been established. It has also been noted that the individuals constituting these diverse races, elementary species, or whatever they may be called, exhibit great variation among themselves. It has often been observed that, as a rule, isolated alfalfa plants set seed far more profusely than those in all but the thinnest stands.

Why the isolation of plants increases the production of seed has not been fully determined, but it is apparent that one of the factors involved is the increased amount of sunlight available to the plant. It has often been observed that trees grown on the banks of irrigation ditches in alfalfa fields, or along the margin of fields, always interfere with normal seed production as far as the influence of their shade extends. In the course of an experiment on the seed setting of alfalfa, it was found that partial shading materially reduced the quantity of seed produced by plants not already receiving more than the optimum amount of sunlight. When alfalfa plants have sufficient space for full development, they have approximately equal illumination on all sides.

In addition to the injurious influence of shade, the crowding of plants interferes with seed production by depriving them of sufficient moisture to enable them to mature their seed properly. This, of course, is true only in areas where the rainfall is light. On the other hand, in sections where irrigation is practised, thick stands, by checking evaporation, bring about such moist surroundings in fields as to promote unfavourable conditions, and so to prevent maximum yields of seed.

The lower shoots, which usually appear when the plant begins to bloom, are developed at the expense of the seed crop. The energy that should be devoted solely to the maturing of the seed is diverted by this new growth. Perhaps the most important factor influencing the development of these lower shoots, which are to form the succeeding crop, is the water content of the soil. If the moisture supply be ample, the lower shoots commence their growth about the time the plant comes into bloom. This is disastrous to the seed-crop, and for this reason it is necessary that there be a sufficient shortage of moisture at this time to retard, or prevent altogether, the development of these shoots. In the seed-producing sections of the more humid parts of the Great Plains area, profitable crops of alfalfa seed are usually obtained only in the occasional seasons of drought which is so extreme that the yield of other crops is greatly reduced.

Drought is used here in a qualified sense. There must, of course, be enough moisture in the soil to enable the seed to mature fully; otherwise it will be deficient in germinating power. On the other hand, the soil must not contain enough moisture to force into growth the crown buds that produce the succeeding crop.

Insect visits are essential to the proper pollination of the alfalfa flower. If fertile seed is to be produced in any quantity, it is necessary that a certain explosive mechanism within the flower be released. By the explosion of an alfalfa flower is meant the snapping out of the stamens and pistil from the wings and keel, which had hitherto enveloped them, to a new position against the standard. This takes place when certain insect visitors insert their nectar-gathering organs into the flower. The impact of the stigma and stamens against the body of the insect appears to have at least three immediate and important results: (1) the wounding of the stigmatic surface of the pistil, making it more susceptible to fertilization; (2) the contact of the sensitive surface with pollen borne on the insect's body from previously visited flowers; and (3) the dusting of new pollen on the insect, which will function in pollinating flowers subsequently visited. Experiments and observations both by the writers and by other investigators indicate that practically no seed is produced if the flowers are not exploded.

It is quite well known that the explosion of alfalfa flowers may be accomplished by other means than insect visitation. The insertion of a more or less pointed instrument into the throat of the corolla has often been resorted to in studying the exploding mechanism of individual flowers. Roberts and Freeman describe a method of exploding flowers in large numbers by rolling the head carefully, but firmly, between the thumb and the first and second fingers. This explodes the flowers then at the proper stage of maturity. Exploding on a still more wholesale scale may be done by grasping the entire plant between the hands at successive intervals. In this case, it is best to work from the bottom toward the top of the plant, exerting the required pressure at the proper spaces. It has been found that flowers exploded by any form of manipulation set seed readily, while other flowers left unexploded, and from which insects are excluded, rarely set seed.

As only a slight pressure on the keel is necessary to explode the flower, artificial methods may be resorted to as a means of supplementing the natural process as accomplished by insects. In an experiment at the Arlington Experimental Farm, in which the method mentioned of exerting pressure successively over the whole plant was used, the yield of pods was increased 25½ per cent. over that of adjoining rows not thus treated. At Chico, California, an increase of 129 per cent. in the number of pods resulted. Although greater seed yields also result, two experiments at least indicate that the increase in the number of seeds is not in as high proportion as is the increase in the number of pods. Further experiments, and more exact observations under varying conditions in different sections, will be necessary to determine just when sufficiently increased yields of seed may be expected to justify the expense of the undertaking. Any alfalfa seed producer may test this method experimentally on a small scale.

It is recommended that the selection of desirable plants commence as soon as the preliminary sowing has developed plants large enough to show their value. The field should be inspected row by row, and seed of the selected plants should be gathered in advance of the regular harvest. The relatively small quantity of seed secured in this way should be sown with great care, to make it cover the greatest possible area of ground. The plot of alfalfa, thus secured, will produce seed of much greater value than that obtained from unselected plants. If this method is carried out, materially increased crops of seed may be secured without detracting from the hay value of the strain. Indeed, both the hay and the seed-producing capacity may be increased by the process.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 22, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, American Sea Island cotton has eased a little in price, and probably Fully Fine. Island could be purchased at $18\frac{1}{2}d.$, and the best Floridas at $16d.$; but buyers are not anxious to add to their stocks, even at these figures.

A small lot of St. Croix West Indian has been sold at $17\frac{1}{2}d.$

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 20, is as follows:—

The market has been very quiet throughout the week, with apparently no demand. The sales were limited to a small crop of Extra Extra, viz: 10 bales Ideal, at 75c., on account of a French spinner. The receipts were 1,152 bales, consequently the stock for sale is increasing, yet notwithstanding this, the factors are refusing to make any concession from their asking prices, viz: Extra Fine 37c., Fully Fine 35c., Fine 33c. However, with orders in hand for quantity, we think we could buy at some decline.

WEST INDIAN COTTON GROWING.

A special session of the Council of the British Cotton Growing Association was held on September 14, 1909, for the purpose of meeting the Imperial Commissioner of Agriculture for the West Indies. Since then, an account of the proceedings that took place at that meeting has been issued in the form of a pamphlet (No. 35, October 1909) by the British Cotton Growing Association.

Dr. Watts, after introduction by the Chairman, Sir Alfred L. Jones, K.C.M.G., proceeded to review the position of affairs in the West Indies, stating that the high prices which had ruled for Sea Island cotton two or three years ago had caused a number of planters to take up the industry under conditions which had been shown to be unfavourable, and not conducive to success. Prices had been low during the past season, and he hoped that they were below normal, so that a chance of their being higher in the future would be given. Another untoward circumstance had been that, during the past two seasons, the crop had been planted late perforce, on account of the lack of rain during the period July to October. Notwithstanding these vicissitudes, he was of opinion that cotton growing in the West Indies is an established industry.

Particulars of the position of affairs in regard to cotton in each island were then given by Dr. Watts. These showed that the industry was in the most flourishing condition, and the outlook most hopeful, in St. Vincent, St. Kitts, and the Virgin Islands. The prospects were also good in Montserrat, if the fluctuation in progress, resulting from the rapid growth of the industry, could be avoided; and in Antigua, Barbados, Nevis and Anguilla, if the seasons were favourable. The present conditions in Antigua and Barbados were somewhat similar; these, with a better knowledge of the means of combating insect pests, in the former island, and with an increased recognition of the value of cotton as a crop for ridding sugar lands from certain diseases, in the latter, should improve. The unfortunate experience of planters in Nevis had not led to their final discouragement, and it was hoped that, with the attempt to revive the sugar industry, the two crops would become mutually helpful. With regard to Anguilla, a debt was due to the Association for the assistance rendered by it to this island—assistance which had caused it to become practically self-supporting, and to attain a position that it had not occupied for the last fifty years. In the Virgin Islands, the special conditions consequent on land being in the hands of the peasants had caused interesting developments to take place. The lack of persons of substance who could aid the peasant in placing his cotton on the market had caused the Government, through the Department of Agriculture, to take the unusual course of buying, grading, pooling, ginning, and exporting the small lots that are brought in week by week by the peasants—a policy that had proved itself worthy of adoption.

After drawing attention to the importance of the establishment of sound relations between producer and buyer, and to the good work that had been done by the Association in this direction, Dr. Watts proceeded to consider three phases of the work in connexion with cotton production. In the first instance, the planter himself required advice as to the kind of cotton that he should grow, the way in which he will be likely to sell it to the best advantage, and what demand there is for the product. The Department of Agriculture, secondly, had to answer these questions as far as possible, to supply seed, if necessary, and, generally, to help the planter to overcome any agricultural difficulties. In the third place, the work of the British Cotton Growing Association had especial reference to furnishing the Department with certain portions of the information which the planter may require, and to securing the sale of cotton under the most favourable conditions. In reviewing these phases of the work, Dr. Watts made reference to the valuable aid given by the Association, specially mentioning the names of Messrs. Wolstenholme and Oliver, and spoke highly of the way in which the Department is assisted in the experimental work by planters.

After a discussion, in which the chief points raised were the levying of export taxes on cotton shipped from where it was grown, the advisability of the introduction of new varieties, measures to be taken against pests, the importance of the continuation of the aid given by the British Cotton Growing Association, and the manner in which cotton should be shipped, the meeting closed, with a hearty vote of thanks to Dr. Watts for his most valuable and interesting address.

OBSERVATIONS ON WILD LEGUMINOUS PLANTS.

Some interesting facts are brought forward, in Circular No. 31 of the Bureau of Plant Industry of the United States Department of Agriculture, with regard to the way in which virgin soils have gained their high nitrogen content. The following is abstracted from the circular to which reference is made :—

Many hypotheses have been formed to account for the large stores of nitrogen in virgin soils, but none of these have been entirely satisfactory. It seems to be a well established fact that small quantities of ammonia are collected from the air by rain and added to the soil; also, that more or less nitric acid is formed by electrical discharges and added to the supply. Some investigators have attributed the fixation of nitrogen entirely to the latter cause. Recently a number of efforts have been made to show that nonsymbiotic, or independent, bacteria are the chief agents in fixing this element. While it seems certain that some nitrogen is added to the soil by each of these methods, it appears to the writer that there is not sufficient evidence to warrant a conclusion that any one of them has been the most important factor in this work. They do not furnish a satisfactory explanation of the presence of such large quantities of nitrogen in the soil.

Several experimenters have suggested that wild legumes may have played some part in this work; they have not generally been considered as important factors. The studies reported in this circular indicate that this subject deserves more thorough investigation than it has yet received, and that native legumes have been of much more importance in this rôle than has been thought.

Several years ago, the writer raised the question as to whether the native legumes of the prairies were sufficiently numerous to have fixed the amount of nitrogen present. A search for published data on the subject was made, but none were found. Accordingly, in the spring of 1908 a series of investigations was begun, a preliminary report of which is here given.

The writer had long been familiar with the flora of this region but was not at all prepared for such results as were found. The average numbers of wild leguminous plants per square yard, that were found, were: ordinary ground 17, high plains 3·6, and sandhills 8·4. After the grasses (including sedges) and possibly the composites, legumes form a larger part of our flora than does any other group of plants. If these figures are representative, or anywhere near it, it is evident that our farm lands from time immemorial have been growing a full stand of legumes. Seventeen plants to the square yard are enough to fill all the soil with their roots. Most of these plants, such as Amorpha, Kuhnistera and Psoralea, have enormous root systems (and these genera represent the large majority of the prairie legumes). A single plant is often sufficient to fill the soil with its roots for a radius of several feet, as any farmer who has ploughed up Amorpha is ready to testify. The smallest root systems are probably those of Vicia and Lotus, and yet seventeen of these to the square yard would seem to be sufficient to gather a large supply of nitrogen.

Many examinations were made to ascertain the prevalence of nodules upon different species. Large numbers of tubercles were found on every species examined, and on nearly every individual except mature Kuhnistera. Nodules are especially plentiful on Psoralea, Astragalus, Acuan, Meibomia, and Lotus. On Lotus the nodules are often almost massed together on the tap-root. Some difficulty was experienced at first in finding tubercles on Kuhnistera, but they are always in evidence on seedlings. On the old plants there is a doubt whether typical nodules are produced, or whether the bacteria are in the small, thickened roots which occur in extraordinary numbers, almost in fascicles, especially on roots of the previous year's growth. During the coming season an effort will be made to determine this point. The efficiency of these legumes as nitrogen gatherers does not seem open to question, however, if the universal inoculation of the seedling plants is considered.

It does not seem that most of these legumes choose the poorer soils, for, in fact, many of them grow much better on rich soil; but when the soil becomes rich in nitrogen and humus, other plants which do not thrive on poor soil are able to crowd out the legumes. There is good reason to believe that lands that are now richest formerly supported the densest leguminous growths, except, perhaps, where the plant food has been washed down from higher levels.

Western farmers have been slow to learn their lessons from Nature. Nature on her farm has kept up the production of grasses and other nitrogen robbers by the constant growth of legumes. If this fact had been recognized sooner, perhaps there would not have been such reckless exploitation of the rich soils of the Mississippi basin. For forty years farmers have lost sight of this and have taken off grain crops (all grasses) continuously, and doubted if this practice would ever exhaust their soils, because they were still productive after the removal of twenty, thirty, or forty crops. But now the effect is evident; farmers must learn from the prairies round them one of the first principles of permanent agriculture, and introduce leguminous crops into the farm rotation.

THE SOY BEAN.

An account of the soy bean was recently given in the *Agricultural News* (Vol. VIII, p. 222). An interesting addition to the information contained there is to be found in the October number of the *Journal of the Jamaica Agricultural Society*.

An enormous quantity of soy bean cake is now being imported into Great Britain from Manchuria. This cake has already won a high reputation as a food for milch cows. The soy bean cake is sold at about £6 15s. to £7 a ton. Some recent trials have been carried through in the United Kingdom with soy bean cake as against cotton seed cake; the results were fairly equal, with a slight advantage in favour of soy bean cake.

The following analysis has been made:—

	Decorticated cotton cake, per cent.	Soy cake, per cent.	Soy beans, per cent.
Moisture	10·89	13·31	10·23
Oil	13·18	6·00	15·62
Albuminoids	40·18	44·37	37·54
Carbohydrates	24·22	25·04	27·27
Woody fibre	4·13	3·90	5·02
Ash	7·40	7·38	4·32
Nitrogen	6·39	7·10	6·01
Sand	None	1·20	None

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

VOL. VIII. SATURDAY, DECEMBER 11, 1909. No. 199.

NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the subject of the Reading Courses and Examinations in Practical Agriculture is dealt with as an editorial.

Interesting information in connexion with the changes that the juice in the sugar-cane undergoes, after breakage of the latter by storm, appears on page 387.

An abstract of a useful article that has recently appeared, on the red sorrel, is given on page 388.

The article on page 389, entitled Alfalfa Growing for Seed Production, should be of service to those who are practically interested in the raising of this crop.

An account of an address recently given by the Commissioner of Agriculture before the British Cotton Growing Association is presented on page 390.

In the Insect Notes (page 394) of this number, the series of articles on the Natural History of Insects is continued. In this instalment, the respiratory and nervous systems of insects are described.

The Fungus Notes, on page 395, give an account of a coffee disease in the New World and of the remedies that are recommended for it.

On the same page, interesting conclusions as to the part that is played by inorganic phosphorus in the nutrition of animals, are brought forward.

Selection for the Improvement of Coffee.

Experiments are being undertaken by the Department of Agriculture of the Dutch East Indies, with a view to obtaining improved varieties of coffee by selection. After several years' trials, it has been found that the ordinary methods of selection which are applicable in the case of annual plants, such as that depending on the actual weight of the seed or on its specific gravity, do not give appreciable results with coffee; on the contrary, great differences were found between the descendants of different seed-trees. In the experiments, the seeds of each tree were sown and cultivated separately. The growth and production of the different lots were compared among themselves, and the tree which gave the most vigorous and productive descendants was chosen to provide seed for the future.

A report on the experiments states that the study of the variability of species is intimately connected with the methods of selection employed. The characters of the seed-trees have been studied in detail, and the average values of the variable characters have been calculated according to the methods of Galton and Quetelet. In many cases, it has been possible to separate a large number of varieties, which have been proved constant by sowing, from the typical species; thus, under *Coffea arabica*, no less than fourteen such varieties have been described.

Cotton in German East Africa.

The *Monthly Consular and Trade Reports* for September, 1909, contains interesting information in connexion with the growth of the cotton-growing industry in German East Africa. The increased acreage in cotton plantations along the Daressalaam-Morogoro Railway has necessitated additional cotton-ginning facilities in Daressalaam. In order to dispose of last year's crop, the Colonial Agricultural Committee (Kolonial-Wirtschaftliches Komitee), by an arrangement with a local firm, has temporarily installed two gins, and is now in a position to work up all the incoming product. Negotiations are pending to establish these gins permanently.

One of the larger companies, whose activities extend throughout German East Africa, has for some time been operating two gins at Tanga; but the increase in production has been so large in that district that they are no longer able to meet the demands. At the instigation of the Colonial Agricultural Committee, the firm has undertaken to erect two additional gins at Tanga. The antiquated Spindel press will also be replaced by a modern hydraulic steam press. A recently installed gin in the Moshi district may also shortly prove inadequate to take care of the increasing production there.

There are in addition, some seven or eight gins on the various plantations throughout German East Africa, to all of which additions are contemplated in the near future. The planters in the Tanga district have requested the Colonial Agricultural Committee to instal and operate a number of gins. The means at the disposal of the Committee, however, seem to preclude the possibility of such a step. It has been suggested that the Committee instal these gins, but that their operation be left to the planters on a sort of commonweal plan.

Montserrat's Gift to the Queen.

Her Majesty Queen Alexandra has been pleased to accept from the people of Montserrat a number of presents, which include fancy work and preserves. The former was made under the supervision of Mrs. Davidson Houston, the wife of the Commissioner of Montserrat, who is attempting to build up an industry in drawn thread work. For many years, this kind of fancy work has been produced in the island, but the workers lacked opportunities for putting the results of their labours on the market under satisfactory conditions. Owing to the efforts of Mrs. Davidson-Houston, these opportunities have been provided, and there are indications that the making of drawn thread work will become a profitable handicraft. The preserves were prepared under the direction of Miss Tull. Both these and the fancy work were on exhibit at the Court House, Montserrat, for a short time before being despatched to England.

The success that has attended these efforts should encourage others to do what they can toward assisting the development of minor industries in the West Indies, for it is only too evident that very little advantage is being taken of the opportunities that are afforded in these islands for making use of this important and effective aid to the well-being of their inhabitants.

The Weevil Borer of the Sugar-cane.

The *Hawaiian Planters' Monthly* for September 1909, contains a report on the weevil borer of the sugar-cane in the Moluccas (*Sphenophorus obscurus*). In many of the islands, this insect does much damage to the sugar-cane and various palms, whereas in others its numbers are kept down by its natural enemies. The chief of these are two predaceous beetles, a Histerid and an Elaterid, and a Tachinid fly. The former of the beetles feeds on the larva of the borer, both as a larva itself and as a perfect insect; it is active in both stages, hardy, and can remain for some time without food. In the case of the Elaterid, only the larval stage feeds on the borer, but both the larvae and the pupae are attacked; like the former, it is hardy and can stand long fasts. Both of them are slow breeders, or their value would be greater. The young of the Tachinid fly enter the larva of the borer and kill it just before it pupates. On an average, there are three parasites in each larva, but there may be as many as eight.

The sugar-cane weevil borer of the West Indies is *Sphenophorus sericeus*. It will be remembered as the one which makes the cocoon of cane fibres in which to pass its pupal stage. (See *Agricultural News*, Vol. I, pp. 168 and 258; and *Lectures to Sugar Planters*, pp. 127-32.)

The Manufacture of Alcohol from Sawdust.

In the *American Sugar Industry and Beet Sugar Gazette*, May 27, 1909, particulars are given of what is known as the Classen Patent for making alcohol from sawdust. It consists in heating the sawdust, with sulphur dioxide, in lead-lined digesters, to a temperature of 250° to 300° F. for an hour. The effect is to oxidize the cellulose in the sawdust, so that a portion of it is turned into glucose. The glucose is washed and then fermented in the ordinary way, any excess of acid being neutralized by means of chalk. It is estimated that by this process 250,000 gallons of wood spirit will be manufactured during the next twelve months, but it is expected that this output will be quickly increased. It is hoped that there will be produced from 1 ton of sawdust, 24½ gallons of alcohol, about 6 gallons of acetic acid, and 1,700 lb. of cake for feeding stock.

A Use for Silk Cotton.

In the current volume of the *Agricultural News*, p. 279, an account was given of silk cotton, or 'Kapok', in Java. From information contained in the *Journal of the Royal Society of Arts*, October 15, 1909, it appears that trials have been made with this substance as a substitute for cork in life-belts, by the Royal National Life-Boat Institution, since July 1905. The reports on the belts were so favourable that, in July 1906, the Committee of Management adopted the kapok life-belt for all future supplies, and at present there are not many cork belts in use. The chief advantages of the former are (1) its weight, which is somewhat over one-half of that of a cork belt; (2) its resulting extra buoyancy; (3) its flexibility; (4) its strength; (5) its durability and non-liability to injury.

A Method for Coagulating Rubber.

An account of a method for coagulating rubber, which is used by the natives of the Ivory Coast, is described in the *Journal d'Agriculture Tropicale*, No. 98. The latex, which is obtained from *Funtumia elastica*, is mixed with the juice of a plant which is common in the forests of the Ivory Coast—*Strophanthus Barteri*—and the whole is stirred rapidly for five to ten minutes. One part of this juice, which is a yellowish-green, sticky liquid, is required for the coagulation of 30 parts of the latex. When they have been formed, the clots of rubber are thrown into a basin and washed with plenty of water, as their surface is covered with a thin yellowish layer, which is apparently produced by the juice of the *Strophanthus;* this substance is exuded from the surface for several days. The rubber thus obtained is as elastic as that recovered by boiling, but its appearance is not as good.

Strophanthus Barteri is found in Africa and Asia, chiefly in virgin forests. It is a liane, which attains the thickness of the arm, and a length of 50 to 60 feet.

INSECT NOTES.

NATURAL HISTORY OF INSECTS.

PART IV. RESPIRATORY AND NERVOUS SYSTEMS.

RESPIRATION.

Insects breathe by means of air-tubes (tracheae) which begin at openings in the body wall, and extend throughout all parts of the insect structure. The openings, which are called spiracles, or stigmata, are valvular, and are capable of being opened and closed. On the outside, they are also generally protected by hairs. There are usually ten stigmata on each side of the insect body, but there are sometimes less, and they also vary in their position, according to the life-habits of the insect. They may be distinctly seen with the naked eye in many insects. In certain large caterpillars, they are surrounded by fine lines, or are enclosed in spots of colour, which make them prominent. In the grasshopper, they may be easily seen: two on the sides of the thorax, and eight on the abdomen. The tracheae are composed of chitin, and are continuous with the body wall. The smaller air-tubes are simple tubular structures, but the larger are strengthened on the inside by ridges, arranged spirally.

The tracheae from the stigmata connect with main lines, which extend the length of the body, and from which the branches and smaller tubes communicate with all parts. In Fig. 46, the cross-shaded portions are the tracheae, and the very fine cross-lines represent the thickenings mentioned above.

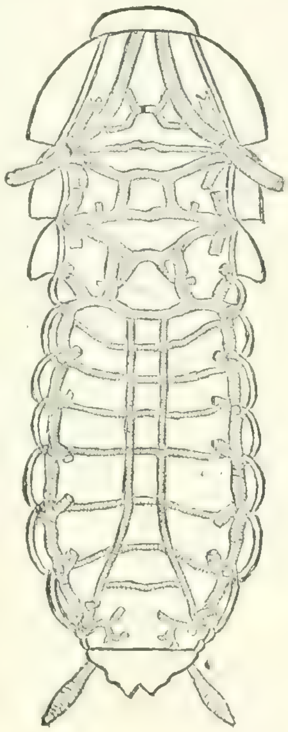


FIG. 46. TRACHEAL SYSTEM.

In large insects which fly long distances, such as pond-flies, butterflies and moths, some beetles, flies, bees, etc., there often occur large distensions of certain tracheae to form air sacs, which probably are of use to the insect in making the body more buoyant, and in increasing the rapidity of breathing.

All insects are air breathers; those which live in the water must come to the surface from time to time for a supply of air, and in many cases the habit of living in water, in decaying organic matter, in plant tissues, or as animal parasites, necessitates some modification, or special adaptation, in the manner of obtaining the necessary air.

Mosquito larvae (Fig. 47) breathe by means of a special organ at the posterior end of the body, which is brought into contact with the air. Maggots of flies which live in plant or animal tissues often have spiracles at the posterior end of the body which communicate with the air. Water beetles come to the surface and carry down, when they dive again, a film of air held by the fine hairs of the body, while certain insects are provided with tracheal gills in the aquatic larval stage.

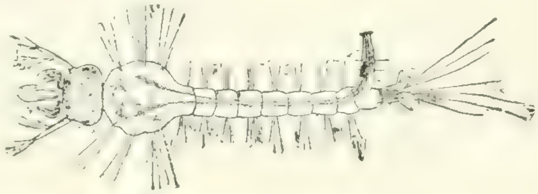


FIG. 47. MOSQUITO LARVA.

The aeration of the blood is accomplished in a manner exactly opposite to that in higher animals. The air penetrates to all parts of the body by means of the tracheae which are bathed by the blood, and comes into intimate contact with the food-substance by means of the minute branches of the tracheae which envelop the alimentary canal.

NERVOUS SYSTEM.

The relative positions of the vital systems are also opposite in insects to those in higher animals. In insects the circulatory system is dorsal, and the nervous is ventral, while in vertebrate animals the nervous system is dorsal and the circulatory one ventral.

In insects, the nervous system is not concentrated into a large brain, but is divided among a series of nerve centres, or ganglia, arranged in pairs. The dotted lines in Fig. 45, (see Part III of this paper) show the position of these ganglia and their connecting nerve cords, and Fig. 48 shows the ventral nervous system, with small nerve-branches.

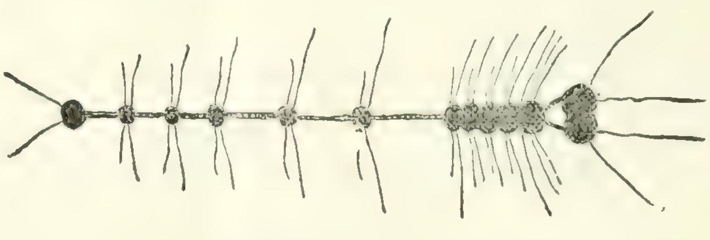


FIG. 48. NERVOUS SYSTEM OF INSECTS.

The double mass shown at the extreme end, and the next portion connected by the heavy lines, together form the brain. The former portion is above the oesophagus or gullet, and the latter below, and the heavy lines referred to are nerve cords which connect the two parts, the gullet running through the opening thus made. The first portion of the nervous system is the supra-oesophageal ganglia, the second the sub-oesophageal ganglia: these are connected by the oesophageal nerve collar. Next follow three thoracic and seven abdominal ganglia, all connected by a central nerve cord.

The nervous system varies according to general structure, usually by fusion of ganglia, but, with the exception of the supra-oesophageal ganglia, it is always ventral in position. Nerves extend to all the organs and muscles, and permit the insect to respond to a stimulus of any sort.

The nerve-endings in certain insect structures, such as antennae, palpi, etc., are very delicate, and enable the insect to be conscious of very slight stimuli.

FUNGUS NOTES.

A COFFEE DISEASE OF THE NEW WORLD.

In No. 8 of the current volume of the *Kew Bulletin* there is an article by Mr. Massee on a disease of coffee due to a fungus known as *Sphaerostilbe flavida,* and it is largely from this article that the following account is taken. A short description of the same disease has already appeared on page 292 of the current volume of the *Agricultural News*:—

The fungus in question attacks the young leaves, stems, and fruits of the coffee, forming circular whitish patches on the leaves about $\frac{1}{4}$-inch in diameter. When the attack is severe, the leaves may all fall within a month of the first appearance of the disease. The bushes then appear heavily loaded with fruit, but without leaves. On the stem the patches are elongated, and eventually the cortex flakes off, and leaves the brown wood exposed. On the berries the spots are nearly circular in outline. As a rule, only two spots occur on each berry. On these spots the first fruiting form of the fungus appears. It takes the shape of minute, yellow, transparent, pin-shaped bodies. These consist of a long stalk of hyphae, whose terminal cells are swollen, and together form the pin's head. From each of these swollen cells spring several slender- simply, or but little-branched conidiophores, each of which bears a single conidium at its apex. This form of fruit was formerly known as *Stilbum*, or *Stilbella flavida.* Later on, an ascigerous form of the fungus appears. This consists of light-red, ovate perithecia crowded together on a stroma. The perithecia more or less resemble those of species of *Nectria* which causes the canker disease of cacao. In fact, the genus *Sphaerostilbe* is closely allied to *Nectria.*

It was found, from careful experiments, that the conidia produced in the first form of fructification were totally unable to infect the leaves of coffee plants, even when the latter were wounded, but similar experiments with the ascospores caused infection after thirteen days. Apparently, the ascigerous form of the fruit is not produced on the leaves, probably owing to insufficient nutrition, and is only formed on the stems and fruit.

The conidia would not germinate when placed in various nutrient media, and this fact, in connexion with their inability to infect the leaf, would seem to indicate that they have become effete. Consequently, the fungus can only spread by means of the ascospores, or through pieces of diseased material coming into contact with healthy plants.

As remedial measures, therefore, the following should be adopted :—

(1) All diseased branches should be removed and burned.

(2) All diseased fruit and leaves, whether fallen or on the tree, should be collected and burned, or buried with lime. The difficulty of collecting the fallen portions can be considerably reduced if the lower shoots of the bushes are always removed. This practice further benefits the plants by permitting proper aeration of the soil.

The fungus also occurs on numerous other plants besides coffee, and a careful watch should be kept for its appearance on bushes or trees in the neighbourhood of the coffee plantation. Any such plants showing signs of the disease should be immediately destroyed.

The disease has caused very serious damage in several of the States of South America, and is reported from a few of the West Indian islands. The ascigerous condition of this fungus has only recently been discovered by Mr. Massee, and the account contained in the *Kew Bulletin* is the first one that has been published, though the conidial form has long been known.

The disease is, as yet, of very little importance in these islands, though from what has been said, it will be readily apparent that a careful watch should be maintained in all places where coffee is grown to any considerable extent.

THE NUTRITION OF ANIMALS.

The first of a series of research bulletins issued by the University of Wisconsin Agricultural Experiment Station has recently been received. It is entitled *The Rôle of Inorganic Phosphorus in the Nutrition of Animals,* and gives an account of experiments which have led to the following conclusions:—

(1) On a ration extremely low in phosphorus, pigs made as large gains, up to 75 or 100 lb., when starting at weights of from 40 to 50 lb., as animals receiving an abundance of this element. After reaching this point, loss of weight began, followed by collapse.

(2) When such low phosphorus rations as induced the above symptoms were supplemented with calcium phosphates, no untoward results appeared. Animals fed on a low phosphorus ration, supplemented with inorganic phosphates, made as vigorous a development as others receiving their phosphorus supply wholly in organic form.

(3) Precipitated calcium phosphates—a mixture of di- and tri-calcium phosphates gave no better results than did floats, a crude tri-calcium phosphate.

(4) Phytin as the supply of phosphorus gave no better results than the inorganic phosphates.

(5) A young animal of 40 lb. weight receiving inorganic phosphates, together with other salts as supplementary to a ration very low in mineral constituents, grew to be an animal of 280 lb. weight, bore a litter of fairly vigorous pigs, which, on the same ration, completed the cycle back to 80 lb., while animals on the same ration, less the inorganic phosphates, collapsed in three months with loss of weight accompanied by a loss of the use of their limbs.

(6) Determinations of calcium and phosphorus in the principal organs and tissues of the animals on the low phosphorus ration showed that they maintained the proportion of these elements constant and comparable to that of normally fed pigs.

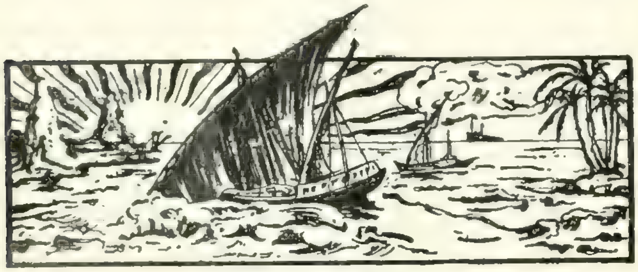
(7) The percentage of ash in the skeleton of pigs on the depleted phosphorus ration was reduced to nearly one-half that of pigs receiving a normal ration, or a phosphorus-poor ration supplemented by an inorganic phosphate.

(8) The marked reduction in the quantity of ash of the bones of the animal receiving an insufficient supply of calcium phosphates, together with the ability of the animal to build up a skeleton very rich in calcium phosphate when an abundance of the latter is supplied in inorganic forms, strongly points to the possession of a synthetic power by the animal, which enables it to convert inorganic forms of phosphorus into the organic forms demanded by its body.

(9) When the animals were starving for phosphorus, they drew this element from the skeleton, but removed calcium and phosphorus in the proportions found in tricalcium phosphate.

(10) The daily phosphorus supply for a 50-lb. growing pig should be at least 3 grams. A supply of 4 to 5 grams is probably a safer quantity.

(11) The data furnish no positive evidence of the synthesis of nucleo-proteids or other organic phosphorus-bearing complexes from inorganic phosphates in the animal body.



GLEANINGS.

The amount of cacao shipped from Trinidad during the present year, up to the end of October, was 41,367,387 lb.; last year, similarly, it was 37,020,821 lb. The amount shipped during last month was 565,542 lb.

The exports of fruit from Trinidad are steadily increasing. The value in 1899 was £338; it is now £16,081. The principal export is bananas, which go to the United Kingdom and France. Of the others, oranges are sent principally to the United Kingdom, and limes to the United States.

In *Farmers' Bulletin*, No. 374, of the United States Department of Agriculture, *Citrus trifoliata* is recommended as a stock to be used in Southern Texas for all citrus trees. This is because it seems to impart some of its hardiness to the scions, and promotes early bearing.

A report on experiments in tobacco growing which have been carried on at the Agricultural Experiment Station of the University of Wisconsin states that the use of manures free from chlorine was found not to exert any detrimental effect on the burning quality of the leaf.

According to the Weekly Report of the Department of Trade and Commerce, Canada, for August 2, 1909, the total value of the imports of cattle, sheep and pigs into the British West Indies for last year was £57,109. Of this amount, Trinidad has a share of £43,366.

As a means for keeping ants away from plants in pots and boxes, water containing a little kerosene has often been recommended by the Department. As an alternative to this, a solution made by dissolving a piece of camphor about the size of a filbert nut in 2 quarts of warm (not boiling) water, and applied when cold, may be used.

The *Bulletin of the Department of Agriculture*, Bahamas, Vol. IV, No. 3, states that the Sea Island cotton industry of those islands, which was ruined by the hurricane of last year, is likely to be taken up on a much larger scale during the coming year, and that the people are convinced as to the value of cotton production as an industry.

In relation to the United Kingdom, the total exports and imports of Canada during the year ending March 31, 1909, were respectively, $133,745,375 and $70,556,738 in value. Of the exports, the chief were wheat, value $51,350,511, and cheese, value $20,272,471. (*Report of the Department of Trade and Commerce*, Canada, 1909, Part II.)

In the *Chemische Zeitung*, XXXIII (1909), No. 29, p. 264, the results of the examinations of samples of calcium cyanamide received directly from factories in Norway and other places are given. These showed that considerable amounts of calcium carbide were present, and that the average percentage of nitrogen in the material was 19·39.

The quantity of rubber exported from the Gold Coast was 1,773,248 lb. in 1908, as compared with 3,549,548 lb. in 1907; the decrease was chiefly due to the low prices of last year. There was also a drop in the amount of rubber exported from Sierra Leone during 1908; this was 41 tons (value £9,372) in 1908, as against 73 tons (value £22,480) in 1907.

In a recent series of Cantor Lectures on Modern Methods of Illumination, delivered before the Royal Society of Arts, it is pointed out that the illuminating power of the oil in petroleum lamps may be improved by as much as 20 per cent., if the reservoir is kept continually well filled. Attention is also drawn to the usefulness of cheap alcohol as a source of light in agricultural districts.

An Agricultural, Industrial and Horticultural Exhibition will be held at 'Telescope', in the parish of Saint Andrew, Grenada, on Thursday, February 10, 1910. About £117 will be given in prizes, in the following sections: (1) horses, mules and asses; (2) cattle, sheep and pigs; (3) poultry, rabbits and dogs; (4) minor products, including vegetables and cotton; (5) fruits, fresh and preserved; (6) native industrial exhibits.

An Agricultural and Industrial show will be held in St. Kitts, under the auspices of the Imperial Department of Agriculture and the Agricultural and Commercial Society, on February 17, 1910. Prizes will be offered for exhibits of large and small stock and poultry, exhibits of sugar-cane and its products, cotton, vegetables, fruit, preserves, minor industries, plants and flowers. Prizes will be also given for driving and riding competitions in the ring.

The adverse effect of black rot (*Phytophthora omnivora*) on the yield of cacao is illustrated by the following experiment, which is recorded by Mr. J. H. Hart. In this, diseased and healthy beans were fermented and cured in a similar manner and at the same time. It was found that, while 432 beans from healthy pods weighed 1lb., with diseased pods, 565 beans were required to make up the same weight. This corresponds to a loss of about 25 per cent. with, of course, a lower quality of product.

Fifty years ago, Sea Island cotton was grown in the Hawaiian Islands, but the industry was allowed to lapse. The Hawaii Agricultural Experiment Station has been making trials with Sea Island and Caravonica cottons, with striking results. The yield is high, the fibre of good length, strength and lustre, and the percentage of lint ranges from 30 to 40. All varieties of cotton thus far tested grow as perennials in these islands, and the shape of the trees and the time of maturing the bolls may be controlled by pruning. (*Annual Report of the Hawaii Agricultural Experiment Station*, 1908.)

STUDENTS' CORNER.

DECEMBER.

FIRST PERIOD.

Seasonal Notes.

The sugar-cane will now have reached such a stage in its growth as to give useful indications in relation to the effect of the manurial treatment which has been given to the soil on which it is growing. Reference should therefore be made to the notes that were taken earlier in the season, when manure was being applied, and they should be completed by an account of the different conditions of the cane which apparently arise from the employment of the different manures. In the case of pen manure, where this has been applied in different ways (such as by broadcasting, burying it in the cane holes, covering it with mould from the banks), ascertain as far as possible what effect the various methods of application have had on the growth of the cane. Similar observations should be made, where this is feasible, as to the effect of the state of the pen manure, when it was applied (whether well-rotted or undergoing fermentation), as well as of the quantities used on the subsequent growth. A careful account of the tillage operations that have been completed in different parts of the estate, or estates, should have been written with a view to its giving assistance in future observations on the effects of the several kinds of tillage employed, on those of deep and shallow ploughing, and on those of ploughing early and late. In what ways may deep ploughing do harm and good, respectively? Speaking broadly, what has happened in well-rotted farmyard manure? In relation to what kind of soils must care be taken in the matter of using ammonium sulphate as a manure? Gain what information you can in regard to the manures 'nitrate of lime' (calcium nitrate) and 'lime-nitrogen' (calcium cyanamide). What important circumstance in their manufacture do these two manures possess in common?

Now is the time to make observations in the field, which have for their object the selection of cotton plants which are to provide seed for future crops. The first stage in the process is to look out for plants which are of such a shape that lines roughly drawn to touch the ends of the branches, beginning at the lowest ones, would tend to meet above the plant; in other words, the plants are pyramidal. The lateral branches should be numerous, and with short internodes. Of the plants which fulfil these conditions, a further choice should be made, in which preference is given to those which produce the largest number of bolls. At the same time, any of those still remaining among the chosen lot, which appear to show a susceptibility to the attacks of insect pests, diseases caused by fungi, or the dropping of bolls, should be rejected. The position in the field of the finally selected plants may be marked by means of a long pole firmly stuck into the ground near them, and a coloured band of cloth or ribbon should be wrapped round the stem of each, in order that they may be distinguished from the other surrounding plants near the pole. The cotton from these plants should be picked separately from that in the rest of the field, and the yield from each must be kept by itself, and distinguished from the rest by a definite mark, letter, or number. It is evident that this process of selection is sufficiently important to deserve careful personal supervision at the time at which the cotton is picked; any carelessness or lack of attention at this stage will render useless all the work that has already been done, and will cause time to be wasted in raising plants from seed which is no better than that which might as well have been selected at random in the first instance.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) A crop removes soil water into the air. State how this process takes place, and describe those parts of the plant which are directly concerned in it.

(2) Distinguish between the pollination and the fertilization of flowers. What changes generally result from fertilization?

(3) Write an account of the way in which seed-cotton should be prepared to be sent to the ginnery.

INTERMEDIATE QUESTIONS.

(1) Give a description of a cotton fibre. What is meant by 'twist' and 'nep'?

(2) Describe suitable methods for improving a pasture by manuring, and state which method you consider the best and most economical.

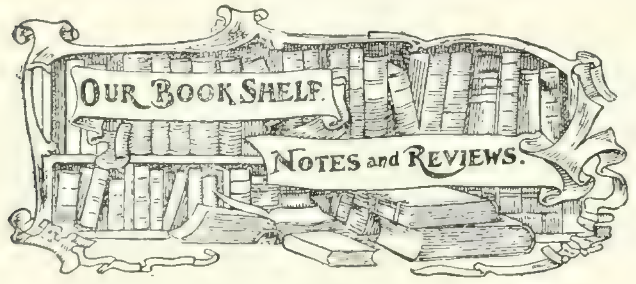
(3) Write an account of a means by which the citric acid content of a sample of lime juice may be roughly determined.

ARROWROOT IN ST. VINCENT.

The low prices that have been obtained in the market for St. Vincent arrowroot have recently led growers to endeavour to find a means of making its production more remunerative, especially as the state of the market has been such as to threaten the extinction of the industry. With the object of gaining information as to the best and most appropriate means to this end, a meeting has been held at the Court House, Kingstown, to consider (1) the question of the more extensive advertisement of St. Vincent arrowroot, (2) that of finding additional markets for the product.

His Honour the Administrator, who presided, opened the meeting with an address in which he gave a brief historical review of the arrowroot industry. His Honour drew attention to statistics which showed that, even when sugar was the main product of the colony, arrowroot was grown, and that, as sugar declined, the area in arrowroot increased. At different periods, since 1880, the position of this product, among the exports, had fluctuated until 1908, when its value had been £27,713; in 1900 with an abnormal crop, this had reached £74,000. In 1900 and 1901, prices had been so low that planters had met together and had resolved not to sell arrowroot at less than 2*d.* per ℔., and to limit the output, so that this was not the first occasion when the necessity for concerted action had been recognized. Now, however, a different remedy was proposed—not that of the limitation of production, but the expansion of markets, so that the area in the crop should be utilized to its fullest extent. For this purpose, his Honour gave an outline of a scheme under which an Association called the St. Vincent Arrowroot Growing Association would be formed, with a Board of Directors who would control the business of advertising, correspondence, etc. The funds necessary for the work of the Association would be raised by a small charge (about 4*d.* to 6*d.*) on each barrel of arrowroot exported.

After the details of the scheme had been given, and a discussion had taken place, it was resolved unanimously that the meeting was in agreement that a small tax of 4*d.* to 6*d.* per barrel should be imposed at the time of shipment, to be applicable to all arrowroot exported, to wherever exported. The provisional committee that had already been formed agreed to continue to act until such time as other arrangements had been made.



TEXT BOOK OF EGYPTIAN AGRICULTURE, Vol. I. Edited by G. P. Foaden, B.Sc., and F. Fletcher, M.A., B.Sc. *Published by the Ministry of Education, Egypt.*

In writing this book, the plan has been to make each of several writers responsible for a certain part of it. The effect has been to render its position authoritative, and to add to its value, but a certain amount of confusion is caused during its perusal by the difference of manner of treatment in the various parts, and there is a degree of repetition which it would have been better to avoid.

The volume includes eight chapters. Of these, the first three deal with the atmosphere and the soil in relation to agriculture, and with cultivation. Chapter IV has for its subject farm implements of cultivation and harvesting, while Chapters V and VI are devoted to irrigation and drainage and the farm implements of irrigation. Land reclamation is treated of in an interesting manner in Chapter VII. Finally, Chapter VIII has special reference to the important topic of manures.

At the beginning of this volume, the contents of Volume II are tabulated. These will be chiefly concerned with the cultivation of crops and their diseases and insect pests, and with the management of farm animals, and dairying.

Dealing with the chapters of the published volume, in order, it is necessary to confess that the perusal of the first three commences with a bewilderment which only increases as progress through them is continued. Fact after fact is presented to the mind in a breathless manner, which can only serve to confuse the student of agriculture, even though he may not be a beginner in that subject. There is little quarrel to be had with the value of the facts themselves, but it would seem that the presentation of a few well-illustrated principles would have been preferable to that of a large number of, often disjointed, actualities. Among minor imperfections may be mentioned the reference, on page 17, to an Appendix which cannot be found; the doubt of the correctness of the explanation concerning plants that have been 'laid', on p. 19; the absence of description or definition in the case of several things for which Egyptian names, alone, are given; a looseness of style and expression which occurs continually. At the same time, it must be said that these chapters are illustrated effectively by well chosen and arranged tables, and that several points receive good treatment, for example: available plant food (page 37); the movements of water in soil (pp. 44-58).

Chapter IV deals with its subject in a thorough manner, and is well illustrated. In Chapter V, the illustrative statistics are especially useful, and a very good idea is given of the special problems of irrigation and drainage in Egypt; it deals with the various problems, in connexion with its own particular application, in an effective way. Similarly, as may be expected, in Chapters VI and VII, the writer shows a thorough grasp of his subject, and an excellent knowledge of the special conditions with which he deals. In fact, these three Chapters (V, VI, and VII) are well worth perusal by everyone who is interested in the different conditions under which agricultural operations are conducted in different parts of the world, for they, more than all the others, incidentally give a very good insight into agricultural conditions in Egypt.

Like the other chapters that are of a similar nature, Chapter VIII contains useful information, well presented in tables for the purpose of illustrating the principles that are there described. Attention is specially drawn to the commencement, where a good account is given of the relation between manuring and the supply of water, where irrigation is practised. With reference to the way in which the soil is regarded, on page 216, may not the question be asked: 'Is not the soil, rather than the farmer's warehouse, merely, the manufactory, from the raw material, of substances which are required in the elaboration of the articles that are finally produced?'

In the preface of the book it is stated 'it is hoped that it may prove of interest to others (than those in Egypt) engaged in tropical agriculture'. From what has been said above, it is evident that this interest does actually exist in the work. Its perusal by such readers would have been simplified, however, had more explanations been given of native terms, and if the botanical, as well as the common, names of plants had been included. It is hoped that this will be done in the case of the second volume, and that there will be more uniformity in the spelling of native names.

Many of the illustrations are not as effective as they might be, owing to the fact that they have been produced on a paper which is inferior to that for which the blocks were intended. This might be remedied by publishing them as plates, on thick paper, either at the end, or in the body, of the book. In other respects, the latter is well produced in an easily readable form, and its contents should form a useful accessory to classes and lectures in agricultural science in Egypt.

HANDBOOK OF BRITISH GUIANA. Published under the Authority of the Permanent Exhibitions Committee. *Dulau and Company, London.*

The contents of this rather bulky 'handbook' may be broadly summarized in order as follows: geography, history and climatology; population and races; political history and constitution; education; description of centres of population and the adminstration of laws in them; flora and fauna; finance and resources; Government departments; consular representation; ecclesiastical and legal interests; customs and shipping; posts and means of communication; touring facilities; planting and financial interests; medical service; agricultural and mining administration; and general statistics. This list will serve to show the completeness with which the inclusion of the various interests has been made. A perusal of the book, or reference to it, will demonstrate how thoroughly the details of these interests have been treated.

This work is not of such a nature that its parts may be separately considered in a specific manner, neither is space available for such a method of treatment. It is proper to say, however, that the way in which it is published is useful, and at the same time, attractive. The type is good, the plates are well chosen and well reproduced, and there is a very good map. Taking it all together, it should form an excellent example for other colonies where there is a desire to publish a handbook of this nature, and it seems probable that its promoters and users will soon feel the need of an abbreviated, condensed edition that will serve for momentary reference, and at the same time add to the usefulness of the larger book.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of October :—

A perfectly normal condition may be reported as that which has ruled in Mincing Lane, with regard to drugs and spices, during the month of October. In no one article has there been any special interest evinced. A fair supply of all articles coming within our special notice has been brought forward, and the demand has also been on a similar scale; the prices realized being also, for the most part, satisfactory; as will be seen from the following details.

GINGER.

In the early part of the month, ginger was but very little in evidence, and even at the two concluding auctions on the 20th and 27th, the demand was very slow and the sales uninteresting; no Jamaica was offered, and there was a very limited demand for other kinds. Of Cochin and Calicut, on the 20th, some 280 packages were offered, and 110 disposed of, at the following rates: brown rough Calicut 41*s.* 6*d.*, new crop washed Cochin 42*s.* 6*d.*, and old crop medium and small 41*s.* 6*d.* At 55*s.* to 56*s.* native cut, unsorted, was bought in. At auction on the 27th, some 196 bags of fair bright, rather wormy and rough Calicut, were sold, without reserve, at 39*s.* 6*d.* to 40*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

At auction on the 13th, there were large supplies of West Indian nutmegs, and sales were effected of 459 packages, 1*s.* 2*d.* to 1*s.* 5*d.* being paid for 63's and 58's, and 3¾*d.* to 4½*d.* for 145's and 120's. But little attention has been given to mace during the month; on the 27th sixteen packages of West Indian were sold, fair to good palish, realizing 1*s.* 8*d.* to 1*s.* 9*d.*; good reddish 1*s.* 7*d.*; fair red 1*s.* 4*d.* to 1*s.* 5*d.*; and broken 1*s.* 1*d.* At the first auction on the 6th, some 197 bags of pimento were offered and bought in at 2½*d.* per lb. A firmer tone prevailed at the auction on the 13th, but all the offerings were bought in. At the last spice auction on the 27th, no pimento was offered but it was stated that fair quality was to be obtained at 2½*d.* per lb.

ARROWROOT.

At the first spice auction on the 6th, 587 barrels of good manufacturing St. Vincent were offered, and all bought in at 2*d.* to 2½*d.* per lb. No further quotations have occurred, but the position of the St. Vincent growers has been discussed with reference to the unsatisfactory condition of the arrowroot market.

SARSAPARILLA.

At the first drug sale on the 7th, the following offerings were brought forward : grey Jamaica 25 packages Lima-Jamaica 4, native Jamaica 32, Honduras 10, Guayaquil 5. Of these, the whole 25 bales of grey Jamaica were disposed of at 1*s.* 2*d.* per lb. for fair grey, and 10*d.* to 1*s.* 1*d.* for rough to slightly dark and roughish; the 4 bales of Lima-Jamaica were also sold at from 11*d.* to 1*s.* for rough to fair, while the 32 bales of native Jamaica were all bought in at from 10*d.* to 1*s.*, according to quality. The whole of the 5 bales of the Guayaquil sold at 11*d.*, but not one of the 10 bales of Honduras was disposed of, 1*s.* 5*d.* being the price at which they were held. A fortnight later, namely on the 21st, 14 bales of grey Jamaica were offered and sold, fair fetching 1*s.* 2*d.*, and slightly coarse 1*s.* 1*d.* per lb.; 9 bales of Lima-Jamaica were also offered, and the whole sold at 1*s.* for fair, and 11*d.* for roughish. Fourteen packages of native Jamaica were offered, and 5 sold at from 10*d.* to 11*d.* for fair red. There were also brought forward at this auction 37 bales of Guatemala, 16 of Mexican, and 10 of Honduras, for which there was no demand and the whole was bought in.

KOLA, OIL OF LIME, LIME JUICE, ETC.

At the first auction kola was represented by 31 packages, 5 only of which sold, 2½*d.* per lb. being paid for 2 packages of Ceylon halves and quarters, of inferior mouldy character; 1*d.* per lb. was paid for 3 packages of small mouldy Grenada; 4*d.* was the price asked for good halves. On the 20th, the offerings amounted to 38 packages, of which 25 were sold, 3½*d.* being paid for good bright halves and 3¼*d.* for fair. A single bag of fair small Trinidad was disposed of at 2½*d.* per lb. Nineteen packages of oil of lime were brought forward on the 6th, and 5 cases sold at 1*s.* 6*d.* Good West Indian distilled was held at 1*s.* 8*d.*, an offer of 1*s.* 7*d.* being refused. A week later some 26 packages were brought forward, but all was bought in at 1*s.* 8*d.* per lb., at which figure the article remained at the end of the month. Some small sales were said to have been effected at 5*s.* 9*d.* per lb. for West Indian hand-pressed oil. At the auction of the 20th, it was stated that some 400 packages of raw West Indian lime juice had arrived, but there was no demand. Fair palish was bought in at auction at 1*s.* 2*d.* per lb.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated November 26, 1909, gives information as follows :—

The weather during the fortnight has been fairly dry, and suitable for reaping and milling.

Milling is general throughout the colony, and shipments to West Indian islands amounted to 3,800 bags during the fortnight.

Yield of paddy in some districts is reported to be very poor, and shortage on last year's crop is anticipated.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally 17*s.* 6*d.* to 18*s.* 6*d.* per bag of 180 lb. gross.
16*s.* 3*d.* to 17*s.* 3*d.* ,, ,, ,, 164 lb. ,,

The Inventor of the Reaper.

A communication from the Editor of the *Prairie Farmer* states that celebrations of the hundredth anniversary of the birth of Cyrus Hall McCormick, the inventor of grain-harvesting machinery, will be held on December 15, 1909, at the College of Agriculture, in the University of Illinois.

McCormick was born in Virginia in 1809. His father was a farmer, who had made attempts to invent a grain-cutting machine, but had failed. In 1834, the son obtained a patent for a successful machine of the kind, and, four years later, established a large manufactory in Chicago. His invention was brought to English notice at the 'World's Fair' of 1851, and later, it gained the Exhibition Medal of the Royal Society. Little more need be said for this inventor than that his efforts have rendered possible the cheap production of the staple food of millions.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, November 23, 1909; Messrs. E. A. DE PASS & Co., November 12, 1909.

ARROWROOT—$1\frac{3}{4}d.$ to $2d.$
BALATA—Sheet, 2/6; block, 2/- per lb.
BEES-WAX—£7 17s. 6d. to £8 2s. 6d.; darkish, £7 15s.
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 50/- to 55/6 per cwt.; Jamaica, 47/- to 52/6.
COFFEE—Jamaica, 37/- to 56/6.
COPRA—West Indian, £24 per ton.
COTTON—Fully Fine, $18\frac{1}{2}d.$; Floridas, 16d.; St. Croix West Indian, $17\frac{1}{2}d.$
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet; common to good common, 42/- to 48/- per cwt.; low middling to middling, 49/- to 53/-; good bright to fine, 54/- to 65/-.
HONEY—30/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11d. to 1/- per gallon; concentrated, £17; Otto of limes, 5/9 to 6/-.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{3}{16}d.$; fair, $2\frac{5}{16}d.$; good, $2\frac{3}{8}d.$ per lb.
RUBBER—Para, fine hard, $8/1\frac{1}{2}$, fine soft, 7/-; fine Peru, 8/1 per lb.
RUM—Jamaica, 2/8 to 5/-.
SUGAR—Crystals, 15/3 to 16/-; Muscovado, 12/6 to 15/-; Syrup, 12/9 to 14/9; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., November 12, 1909.

CACAO—Caracas, 11c. to 12c.; Grenada, $11\frac{1}{4}$c. to $11\frac{3}{4}$c.; Trinidad, $11\frac{1}{2}$c. to 12c.; Jamaica, $9\frac{1}{2}$c. to $10\frac{1}{2}$c. per lb.
COCOA-NUTS—Jamaica, select, \$32·00 to \$33·00; culls, \$19·00 to \$20·00; Trinidad, select, \$32·00 to \$33·00; culls, \$19·00 per M.
COFFEE—Jamaica, ordinary, $8\frac{1}{4}$c. to $8\frac{1}{2}$c.; good ordinary, $8\frac{3}{4}$c. to 9c.; and washed, from 10c. to 11c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, no quotation; Barbados, 53c. to 55c.; St. Thomas, St. Croix, St. Kitts, 48c. to 50c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—\$2·50 to \$4·00 per box.
LIMES—Dominica, \$5·00 to \$6·50 per barrel.
MACE—34c. to 38c. per lb.
NUTMEGS—110's, $9\frac{1}{2}$c. per lb.
ORANGES—Jamaica, \$1·50 to \$2·00 per box.
PIMENTO—$4\frac{1}{2}$c. per lb.
SUGAR—Centrifugals, 96°, 4·45c. per lb.; Muscovados, 89°, 3·95c.; Molasses, 89°, 3·70c. per lb., all duty paid.

Trinidad, Messrs. GORDON, GRANT & Co., November 27, 1909.

CACAO—Venezuelan, \$11·30 per fanega; Trinidad, \$11·10 to \$11·35.
COCOA-NUT OIL—95c. per Imperial gallon, cask included.
COFFEE—Venezuelan, $10\frac{1}{2}$c. per lb.
COPRA—\$4·00 per 100 lb.
DHAL—\$4·25 per 2-bushel bag.
ONIONS—\$4·00 per 100 lb.
PEAS—SPLIT \$6·00 to \$6·25 per bag
POTATOS—English, \$1·60 to \$1·80 per 100 lb.
RICE—Yellow, \$5·20 to \$5·25; White, \$5·00 to \$5·25 per bag.
SUGAR—American crushed, \$5·10 to \$5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., December 4, 1909; Messrs. T. S. GARRAWAY & Co., December 6, 1909.

ARROWROOT—St. Vincent, \$3·60 to \$3·75 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$14·00.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., scarce.
HAY—\$1·20 per 100 lb., unsaleable.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, \$2·75 to \$3·00 per 100 lb.
PEAS—Split, \$6·00 per bag of 210 lb.; Canada, \$3·40 per bag of 120 lb.
POTATOS—Nova Scotia, \$1·75 to \$2·75 per 160 lb.
RICE—Ballam, \$4·85 to \$5·00 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, November 27; Messrs. SANDBACH, PARKER & Co., November 26, 1909.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·25 to \$8·50 per 200 lb.	\$9·00 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	50c. per lb.
CACAO—Native	11c. to 12c. per lb.	12c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·00 to \$6·50 per barrel of 196 lb. Sales—scarce.	No quotation
COCOA-NUTS—	\$12 to \$16 per M.	\$16 per M., peeled and selected.
COFFEE—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	$13\frac{1}{2}$c. per lb.	$13\frac{3}{4}$c. per lb.
Liberian	10c. per lb.	10c. per lb.
DHAL	\$4·05 to \$4·10 per bag of 168 lb.	\$4·25 per bag of 168 lb.
Green Dhal	\$5·50	——
EDDOES	\$1·32 per barrel	——
MOLASSES—Yellow	22c. to 25c.	——
ONIONS—Teneriffe	——	No quotation
Madeira	4c. per lb.	$3\frac{1}{2}$c. per lb.
PEAS—Split	\$6·50 to \$6·60 per bag (210 lb.)	\$6·40 to \$6·50 per bag (210 lb.)
Marseilles	None	\$5·00
PLANTAINS—	24c. to 60c. per bunch	——
POTATOS—Nova Scotia	\$2·50	\$2·40 to \$2·50
Lisbon	No quotation	No quotation
POTATOS-Sweet, Barbados	\$1·44 per bag	
RICE—Ballam	No quotation	\$4·75
Creole	\$4·25 to \$4·30	\$4·00 to \$4·30
TANNIAS—	\$2·40 per bag	——
YAMS—White	None	——
Buck	\$2·40 per bag	
SUGAR—Dark crystals	\$2·45 to \$2·55	\$2·45
Yellow	\$2·90 to \$3·00	\$2·80 to \$3·00
White	\$3·70 to \$3·80	\$3·60 to \$3·80
Molasses	\$2·00	\$2·00 to \$2·30
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is fifty-nine. The following list gives particulars of all the pamphlets which are still available. The missing numbers are out of print and can no longer be supplied:—

SUGAR INDUSTRY.

Seedling and other Canes at Barbados in 1900. No, 3, price 2d.; in 1901, No. 13, price 4d.; in 1902, No. 19, price 4d.; in 1903, No. 26, price 4d.; in 1904, No. 32, price 4d.

Seedling Canes and Manurial Experiments at Barbados, in 1903-5, No. 40, price 6d.; in 1904-6, No. 44, price 6d.; in 1905-7, No. 49, price 6d.; in 1906-8, No. 59, price 6d.; in 1907-9, No. 62, price 6d.

Seedling and other Canes in the Leeward Islands, in 1900-1, No. 12, price 2d.; in 1901-2, No. 20 price 2d.; in 1902-3, No. 27, price 2d.; in 1903-4, No. 33 price 4d.; in 1904-5, No. 39, price 4d.; in 1905-6, No. 46, price 4d.; in 1906-7, No. 50, price 4d.; in 1907-8, No. 56, price 4d.

Manurial Experiments with Sugar-cane in the Leeward Islands, in 1902-3, No. 30, price 4d.; in 1903-4, No. 36, price 4d.; in 1904-5, No. 42, price 4d.; in 1905-6, No. 47, price 4d.; in 1906-7, No. 51, price 4d.; in 1907-8, No. 57, price 4d.

SCALE INSECTS.

Scale Insects of the Lesser Antilles, Part I. No. 7, price 4d.; Part II., No. 22, price 4d.

GENERAL.

(5) General Treatment of Insect Pests, 2nd. Edition (Revised), price 4d.
(9) Bee Keeping in the West Indies. Price 4d.
(14) Screw Worm in Cattle at St. Lucia. Price 2d.
(15) Plain Talk to Small Owners. Price 2d.
(16) Hints on Onion Cultivation. Price 2d.
(17) General Treatment of Fungoid Pests. Price 4d.
(18) Recipes for Cooking West Indian Yams. Price 2d.
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The 'AGRICULTURAL NEWS'. A Fortnightly Review.

The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

The 'Agricultural News' is printed in time to be distributed, regularly, by each mail, and is on sale by the local agents of the Department at one penny per number, post free, 2d. The subscription price, including postage, is 2s. 2d. per half-year, or 4s. 4d. per annum. Volumes IV, V, VI, and VII complete, with title page and index, as issued —Price 4s. each.—Post free, 5s. Some numbers of the early volumes are out of print and therefore these volumes can no longer be supplied complete. The scale of charges for ADVERTISEMENTS may be obtained on application to the Agents *All applications for copies are to be addressed to the Agents, not to the Department.*

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AGRICULTURAL NEWS

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OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Publications of the Imperial Department of Agriculture.

AS the present number of the *Agricultural News* forms the two hundredth issue, this paper having been sent out continuously since April 25, 1902, a suitable opportunity is given for a consideration of the position of the periodical publications of the Imperial Department of Agriculture. These consist, in addition to the paper just mentioned, of the *West Indian Bulletin*, the Pamphlet Series of the Department, the Annual Reports, and various leaflets. The *Agricultural News* is issued fortnightly, the *West Indian Bulletin* quarterly, or as nearly so as circumstances permit, and the pamphlets when the occasion occurs.

Commencing with the *Agricultural News*, attention is drawn to the editorial of the first number. A statement appears in that article to the effect that this paper laid no claim, when it was first issued, to public recognition beyond an earnest desire, on the part of the Imperial Department of Agriculture, 'to instruct and assist all classes of the community, and to promote the agricultural interests of these colonies'. This claim may now be extended, in view of the work which has been done through the medium of this paper, in serving the interests of West Indian agriculture. In regard to its scope, it is evident that, although any one issue of the paper cannot have direct application as a whole to some particular interest, yet it always contains articles that have a general agricultural bearing. It is not only meant to give information, but to have a use in making suggestions, chiefly in regard to the adoption of new methods and means of carrying on agricultural operations, and the improvement of those methods and means that exist already; to the introduction, where this is advisable, of new crops or varieties of plants; to the presentation, in a broad manner, of new or modified theories connected with agricultural practice; and in relation to plans for continuing experiments that have already been commenced, as well as to schemes for initiating and carrying out those which are new.

Though it is well to keep in mind this broad aspect of the purpose of the *Agricultural News*, attention is due to the fact that it is intended to have a particularized usefulness in regard to the special agricultural interests in the West Indies. There are indications that this side of its utility is often insufficiently appreciated. One of the aims in this publication is to give information and statistics which will be helpful, not only to the agriculturist, but to those whose work is of a more directly commercial nature. As commerce in the West Indies is so intimately bound up with the interests of agricultural production, it behoves those who are engaged in it to keep themselves closely in touch with the means and different phases of that production. Hence it is suggested that systematic abstraction or indexing of such parts of this and other publications as relate to any special interest will often afford information that is being sought by those engaged in that interest, and at the same time, may prove valuable in the matter of originating new ideas.

To fulfil its intended purpose, the *Agricultural News* must be in intimate sympathy with all that pertains to agriculture in the West Indies. If it is to accomplish this, the stimulus must not only come from within—that is from those who are more directly connected with its publication—but from without, as well. This is to say, those for whom it is intended can add to its interest and usefulness by giving opportunities for their personal and practical experience to be employed in the elucidation of many of the subjects with which it continually deals. This will aid those who are responsible for its production, and will give additional value to the result of their efforts.

The *West Indian Bulletin* is often described, in the announcements concerning it, as the Quarterly Scientific Journal of the Imperial Department of Agriculture for the West Indies. In using this title for that publication, there is no desire to intimate that its contents have relation to the work of the scientific investigator of agricultural problems, alone. The purpose of the publication is to deal with agricultural subjects in a more particularized manner, and thus at greater length than is expedient, or indeed possible, in the *Agricultural News*, and to afford an opportunity for placing on record the methods and results of scientific researches that have been undertaken by the Department. Its pages contain matter that is of use both to the scientist and to the members of the planting community, and although many of the articles that have appeared may not, when taken as a whole, have a direct bearing on the work of any one member of that community, yet he will find in them useful statistics and information that will have a special reference to his particular interests, and to make note of these when they appear will probably save him future trouble in the matter of supplying himself with that information. The chief point to remember is that each number of this publication contains, in its hundred odd pages, matters of knowledge that are important to everyone who is engaged in agriculture in the West Indies, and in a smaller degree to those who are situated in other tropical parts of the world. It may be claimed that the *West Indian Bulletin* is indispensable to every progressive planter in these colonies and that he will be benefited by availing himself of the information that is so plainly and conveniently placed before him. The first number was issued on July 1, 1899, and it has now reached nine complete volumes and two numbers of the tenth: the third of these is at present in course of preparation.

The pamphlets are intended for the purpose of putting one widely considered phase of any special subject before those who are likely to require such a presentation, in order that the information which will be useful to them may be available in a compact form. It would not be expedient to enumerate here the many subjects with which they have dealt; reference to the advertisements of the publications of the Department will give a full idea of these. So far, sixty-two of these pamphlets have been issued, and in bringing them out, occasion is employed to publish revised and enlarged editions of some of those that have already appeared, in order to take advantage of any additional information that has become available since that appearance. One of the most valuable uses of this form of publication is that afforded by the opportunity which it gives for presenting in a concise form, the results of the sugar-cane experiments that are annually conducted in Barbados and the Leeward Islands. The pamphlets are issued at a low price, and are attaining a constantly increasing usefulness in relation to the particular subject with which each of them deals.

The work of each of the local departments in the Windward and Leeward Islands and Barbados, under the Imperial Department of Agriculture, is summarized yearly in a report which is issued by this Department; in the Leeward Islands and Barbados, the magnitude of the sugar experiments has justified the publication as well, of special annual reports dealing with these. The information in the reports naturally has relation, in each case, to the Botanic and Experiment Stations, and where this has been conducted, to the work of the Agricultural School, of the Agricultural Instructor and of Land Settlement and Prize-holdings Schemes. In St. Vincent, owing to the presence of anthrax in that island, an additional feature is the annual report of the Government Veterinary Surgeon. Little or no attempt is usually made, in this form of publication, to discuss the results of the experiments. General statements as to them appear, and these are well supported by useful tables. The information which these reports contain often relates to a stage in the progress which is being made toward the solution of a certain agricultural problem, and they serve as a useful means for making public such results as are being obtained where the experiment is in course of completion. Their value is naturally more particularly local, but they also have an interest which includes all countries where tropical agriculture is carried on.

Leaflets dealing with certain subjects are issued from time to time by the Department. Each of these has its own special use, and, besides being of rather temporary concern, is usually a reprint of matter that appears in one or more of the other publications. There is therefore no need for particular consideration of them.

It is hoped that the facts that have been adduced above, as to the scope and use of the periodical publications of the Department, will be of utility to those who regularly take advantage of their contents, as well as to those who have not completely realized, as yet, how they may be employed as an aid in pursuing their own particular interests.

THE DANISH SYSTEM OF CATTLE BREEDING.

The following is taken from an abstract of a paper read before the Agricultural Sub-section of the British Association at Winnipeg, 1909, which appears in the *Journal of the Royal Society of Arts*:—

Denmark, mainly an agricultural country, which formerly grew corn for export, and raised very few cattle, began to turn its attention to dairy farming after the middle of last century. With the introduction of the centrifugal cream-separator and the building of co-operative dairy factories all over the country in the eighties, the system of dairy farming spread to even the smallest farms. The question of improving the two national milking breeds—the black and white Jutland and the red Danish dairy cattle—became important, and of interest to almost all farmers.

The work of improving cattle breeding in Denmark being, as explained, of fairly recent date, has been gradually developed in two quite distinct directions. Some features of the work aim at encouraging prominent breeders to develop herds capable of transmitting the most valuable qualities of the breed, and inducing other breeders to take up this work, while other features aim at the better utilization of the breeding animals from these superior herds for the improvement of the cattle breeding in general.

Already, about the year 1870, the classes for single cows were discontinued, and prizes offered instead for collections of cows bred by the exhibitor—a feature which is still considered very important, the idea being to draw attention to the best herds, which can more safely be done when a collection and not a single individual is shown. In 1887, the State caused special shows to be held for bulls over three years old, for the purpose of encouraging farmers to keep the good bulls for a longer time. The result has been striking, the number of old bulls shown having increased from 371 to over 1,200. A special Danish feature has been introduced with these shows, namely, judging the bulls through their offspring, inasmuch as no prize is awarded for bulls over five years old unless their offspring, which must be judged before the show, has been found satisfactory. This entails a good deal of work, but has been found very useful.

The judges at shows take into consideration not only the points of the exhibited animal, but also, in the case of bulls, the pedigree, including information on the milk production of the dam, and, in the case of cows, the milk production (quantity and quality).

The Cattle Breeders' Association has for its principal aim the purchase of a good bull. The first Association was formed in 1883. From the beginning, these associations also paid attention to the cows and to the health of the herds; they also required accounts to be kept of the feeding and the yield of the individual cows. From 1887 the State gave a yearly grant, which helped the movement on. There are now 1,300 Cattle Breeders' Associations, with 1,500 bulls, the State giving £8 per annum per bull, on condition that the bulls have taken prizes, that the committee select the best cows of the members to be served by the bull, and that the committee at least once a year inspect the herds on the farms as to the state of health.

While the other objects of the Cattle Breeders' Associations have been attained, it was different with the required accounts of the feeding and yield of the individual cows. The members could not manage these, and when, in the beginning of the nineties, information of the percentage of fat in the milk was included in the requirements, it was found necessary to take the whole matter up in a different way. This led to the formation of the Control Union of Cow Testing Associations. The object of these is to strike a balance-sheet for each individual cow, for the guidance of the daily feeding, for the weeding out of those cows which it does not pay to keep, and for the selection of cows for breeding. Farmers in a district appoint jointly a 'controlling assistant', who, once every fourteen or twenty days, visits each herd, weighs the milk of each cow, estimates the percentage of fat, weighs the food given daily to each cow, and keeps account of it all.

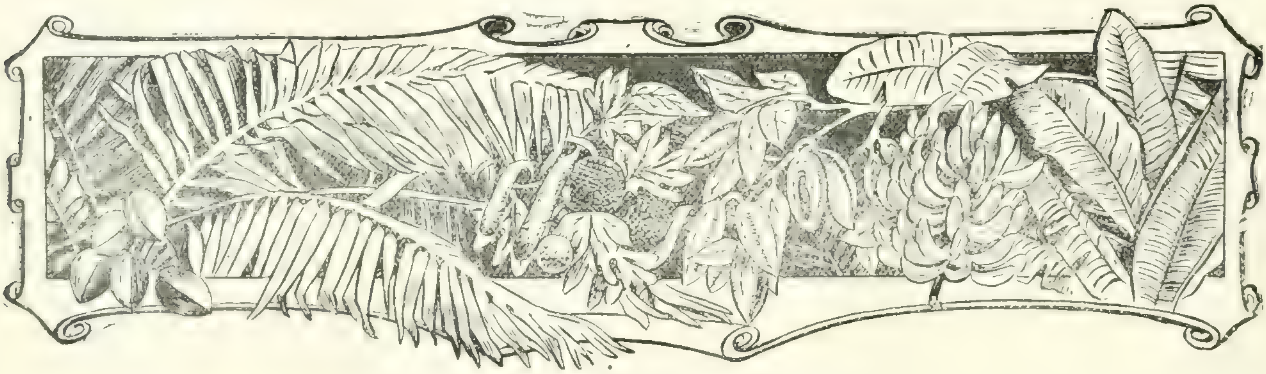
The information with regard to the yield and quality of milk of the individual cows collected by the Control Union is taken into account in awarding the prizes at the shows, and is also made use of in selecting the cows to be served by the bulls of the Cattle Breeders' Associations.

DEPARTMENT NEWS.

Mr. H. A. Tempany, B.Sc., Assistant Government Chemist for the Leeward Islands, has been appointed provisionally for one year by the Secretary of State for the Colonies to the post of Government Chemist and Superintendent of Agriculture for the Leeward Islands.

Mr. G. G. Auchinleck, B.Sc., arrived in Grenada on the 22nd instant, by the R.M.S. 'Berbice', in order to take up the duties of the post of Agricultural Superintendent in that colony. While in transit, Mr. Auchinleck spent a week at the Head Office, engaged in work connected with the post in Grenada.

With reference to the announcement in the issue of the 27th ultimo. relative to the appointment of Mr. C. R. Kirton to act as Agricultural Instructor in St. Lucia for a period of six months, it should be stated that Mr. Kirton, on his arrival in that colony, found himself unable to take up the duties of the post, and returned to Barbados by the R.M.S. 'Berbice', on November 30.



WEST INDIAN FRUIT.

GROUND NUT EXPERIMENTS IN DOMINICA AND ST. KITTS.

The chief purpose of these experiments was to determine the effect, in relation to the yield, of liming the land on which ground nuts were grown. The particulars of the trials were as follows:—

In Dominica, at the Agricultural School, a piece of land 1,176 feet square was selected and divided into two plots of equal size, which were labelled A and B. The soil, which had previously grown bananas, is light, open and rich in humus. Previous to the experiment, it was broken up thoroughly and carefully levelled. The amount of seed sown in each plot was $\frac{3}{4}$-lb. The table below gives details of the manurial treatment and results.

Plot.	Manure.	Yield; lb. of cured nuts.
A	None	9
B	Slaked lime, 13½ cwt. per acre.	12

The plants in part of plot B did not grow well, and, in both plots, they were more or less severely attacked by a fungus. Though the experiment was not quite satisfactory, owing to the causes just stated, it seems to indicate that liming would be beneficial in growing ground nuts in the soil on which it was conducted.

The experiments at the Botanic Station, St. Kitts, were in continuation of others that have been conducted in former years. They include observations of the response to liming of different varieties, the latter being Spanish, Tennessee Red, Carolina Running and the local variety. An area of $\frac{1}{20}$-acre of each was planted; one-half of this was limed in each case while the other half was left untreated. The plants grew well and no signs of disease showed themselves until they were fully developed, when the same fungus as attacked the plants last year appeared in a few holes. Bordeaux mixture was at once applied as a spray, with the result that no spread of the fungus took place. The results in the case of every variety except the local one, which had not been reaped when the report was made, are given in the table below. The weights of the freshly reaped nuts were taken; the loss in drying is not less than 33 per cent.

Variety.	Unlimed plot. lb.	Limed plot. lb.
Spanish	124	116
Tennessee Red	120	119
Carolina Running	65	83

These differences are not sufficiently great to give any definite information as to the effect of liming on the yield. The experiments are more encouraging than has been the case before, and should be the means of introducing these new varieties of ground nuts, which have the advantage of attaining maturity more quickly, and being easier to reap, than the local one. In St. Kitts the Spanish variety is in most general favour.

It would seem desirable to make efforts, at the different Botanic Stations, to raise acclimatized varieties of ground nuts for local cultivation.

Trinidad and the Colonial Fruit Show.

A catalogue of the exhibits sent from Trinidad to the recent Colonial Fruit Show of the Royal Horticultural Society (see *Agricultural News*, Vol. VIII, p. 382), has been lately received. It was prepared under the direction of the Permanent Exhibition Committee, Trinidad, and is accompanied by a useful leaflet, also drawn up by the Committee, which contains concise information, such as would be useful to tourists visiting the island.

The catalogue gives details of the exhibits, which have been sent up in the following classes: fresh fruits; fresh vegetables; nuts and spices; preserves; jellies; crystallized fruits and marmalades; fruit syrups; condiments; miscellaneous products and preparations, including cacao beans and chocolate, various seeds, lime juice, oil of limes, cassava cakes, cocoa-nut farine, maize, sugar-cane and rice. In addition to these, there have been forwarded fifty-six exhibits, consisting of specimens of fruits, spices, vegetables, etc., preserved in formalin, among which are represented the lime, mango, sapodilla, guava, bananas, nutmeg and mace, peppers, egg-plant, ochro, christophine, cacao and vanilla.

A Useful Aid in Distillation.—Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, has recently sent particulars of a useful apparatus for simplifying the operation of taking the exhausted material from the still after the removal of essential oil from it by distillation. This apparatus was first suggested by Mr. E. A. Agar, of Dominica, and consists of wire baskets made of ordinary wire mesh, supported on a frame formed of $\frac{1}{2}$-inch iron band. In practice, it has been found convenient to use two baskets, instead of one, each having a height of rather less than one-half of that of the still. In the case of a full charge of material, both of these are filled, and placed in the still one above the other. Mr. Tempany states that he has found them, on trial, to be very satisfactory, and to give a method of discharging the still which is much quicker and more convenient than any of the ordinary ones that have been tried by him.

A USEFUL LEGUMINOUS PLANT.

In *L'Agronomie Tropicale* for September 1909, there is an account of a leguminous plant, *Tephrosia purpurea*, which deals with its suitability for the purpose of keeping down weeds, in rubber and coffee cultivation.

For some time, the investigations of physiologists and agriculturists have called attention to the disadvantages of weeding (in rubber and similar cultivations), but changes of method in this direction have not been adopted by many planters; few experiments have been undertaken in connexion with it in the truly practical sense.

Interest has, however, been awakened, and experiments with leguminous and other plants have been made to a certain extent everywhere. There have been attempts in many regions, to introduce a plant which, while capable of keeping down others which are harmful, enriches the soil and does not do any harm to such trees as rubber. According to a planter in the Federated Malay States, *Tephrosia purpurea* fulfils this purpose admirably. This *Tephrosia* grows slowly at first, but toward the end of four months, it attains the dimensions of a small bush; it then commences to show superiority over other plants. When fully grown, it is 9 to 11 feet high. In plantations, it forms hedges across which no other plant can pass, and the necessary weeding near the plants, costs little. The hedges are sufficiently distant to allow the air to circulate between the trees, and the soil is always well shaded and kept in good physical condition. As for the protected trees, these appear to make as good growth as they do on soil that is completely and regularly free from weeds.

By growing the plants of *Tephrosia* in hedges, a better circulation around the roots is assured and the inspection of the protected plants is facilitated; other methods of cultivation have their advantages, however, as for example, that in which each rubber tree is surrounded by *Tephrosia*.

The plants attain a certain height, and should be cut once or twice a year; but this development gives them an advantage in combating lalang and other tall weeds, and as they do not climb, they may be planted without inconvenience near rubber and coffee trees. In addition, *Tephrosia purpurea* is a plant which enriches the soil, has few natural enemies, is very hardy and propagates itself when it is once established.

The account goes on to show how a great saving in the expense of weeding follows the adoption of this plant in rubber cultivations. It may be remarked that several species of *Tephrosia* are common in the West Indies; among these are 'goat rue' (*T. cinerea*) and 'Surinam poison' (*T. toxicaria*). Of these, the former is a loosely spreading undershrub, which tends to run along the ground; stem 1 to $1\frac{1}{2}$ feet long; leaflets $\frac{1}{2}$-inch to 1 inch long; flowers about $\frac{1}{2}$-inch long, red, appearing in February to June; pods spreading, with 5 to 10 seeds; found in open spaces, thickets and on the sea-shore. *T. toxicaria* is an upright, larger plant, with an erect stem about 4 to 5 feet high; leaflets $1\frac{1}{2}$ to 2 inches long; flowers $\frac{2}{3}$-inch long and over, blue; pods about 2 inches long.

ORNAMENTAL FLOWERING PLANTS IN DOMINICA.

In October 1901, seeds of *Mimusops Shimperi*, the 'Persea' of ancient writers, were received at the Dominica Botanic Station, from Kew. From these, two specimens of the plant were raised, and the Curator has recently reported that one of them has flowered. The plant itself is a native of tropical Africa, and bears handsome, long-stalked, elongated flowers, which give place to an elliptical, one-seeded fruit. It is, of course, related to the bullet tree (*Mimusops globosa*) of British Guiana, which yields balata.

The Curator of this Station also reports that a specimen of *Baikiaea insignis*, which had been received in the first instance from Kew, flowered there for the first time in March 1908. In the *Annual Report* on the Botanic Station, etc., Dominica, 1908-9, which is just being issued, the following reference is made to this plant: 'The young plant of *Baikiaea insignis*, a West African tree mentioned in last year's progress report, continues in good health. For several months during the year it produced daily from one to four of its large and beautiful flowers The flowers usually open in the afternoon, and fade away about the middle of the following day. They are in full beauty during the evening and early morning. The plant, which is growing near to the main carriage road, has attracted a good deal of attention from visitors. No seed has yet been ripened. This is probably the finest flowering tree brought to the West Indies since the introduction, many years ago, of *Amherstia nobilis*.'

The *Kew Bulletin*, No. 8, 1909, gives information concerning this plant as follows :—

The flowers are 10 inches across when fully expanded and are remarkable as being the largest produced by any member of the *Leguminosae* (pod-bearing plants). The tree is of erect habit, evergreen, with large, abruptly pinnate, coriaceous leaves from 1 to 2 feet long; pinnae slightly oblique, elliptic, 6 inches to a foot long, and sometimes as much as 4 inches in diameter. The flowers are borne in loose clusters on the tips, or in the axils of the upper leaves of the ripened wood of the current year. The calyx is 4 to 5 inches long and divides on opening into four linear segments, the three upper sepals reflex and curl round the stalk of the flower, the two lower remain united and form an erect, boat-shaped support, upon which rests the large, somewhat fleshy lip. The corolla is erect on first expanding, but the petals gradually reflex at the tips, and the whole flower is then about 10 inches in diameter. The petals are snow-white, spathalate, 6 to $6\frac{1}{2}$ inches long, and 3 inches broad, with undulating margins. The lower petal or lip is boat-shaped, lemon-yellow in colour, and somewhat more fleshy in character than the other members of the corolla. The ten stamens are in two series, the five longest being equal in length to the petals, the other five an inch shorter. The filaments are slender, villose on the lower half, nine being connate at the base. Anthers linear, versatile, $\frac{3}{4}$-inch long, primrose-yellow in colour. Ovary a slender legume 2 inches long, style slender, slightly shorter than the petals; stigma capitate, small.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 4, is as follows:—

The market remains very quiet, with apparently no demand. The sales consist of only one crop lot of 35 bales W. G. Hinson-Midway on private terms for France. In the absence of an inquiry, the factors continue to hold, viz: Extra Fine at 37c., Fully Fine at 35c., Fine at 33c. Our impression is that with orders in hand, especially for quantity, we could succeed in buying at some decline.

On November 27, Messrs. Henry W. Frost & Co., reported as follows:—

Although the figures of the amount ginned this year point to a much larger crop than the last, factors and interior merchants still think it will be smaller, the falling off being chiefly in Florida; that the plant has ceased bearing, the crop has all been picked and a larger portion of it ginned than in previous years, and they continue to hold to their estimates of 90,000 to 95,000 bales. It would require, however, a great falling off in the ginning from now on to warrant these estimates.

(Owing to the fact that this number of the *Agricultural News* went to press earlier, on account of the Christmas Holidays, Messrs. Wolstenholme and Holland's report is unavoidably held over.)

THE COTTONS GROWN IN THE UNITED STATES.

A report entitled *Agricultural Impressions of the American Cotton Crop*, prepared by the Director of Agriculture, Nyasaland, has recently been issued. It contains an interesting account of the present position of the various cottons that are grown in the United States, from which the following extracts are taken:—

SEA ISLAND COTTON. This is a small high quality crop forming less than 1 per cent. of the American cotton crop, but of great importance owing to its high quality. It is grown to the highest degree of perfection on James and Edistow Islands, which lie to the west and south-west of Charlestown, in the State of South Carolina. The largest part of this crop is grown on the coast line of South Carolina, the interior of Georgia and the north centre of Florida, the coast countries of Georgia and Florida producing little cotton owing to the inferior character of the soil and the absence of necessary labour. With this crop, planting is very wide and in most cases 5 feet is left between the rows and 22 inches between the plants, planting commencing in March and harvesting in the latter part of August and continuing till December. The island-grown cotton is much superior to the mainland crop, which is always inferior owing to the large amount of hybridization with Upland cotton, which is grown in close proximity with the mainland crop, as well as to the lack of humidity in the atmosphere. The inland cultivators of Sea Island cotton say that their Sea Island crop is superior to their Upland crop when the season is warm with much rain, and vice versa when there is drought. The inland-grown crop is shorter of staple and lacking in lustre, the best results always being obtained by growing the inland crop from Island-grown seed. During the present year the Island cultivators have formed a union to prevent the sale of Island seed, as they say the increase of mainland Sea Island is affecting their prices.

It has been predicted by several that there is very little possibility of extending the Sea Island cotton industry in America under the existing conditions. The principal reason is that the cost of labour is very high, and the crop gives such small returns when planted outside of its ideal conditions. It is more profitable to grow ordinary Upland in most districts, as it is a far surer cropper, especially in drought seasons, which frequently occur in the States of Carolina and Georgia, which have the most suitable situations for this crop.

The mainland Sea Island cotton is classified according to length into 'East Floridas', $1\frac{3}{4}$ to 2 inches, 'Floridas', $1\frac{5}{8}$ to $1\frac{3}{4}$ inches, 'Georgias', $1\frac{5}{8}$ inches; and further classified according to strength, cleanness and evenness of staple into fancy, extra choice, choice, extra fine, fine, and 'dogs'— the average mainland Sea Island selling from 17c. to 25c. per lb.

UPLAND COTTON (Short Staple). Upland cotton is the principal cotton of commerce, and is very extensively cultivated in every State of the American cotton belt. The principal Upland cotton States are South Carolina, Georgia and Alabama on the east side of the Mississippi, and the eastern half of the immense State of Texas on the west side of the Mississippi. It is considered that Georgia and Alabama grow the best short staple Upland, and the best variety I saw in this country was 'Cook's improved'. The soil of Georgia and Alabama is red and rich in iron, much of it being light and specially suitable for fruit-growing, which is an important industry in those two States.

During my tour through the States of Georgia and Alabama I saw few crops which would yield 400 lb. of lint per acre, and many crops which would give under 125 lb. This is a great contrast to conditions in the delta of Egypt where 500 lb. of lint or 5 cantars of seed-cotton is considered an average crop. Texas cotton is inferior to Georgia and Alabama cotton, and especially that which is produced in South-west Texas, which is distinctly inferior to north and central Texas cotton.

The system of handling Upland cotton in America is disgraceful; the bale coverings are of the cheapest materials, and quite inadequate to protect the fibre or hold it together;

Egypt has nothing to learn from America as to the best methods of handling cotton. The amount of loss in transit from the farm to the spinner must in many cases exceed 3 per cent. of the original weight of the bale. The compress sheds, docks and railway sheds are simply littered with cotton, and I was informed that many of the cotton factors pay their office expenses from the samples they draw, and the cotton collected from the floors of their compress sheds, and docks. The farmers are largely responsible for this loss, as they refuse to pay for a better class covering, which can be obtained at a higher price.

At the present time, cotton seed is in great demand and finds a ready market at the ginneries, which are principally worked by oil millers. Many of the farmers exchange their cotton seed for cotton meal, as the meal is more available as a manure. The usual exchange in the south is 2,000 lb. (American ton) of seed for 1,200 lb. of meal; others sell the seed at an average of \$15 the American ton. Cattle are scarce in the cotton belt on the East of the Mississippi, but plentiful in Texas and the West, where large areas are still devoted to cattle ranching. The cotton farmer never thinks of fattening cattle, but many of the oil and ginning firms are fully alive to the profit in cattle fattening, and it is a common sight in the West to see the mills surrounded with yards where cattle are fattened exclusively on a mixture of cotton meal and hulls. Hulls are sometimes purchased as horse foods at \$5 a ton; most of the meal is exported with the oil to Europe, where it is made into cattle cakes, etc.

The cotton belt would yield a much larger cotton crop if there was more mixed farming, for undoubtedly the best results in cotton growing are always obtained when the crop has some form of organic manure as a basis for its food requirements: fine physical soil conditions are never obtained by the exclusive use of artificial manures, or insufficient tillage with no manure, as is the practice throughout the greater part of the American cotton belt.

UPLAND COTTON (Long Staple). It is only within the last few years that long staple Upland cottons have been cultivated. The crop is almost exclusively grown in the valley of the Mississippi, on the rich river bottom lands. This cotton is more delicate than ordinary Upland, and is a much lighter cropper although the fibre is distinctly superior in length, being over 1 inch.

Small quantities of long staple Upland are grown in South Carolina and Georgia, but the area is decreasing in those States, in fact throughout the cotton belt the tendency is to give up the cultivation of long staple Upland; and even in the Mississippi valley it is estimated that the present crop is about one-fifth of last year's crop in area. The cause of this decrease in long staple Upland cultivation principally lies in the fact that the supply has exceeded the present demand for this staple, and the present premium of 2c. per lb. is not sufficient to compensate for the smaller crop produced by this variety, when compared with ordinary Upland. Two years ago the premium was as high as 7c., and it is considered that when the premium is under 4c. a pound, it does not pay to cultivate this class of cotton.

There is little prospect of long staple cottons increasing in the States as they mature late, and this is becoming the most important factor in American cotton cultivation, as all late cotton in affected areas is destroyed by the cotton weevil. It is the general opinion of American cotton experts that all varieties of long staple Upland cottons are allied, or derived from, 'Allen's Long Staple,' two of the best varieties being 'Griffin' and 'Queen'. In America, long staple Upland cottons are spoken of as 'Florodora Cottons'.

EGYPTIAN COTTON. During the past two years, America has imported, on an average, 54,000,000 lb. of this staple yearly from Egypt; and in 1907 the value of the cotton imported from Egypt exceeded all previous records, amounting to over \$16,000,000. The average price in the Boston market was 21·9c. per lb., or double the price of ordinary Upland.

In view of the considerable value of this import, the Department of Agriculture has been endeavouring to produce Egyptian cotton in the United States to supply their home market. The standard Egyptian varieties have been experimented with, but the experiments have been a total failure throughout the main cotton belt, extending from Carolina to Texas. The chief cause of failure is insufficient heat to mature the plants before the frost sets in. Experiments have met with more success in the south-west, and especially in the Colorado River region of Arizona; where the deep alluvial soils, irrigation and a longer and warmer summer approach more closely the ideal conditions of the Egyptian delta. In 1902, all experiments in the main cotton belt were abandoned; experiments at Yuma, Ariz, and Calixico, California, were commenced, Yuma being the chief centre of experiment.

During the first three years, these experiments were practically a failure, but after five years' acclimatization and selection great improvement was attained, and now the Department hopes to produce Egyptian cotton for its own use, although it will never produce it in large quantities. I was unable to visit Yuma, as the distance was too great, but discussed the problem with Mr. Kearney at the Department of Agriculture, Washington, who has charge of those experiments. I examined some of the fibre produced in Arizona, and consider it wanting in colour, gloss and evenness of staple, but of good length and strength. The Department has had great difficulty in keeping it pure, as it readily crosses with *Gossypium hirsutum*, and they discourage the growth of Upland cottons in the locality of the experiments. I am of opinion that American-grown Egyptian will never compete with Egyptian proper, as the loss of lustre and colour makes it of less value for mercerizing, which is the chief quality of Egyptian cottons. The American experiments are interesting, as they clearly demonstrate the value of acclimatization, and show that poor results at first do not necessarily mean that a variety is hopelessly unsuitable for introduction.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated December 10, 1909, gives information as follows:—

The weather during the fortnight under review has been showery, which is not unusual at this time of the year. Should the coming fortnight be a wet one, milling on factories not equipped with a drier will have to be suspended, and as a result, the price of the cleaned article may improve.

Milling continues general throughout the colony; 2,391 bags have been shipped to the West Indian islands for the fortnight—a decrease of 1,400 bags, as compared with the previous one.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 16*s.* 6*d.* to 17*s.* 6*d.* per bag of 180 lb. gross.
15*s.* 6*d.* to 16*s.* 6*d.* ,, ,, ,, 164 lb. ,,

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

VOL. VIII. FRIDAY, DECEMBER 24, 1909. No. 200.

NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial, the uses and scope of the periodical publications of the Imperial Department of Agriculture are discussed.

A description of interesting experiments with ground nuts, which have been undertaken in Dominica and St. Kitts, is given on page 404.

In relation to Dominica also, an account of notable flowering plants that are at present growing in the Garden will be found on page 405.

An abstract of a useful report on the cottons at present being grown in the United States is presented on page 406.

The Insect Notes of this number, on page 410, form the conclusion of the series of articles on the Natural History of Insects. In this one, the functions of digestion and reproduction are treated.

A useful summary of such of the more recent mycological work of the Department as has been described to readers of the *Agricultural News* is contained on page 411.

A further, interesting contribution to the state of knowledge in regard to the supposed poisonous properties of wild ipecacuanha (*Asclepias curassavica*) appears on page 415.

The Late Sir Alfred Jones, K.C.M.G.

Telegraphic news was received on December 14 that Sir Alfred Jones had died of heart failure, following a chill, on the 13th instant.

Sir Alfred was born at Carmarthen in 1846, and early showed an aptitude for commercial affairs. It was this aptitude that led to his becoming the senior partner of the firm of Elder, Dempster & Co., the noted shipowners. He was one of the first to recognize the value of the undeveloped resources of the Empire, and the results of his work in assisting in the expansion of trade in West Africa and Jamaica remain as a testimonial to his ability.

Among his other positions, Sir Alfred was an Honorary Fellow of Jesus College, Oxford; President of the Liverpool Chamber of Commerce; Chairman of the Bank of West Africa, Limited; and Founder of the Liverpool School of Tropical Medicine It is hardly necessary to say that his death has caused almost as great a loss to colonial interests generally, as to the more particular commercial concerns which he chiefly directed.

Lime-Seedlings in Nurseries.

Useful information in connexion with the raising of lime-seedlings in nurseries is given in the annual report on the Experiment Station, St. Lucia, which has recently been issued. It appears that the lime-seedlings raised in August 1908, were seriously affected, while quite young, by heavy rains and flood water, and in consequence damped off in thousands. As soon as the damage was observed, the seedlings were sprayed with Bordeaux mixture, with a repetition of the treatment after twelve days. The opinion is given that this doubtless prevented the total loss of the seedlings.

Observations would appear to show that the disease commenced at one end of the seed plots; when it was noticed first it had taken possession of three quarters of the area of the plot, and was advancing rapidly, showing a very distinct boundary between the healthy and diseased areas. After spraying, the line of this boundary remained fixed and conspicuous, proving that the fungicide had effectually arrested the course of the disease.

The Preservation of Timber.

On page 249 of the current volume of the *Agricultural News*, a note was given on the Powell Wood Process. Further particulars relating to this process appear in a recent number of the *Journal of the Royal Society of Arts* (October 22, 1909.) The process consists of boiling timber in a saccharine solution, and then drying it in specially constructed chambers. The inventor of the process obtained his idea through observing that the timber used for flooring or wall plates in sugar refineries never appears to be affected by dry rot. From a number of experiments, he was led to conclude that wood which had been boiled in a mixture of molasses and water, and carefully dried in a kiln, could be seasoned rapidly without splitting or cracking. In its developed state the process includes the addition of other ingredients which also give immunity to the action of white ants and teredo.

A New Mexican Fibre.

In *L'Agriculture Pratique des Pays Chauds* for September 1909, an account is given of a new Mexican fibre, the information concerning which was furnished by the American Consul at Manzanillo. It is obtained from the plant *Centaurea salmantica*, which is known locally as 'escoba'. This is a kind of shrub which attains a height of 18 inches to 5 feet. Its name, which means 'broom', is derived from the fact that the natives cut it every year, and, after having dried it, make small bundles of it, which they use for brooms.

In those parts where it is abundant, large ropes are made from it in the following manner. After cutting it, the natives sink the shrub in a slowly running stream for about two days, after which treatment, the bark is easily removed. When it has been stripped and washed, it yields a long, delicate and silky fibre, which is very strong and of which the ropes are made.

The plant grows abundantly in open places, and when it is cut at the end of the season it makes a second growth which is sufficiently large for a fresh crop to be obtained from it after the following rainy season. It does not require any cultivation or replanting, and grows very vigorously. On account of the strength and durability of the fibre and the abundance of the plant, a large industry will probably be established, as much for the manufacture of ropes as for that of the sacks which are used in every part of Mexico for carrying burdens on the backs of animals.

Oil Seeds in British India.

According to the *Monthly Consular and Trade Reports* for October 1909, practically all the cotton-seed exports from Bombay go to England, two-thirds of the sesamum seed from Bombay to France, and nearly all the ground nuts from Madras to France. The largest export of ground nuts from Bombay took place in the fiscal year 1895, when 78,488 tons were despatched to foreign ports from Bombay alone. Since then, the figures have rapidly fallen to 2,890 tons during 1903, and at present this once important export trade may be considered as practically extinct, as far as Bombay is concerned, the decline being attributed to disease and exhaustion of the soil, to the restricted areas and reduced out-turn consequent upon unfavourable seasons, and to the large use of the nuts in the manufacture of oil for local consumption.

Very little, if any, cotton seed is pressed for oil in India. Interest is just beginning to be taken in the possibilities of an indigenous industry for the production of edible cotton-seed oil. It is estimated that the cotton seed available for such a purpose is 1,500,000 tons a year, India being next to the United States as the greatest producer of raw cotton.

The exports of ground nut oil to foreign countries are not of sufficient importance to be given a separate heading in the Government trade returns. In the fiscal year 1907, only 17,000 gallons was exported. There is, however, an enormous trade in this article between the port of Madras and Burma. Madras is the centre of both the ground nut and ground nut oil trade. Ground nuts seem destined in the near future, however, to excite much more interest than in the past, for the Government is making every effort to improve the seed by the introduction of a new and better quality from Mozambique and Senegambia. In the Madras Presidency, where it has hitherto been raised on a systematized scale in a very circumscribed area on the Coromandel coast, it has been introduced with the most encouraging results, and on the Malabar coast it is now grown as a dry land crop, where it has proved far more profitable than the dry land crops that are usually grown. The bulk of the Indian manufacture of ground-nut oil is in the hands of ordinary native pestle-and-mortar pattern rotary mills.

The quantity of sesamum oil exported in the fiscal year 1908 was 161,581 gallons, valued at $105,123; and in 1909, 174,210 gallons, valued at $105,254. Almost all of this goes from Bombay, and the chief markets are Mauritius, Arabia, Aden and Ceylon.

The Lumber Trade of the West Indies.

Information concerning this trade is given in the *Weekly Report* of the Department of Trade and Commerce, Canada, No. 289. From this it appears that the lumber trade of the British West Indies, British Guiana and Bermuda amounted during the year ending March 1909, to £561,624; of this sum, £421,922 was the value of imports, and £139,702 that of exports. Of spruce, white pine and hemlock, the amount from Canada was £41,931, and from the United States £29,142, showing a difference in favour of Canada of £12,789.

In unclassified lumber, the imports from the United States were £37,273 and from Canada £9,900. Of the wood imported, pitch pine had the greatest proportion, its value being £114,375; all this came from the Southern States of America. In the export of wood from the above parts of the West Indies, Jamaica, British Guiana, Trinidad and the Bahamas led with £90,277, £27,370, £7,882 and £6,178, respectively.

The Manufacture of Guayule Rubber.

In the *Journal of Industrial and Engineering Chemistry* for April 1909, an account is given of the extraction and manufacture of Guayule rubber. It is shown that the shrub, when perfectly dry, contains 9 per cent. of pure rubber. The extraction of the rubber by such solvents as carbon disulphide and benzene has ceased to be employed in Mexico; in only one case is this effected by boiling for six hours, with a solution containing 6 per cent. of caustic soda. Mechanical processes for extraction are almost exclusively employed now in this industry.

The rubber obtained is black, of a pitch-like consistency, and contains 20 per cent. of resin. Investigations have shown that the wood of the stem does not contain any caoutchouc; the largest amount is yielded by the bark of the stem and the root. Of these, the former contains 21·4, and the latter 19·5 per cent. The rubber content of the branches and leaves is 9.7 per cent.

INSECT NOTES.

NATURAL HISTORY OF INSECTS.

PART V. DIGESTION AND REPRODUCTION

DIGESTION.

The digestive system in insects, in its simplest form, consists of a cylindrical tube, extending in a direct course from the mouth to the anus. In the more specialized insects, the alimentary canal is very modified, being folded and doubled on itself in such a way as to give it a length considerably in excess of the total length of the body. The organs which are concerned with feeding and digestion occupy a very large proportionate part of the entire body cavity, Fig. 45 (see *Agricultural News*, Vol. VIII, p. 378) will give an idea of this. The cross shaded portion is the alimentary canal. Food taken in at the mouth passes by means of the oesophagus, or gullet, to the stomach. Sometimes a crop and gizzard are developed, the crop for storing a portion of food, the gizzard with strong muscles and chitinous ridges and hooks, by means of which the food is reduced to a finer condition before entering the stomach. In certain insects, at least, a larger part of the actual digestive process is carried on in the crop, and in these insects also, the gizzard serves as a strainer through which the finer portions of the food with digestive fluids are carried to the stomach, in which absorption takes place. The stomach is a large digestive region (Fig. 45; AL) from which the food passes to the intestine, colon, rectum, and to the anus, where waste and undigested food is voided. The food canal is composed of three sections, the fore-gut, mid-gut and hind-gut.

The manner of taking food also varies greatly among insects. Certain insects such as grasshoppers eat vegetable food, with biting mouth parts, in both larval and adult stages of their development. Others, such as plant lice and cotton stainers, take plant food by means of sucking mouth parts also during the whole of the larval and adult life. Others, still, feed with biting mouth parts in the larval stage, and in the adult one either do not feed at all, or get their food by sucking the juices of plants and flowers. Many butterflies and moths are examples of this. Other examples of the variety of ways of feeding are to be seen in the mosquito, the larva of which is a scavenger or predator in stagnant water, while the adult male sucks the juice of fruits and flowers, and the adult female sucks the blood of animals. Another example is to be found in many bees and wasps, where the same individual possesses mouth parts developed for both biting and sucking.

The manner of feeding has a great influence on the development of the food canal. Larvae, with biting mouth parts, which feed on vegetable matter have very large alimentary systems, while predaceous insects have smaller ones and those which suck the juices of flowers and plants, and the blood of animals, even less. Certain insects which suck their food such as Lepidoptera, Diptera and Hemiptera, have a development of the gullet which acts as a sucking-pump, by means of which the food is taken up and forced back into the stomach. In bees and ants, the region of the gizzard is occupied by the honey-stomach, into which the nectar can be taken and kept separate from the actual food of the insect. The nectar or honey can be disgorged at will.

Attached to, or communicating with, the alimentary canal, there are two or three different kinds of glands, each kind in pairs or a number of pairs. The salivary glands open into the mouth, and in addition to possessing the function of moistening foods, they are often developed for quite different purposes. For instance, the silk glands of the silk-worm and many other caterpillars, the poison glands of mosquitos and of certain Hemiptera are salivary glands, or portions of the salivary glands specially developed for the purpose. Other poison glands, scent glands, and glands for many special purposes occur in insects, but quite apart from the digestive system. The kidney tubes, or 'malpighian' tubes, of insects communicate with the food canal, at the juncture of the mid-gut with the hind-gut, that is where the stomach and small intestine join. These are often very numerous, and their function is excretory, similar to that of the kidneys in other animals. The waste products are passed into the intestine, and thence voided through the anus with the undigested food and other waste matter.

REPRODUCTION.

Reproduction in insects is sexual, as a general rule, the organs of the two sexes being borne in separate individuals. Hermaphroditism (the two sexes in one individual) does not occur normally, and it is not known that hermaphrodite insects ever reproduce. The sexual organs are well developed, the testes of the male producing the spermatic fluid, and the ovaries of the female, the eggs. In the female of many species, the ovipositor is developed with special reference to the situation in which the eggs are to be laid. Certain grasshoppers are able to force the abdomen into the hard ground; some crickets, thrips, and many other insects have saw-like ovipositors, with which cuts are made in the surface of plant tissue; piercing ovipositors, of which the stings of the bees, ants, and wasps are good examples, puncture the tissue in which the eggs are to be laid.

Asexual reproduction occurs in plant lice, during a portion of the year, and in a few other insects. This parthenogenesis, as it is called, is a normal feature in the life-cycle, and the off-spring consists of females. The queen of the honey-bee is able to lay, at will, fertilized eggs which produce female, and unfertilized eggs which produce male, insects. Another kind of asexual reproduction sometimes occurs in insects, known as paedogenesis. The larvae of certain Cecidomyiidae are capable of giving birth to young, and in another group of small flies the pupa deposits unfertilized eggs which are capable of hatching.

The papers on the Natural History of Insects are concluded with the present article. The five parts, taken together, give a comprehensive view of the vital processes of the insects, and also show the differences and likenesses between the insects and the nearest relatives, the Crustacea, the Myriapoda and the Araneida. The structure, growth, senses and circulation, the nervous respiratory and digestive systems and the reproduction of insects have all been treated briefly, but in such a way, it is hoped, as to give the readers of the *Agricultural News* a general knowledge of insects. The illustrations, eleven in number, will be found to aid in understanding many of the points. If these articles are taken in conjunction with those relating to the orders of insects, which appeared a short time ago, and for which the following references may be consulted, a general outline of West Indian entomology may be had. These references are as follows:—Grasshoppers, Vol. VI, p. 218; crickets, Vol. VI, p. 106; pond-flies, Vol. VI, p 266; Hemiptera, Vol. VII, p. 138; Lepidoptera, Vol. VII, p. 234; Coleoptera, Vol. VII, pp. 250, 266; Diptera, Vol. VII, pp. 314, 330, 346; Siphonaptera, Vol. VII, p. 346; Hymenoptera, Vol. VIII, p. 234.

FUNGUS NOTES.

SUMMARY OF RECENT INFORMATION.

The following is a short summary of information concerning the plant diseases that have come under the notice of the Mycologist to the Department, since April of this year, and of which mention has already been made in the *Agricultural News*.

ON COFFEE. A disease of leaves, stems and berries due to *Sphaerostilbe flavidum*, Massee, reported from Dominica. *Agricultural News*, Vol. VIII, pp. 292 and 395. The illustration on this page (Fig. 50) shows the fungus causing this disease, and its effect on a coffee leaf. A complete account of the fungus is given on page 395 of the current volume of the *Agricultural News*.

ON GROUND NUTS. Dominica. Two fungi are reported as causing disease of the leaves: *Uredo arachidis*, forming minute brown pustules scattered over the blades and petioles; and *Cercospora personata*, forming rather larger black circular spots on the leaves; on these spots the fructifications appear as brown pustules. *Uredo arachidis* has also been reported from Montserrat.

A root disease due to an unidentified fungus also occurred in Dominica and St. Kitts; the fungus was found on various other plants in Dominica and Barbados.

Remedial measures applied to the leaf diseases met with partial success. (*Agricultural News*, Vol. VIII, pp. 315 and 347.)

ON SCALE INSECTS. The red-headed fungus, *Sphaerostilbe coccophila*, has been found in Dominica, St. Lucia, Grenada and St. Vincent, on various scale insects, mainly however, on *Mytilaspis citricola*. Recently a different form of red conidial fructification, either due to the moist conditions or that of a variety, has been found in the interior of Dominica.

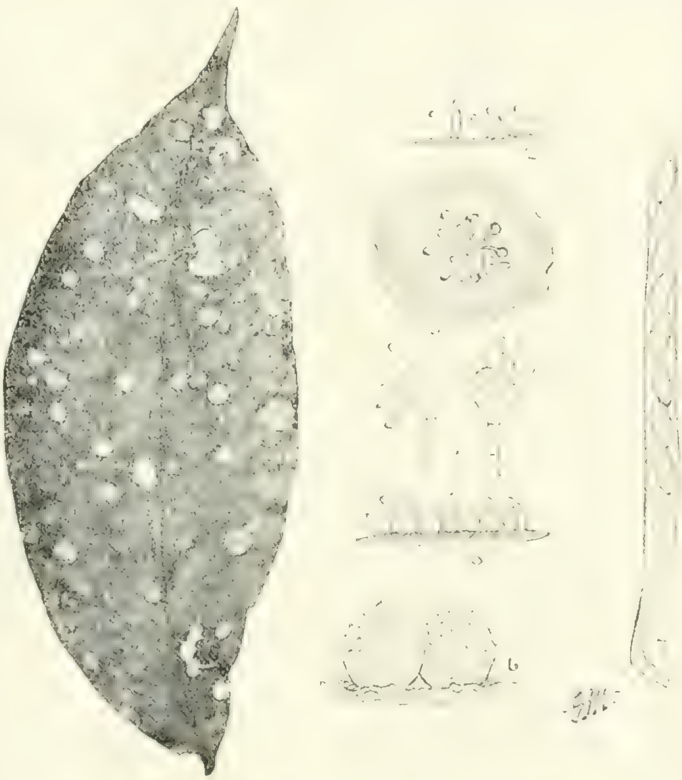


FIG. 49. SPHAEROSTILBE FLAVIDUM, Massee.
(Kindly lent by H.M. Stationery Office.)

The white-headed fungus, *Ophionectria coccicola* has recently been recorded to be widely spread in moist situations in Dominica on *Mytilaspis citricola* and *Chionaspis citri*, on which it proved a most effective parasite. Both the conidial and ascigerous conditions were found.

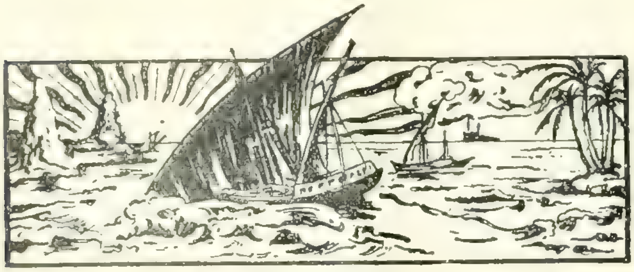
Myriangium Duriaei has been recorded from Dominica, St. Lucia, St. Vincent and Barbados, mainly on *Mytilaspis citricola* and *Chionaspis citri*. It appears to occur more generally on those insects living on twigs or stems, rather than on those living on leaves.

The Shield Scale fungus has been found in Antigua, Dominica, Grenada, St. Vincent and Barbados. The scales attacked were *Lecanium viride*, *L. hesperidum*, *L. nigrum*, *L. oleae*, *L. hemisphericum*. It is most effective in moist situations, but has also been recorded by Mrs. Patterson on a guava in St Vincent, growing in a somewhat windy situation; though under these circumstances its effect was considerably diminished. The same observer has recorded the occurrence of the same, or a very similar fungus, on aphids.

It is interesting to note that the red- and white-headed fungi and the shield scale fungus have been found growing on scale insects in Dominica on a plantation of limes, in the forest, which was at some distance from any other limes. This would seem to indicate that these fungi may have spread to the insects on the limes from others on the forest trees, and that the fungi are very possibly native to Dominica. Further observations in connexion with this idea would be useful. (*Agricultural News*, Vol. VIII, pp. 154, 186, 202, 299.)

In addition to what has been said, it may be stated that a disease of lime roots occurring in Antigua and Dominica, and a minor disease of cotton bolls from Montserrat are under investigation, and it is hoped that some account of these diseases will be published shortly. Investigations are also being made into prevalence of species of *Lasiodiplodia*, one of which attacks cacao, and as to the possible identity of some of these fungi with that on cacao. It is becoming apparent that the latter genus and some of its allies are very widespread and probably of considerable importance in these islands.

To illustrate this, it is only necessary shortly to summarize the species already known in the West Indies. *Diplodia cacaoicola* occurs on cacao, causing 'Brown Pod', and 'Die back', and also is found on sugar-cane. *Lasidiplodia* sp. attacks the roots and stems of cacao, and has been known to occur on the pods. There is evidence to indicate that these two fungi are identical. *Diplodia epicocos* is reported as occurring, in conjunction with *Pestalozzia palmarum*, on cocoa-nut palm leaves, and *Botryodiplodia* sp. causes a root disease of the same tree. *Botryodiplodia diplocarpa* has been found attacking orange trees. Other species, not as yet definitely identified, have lately been found on different host plants in the islands. The identification of some of these with species already recorded might lead to interesting and important results with regard to the infection of healthy cultivated plants, such as cacao or limes, from diseased plants, or from decaying stumps in the forest; it would probably also provide information on the question of the infection of one kind of crop from another of a different kind, when the two crops are growing in close proximity.



GLEANINGS.

Statistics show that the most valuable export from Zanzibar is cloves. The value of this in 1908 was £264,960.

The amount of arrowroot starch exported from St. Vincent during 1908-9 was 5,194,727 lb. In 1907-8 and 1906-7 the amounts were, respectively, 4,501,637 lb. and 4,643,124 lb.

The exports from the Bahamas with the greatest value during 1908 were sponges and sisal, which amounted to £94,238 and £42,627, respectively. Next in value came fresh and preserved pine-apples with £22,853.

The world's production of phosphates in 1908 was about 4,690,000 tons, and the consumption 4,590,000 tons. It is estimated that the production in 1909 will be about 5,000,000 tons. (*Engrais*, XXIV, 1909, No. 12.)

The French Association Cotonnière Coloniale reports that the cotton crop of Dahomey for the last season has been very satisfactory, the total production being estimated at rather more than 100 tons of lint (*Dépêche Coloniale*, September 30, 1909.)

An interesting indication of the increased importance which is being attached to the subject of Tropical Hygiene is afforded by the fact that a suggestion has been placed before the Indian Tea Association to the effect that this Association should undertake the organization of a department to advise generally on medical and sanitary measures.

The Acting Vice-Consul for Samoa reports that the year 1908 has been a prosperous one. The export of copra amounted to 10,000 tons and of cacao to 200 tons. The production of the latter is steadily increasing, so that in a few years' time the annual yield may reach 2,000 to 3,000 tons. The quality of Samoan cacao is stated to be very superior.

In accordance with the proposal of the Departmental Professor of Agriculture, Corsica, and others interested in the development of agriculture in that island, experiments in cotton-growing have been undertaken in recent years. At first, the results were not satisfactory, but those obtained in 1908 were more encouraging, and showed that, at least from a botanical point of view, cotton can be grown in Corsica. The varieties tried were Egyptian and Upland.

The Curator of the Botanic Station, Montserrat, states that specimens of the Agave found growing in quantity near the coast between O'Garas and Roaches have been recently sent to Dr. Trelease of the St. Louis Botanic Gardens, U.S.A., who states that the plant seems to show a specific, or at least a very strong varietal, difference from the typical *Agave Karatto.*

A report recently issued by the Economic Department of the Indian Government states that the South African fibre known variously as 'aramina', 'guaxima', and 'naxyma', the product of *Urena lobata*, is not very different from jute, though somewhat harsher, with a staple of 4 to 6 feet in length. The plant is widely distributed in India, being practically a jungle weed in Assam, Burma and Chittagong.

A report from H.M. Legation at Buenos Ayres states that a Government project has been agreed upon for turning to account vast districts of Argentina, which are unproductive at present, by the adoption of systems of irrigation in them. The scheme is being undertaken in conjunction with the railway companies, and the sum of £50,000 has been voted for preliminary surveys.

The raw sugar industry in Formosa has been developing very rapidly during the last few years. The yearly production, which was about 60,000 tons in 1905, has risen this year to 120,000 tons, and promises shortly to reach 180,000 tons. It is expected that the output will, at no distant date, supply the greater part of the Japanese demand. (The *Board of Trade Journal*, October 14, 1909.)

It has been decided to hold a Congress and Exhibition in connexion with the cultivation and preparation of fibres, under the auspices of the Netherlands Indian Agricultural Association, at Sourabaya, Java, on July 3 to 8, 1911. The Congress will attach particular interest to such fibres as Sisal, Manila hemp, jute, and its substitutes, kapok, and pine-apple fibre. Toward the end of the Exhibition, tests will be made of various types of machinery employed in the preparation of fibres.

The production of peppermint oil has been introduced as a new industry in North Formosa, and appears to be attended with success, although the project is in the experimental stage. During 1908 (the first year) 6,500 lb. of leaf were obtained from three crops on 1 acre. This produced about 105 lb. of peppermint oil which, valued at 6s. per lb., gives £31 10s. per acre. The cost of production was about £20 per acre, so that the net profit was about £11 or £12 per acre. The oil is steam-distilled, and is said to be of very good quality. (*Diplomatic and Consular Reports*, No. 4,240 Annual Series.)

The latest practice in the shipment of bananas is represented in the S.S. 'Tortuguero', which was built on the Clyde by Messrs. Alexander Stephen & Sons. This vessel is of 5,000 tons gross, and has insulated space of 220,000 cubic feet, 175,000 cubic feet of this being occupied by fruit bins, in which the cork for insulation has a thickness of 7 to 8 inches. The bins are so constructed that the fruit is prevented from touching any metal surface during transit. The air is cooled to 55° F. by means of a Hall's carbon dioxide refrigerating plant. While on the voyage the fruits are not stored with a covering of any kind.

STUDENTS' CORNER.

DECEMBER.

SECOND PERIOD.

Seasonal Notes.

Reference has been recently made several times to green dressings, in the *Agricultural News*, and much information in connexion with them has been given. Make notes of this, and consult in the same way other publications which deal with the subject; details of useful experiments with these plants will be found in some of the annual reports on the Botanic Stations and Experiment Plots that have been issued for 1908-9, as well as in those of former years. In making the notes, leave room for recording the results of observations, and suggestions for future experiments. Take these notes into the field, where green dressing crops are raised, and verify, as far as possible, the information which they contain, adding any facts that may be the outcome of your own scrutiny, and placing on record any ideas for future experiments that may occur to you. Remember that leguminous plants are not the only ones that are employed for the purpose of furnishing green dressings; other plants which do not increase the food value of the soil by simple addition are used as well. If such plants have no effect on the total amount of plant food that is in the soil, why are they used? What effect has buried vegetation on part of the plant food that is already in the soil?

When green dressings are being turned in, note which of them become incorporated with the soil most quickly. With what kinds of soils does this incorporation take place most rapidly? In comparing the growth of various green dressings, the amount of head growth provided should not only be considered, but also the mass of decaying matter below. The Bengal bean and the purple bonavist bean have much more of the former than either the pigeon pea or the horse bean. What special use has been recently suggested for the Bengal bean, in relation to lime cultivation? Give any explanation that you can of its action in this connexion. In comparing the growing plants of various kinds of green dressings in the field, it will be noticed that some are not attacked by insects to any extent. Give a simple explanation of this. Nurseries for the purpose of providing seed for planting next year's crop of green dressings should be prepared.

Make careful observations on the beans of fermenting cacao, with the object of ascertaining the more obvious changes that take place. Note how the cacao is dried, and record any precautions that are of special importance in this connexion. A good opportunity will have been recently provided for making thorough inspection of the trees in the cacao plantations, with a view to gaining information as to the diseases and pests by which it is chiefly attacked. Refer to the publications of the Department for the purpose of identifying these, and in order to obtain information as to the best ways for preventing them from attacking the trees, and as to remedies for them. What are the chief ways in which fungi, when they are deprived of the food that is contained in the tissues of living plants, are enabled to survive until the food supply is restored?

Where limes are grown, conduct a similar examination to that which has just been described for cacao, giving special attention to scale insects. In what ways do these pests cause damage to the trees which they infest? What class of poisons is employed for the purpose of reducing their numbers? Consult the publications of the Department with a view to gaining information as to the way in which these and other insecticides are made. Why is the practice sometimes adopted of tying branches, on which scale insects or their remains are present, into trees that are already infected by them?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Explain what is meant by a well balanced ration for stock.

(2) In selecting cotton plants which will provide seed for a future crop, to what points would you pay particular attention?

(3) State what you know of any process in which the nitrogen of the air is used for making manures.

INTERMEDIATE QUESTIONS.

(1) Why is it preferable to apply fresh manure to light soils than to use it for heavy soils?

(2) Describe a method of preparing a West Indian starch on a commercial scale.

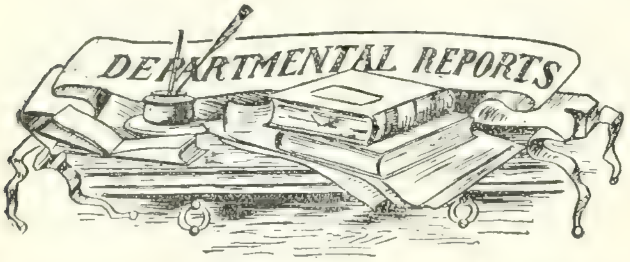
(3) How is the nitrogen in sulphate of ammonia rendered available for plants?

SCIENCE IN ELEMENTARY SCHOOLS, ST. LUCIA.

The Code of Rules for the Government of Elementary Schools, which has recently (September 3, 1909) been issued in St. Lucia, shows that *Blackie's Tropical Reader*, Parts I and II, and *Nature Teaching* are chiefly used as aids in teaching science in those schools. Assistance is also afforded, at most of the schools, through the possession of school gardens (see Annual Report on the Botanic Station, etc., St. Lucia, 1908-9). Instruction is also given in the rules of tropical hygiene. In order to help teachers in the courses of nature study, the following scheme for employing *Nature Teaching* is given as part of the Code, and as it may be useful to others, it is reproduced here. The numbers refer to pages; those on the left relate to the purely instructional parts of the book, while those on the right give the pages where the corresponding practical or observational work appears.

The seed: parts of a seed	1-3	
Plant foods in seeds	4-5	
Raising seedlings	15-21	
Germination; pigeon peas, guinea corn, castor	5-13	
Germination of bean, corn and cotton seeds	21-23	
The root; root-hairs; root-caps	27-28;	34-35
Roots, including growth	29-31;	35-36
The stem; uses of stems	44-47;	56-58
Stems; structure and uses	47-50;	58-59
The leaf	71-75;	88-90
Leaves, structure and uses	75-81;	91-97
The soil	105-107;	116-117
Water in soils	107-109	
Vegetable matter in soil	111-114;	123-125
Plant food and manures	127-128;	133-136
Flowers and fruits	146-150;	164-165
Parts of a flower	150-157;	165-167
Weeds	173-175	
Insects; life-history of a caterpillar	179-181;	187-190

The schedule states that pupils of Standard IV, or under, will only be examined in the subject-matter in italics, while those in Standards V and VI must take the whole course, a more thorough knowledge of the whole subject being required of those in Standard VI. It is interesting to note that the collection and preservation of plant specimens is encouraged, and that arrangements for the inspection of these have been made.



DOMINICA: REPORT ON THE BOTANIC STATION, AGRICULTURAL SCHOOL AND EXPERIMENT PLOTS, 1908-9.

The expenditure for the year was £705 0*s.* 6*d.*: of this, £358 4*s.* 11*d.* was spent on the upkeep of the Botanic Garden, including the ornamental grounds, experimental area, and nurseries. The sum received from the sale of plants, cured cacao, fruit and seeds was £346 15*s.* 7*d.* The expenses of the Prize-holdings Competitions were met by a vote under the head of Special Services, allowed by the Imperial Department of Agriculture, amounting to £33 10*s.*

Particulars are given of the chief flowering and economic plants that are grown in the ornamental part of the Garden The number of plants distributed during the year from the nursery at the Garden, was 67,596; by far the greatest number of these were limes, both ordinary and spineless, the total number being 55,648; the number of cacao plants was 5,613. A large number of seeds was also sent out, including those of cacao, species of rubber, green dressings, shade trees, various coffees, the spineless lime, and vegetables.

The economic plants in the Garden include twenty different kinds of rubber-yielding plants. Of these, Para rubber (*Hevea brasiliensis*) has shown itself to be the best; Central American rubber (*Castilloa elastica*) stands next in order. Samples of rubber from both of these kinds, which were sent to the Imperial Institute for examination, received favourable reports. After these, Rambong (Assam) rubber (*Ficus elastica*), and Sapium (*Sapium Jenmani* and *Sapium aucuparium*) appear, so far, to be best suited for cultivation in Dominica. The grafting of cacao is being continued; 246 grafted plants were distributed during the year, and some were planted at the Station. Marked success has been obtained in the experiment of grafting plants of the alligator cacao (*Theobroma pentagona*) on to Forastero stocks; at the time of reporting, there were 200 of these grafted plants at the gardens, and 400 had been distributed to estates for experimental cultivation. Attention is drawn to the fact that, although the Station will be able to aid planters in obtaining grafted plants, the demand for these prevents a large number from being allotted to any one applicant. The collection of mangos is making good progress, and there is now a steady demand for grafted plants in Dominica. The other plants, of which particulars are given are coffee and spineless limes.

During the year, exhibits were sent, by the Permanent Exhibition Committee, to four exhibitions, of which three were held in London and one in Canada. At all these, the capability of Dominica to produce good fruit was successfully demonstrated. The popularization of green limes was one of the chief objects of the Committee in forwarding material to these exhibitions, and to this end, free distributions of the fruit were made through suitable channels. In addition, supplies of limes for free distribution were sent by each mail, from August 9 to December 13.

Prize-holdings competitions were successfully held in the La Plaine and Grand Bay districts, and the results show that the efforts of those who kindly consented to act as local instructors for them had led to an improvement in cultural methods on the part of the competitors.

Interesting details of the lime and cacao industries are given. These show that, with respect to lime products, there was an increase in quantities shipped, over those of 1907, the total value being £55,612. The amount of cacao exported suffered a decrease, being 9,820 cwt., as against 11,628 cwt. in 1907.

The manurial experiments with cacao, at the station and in country districts, have been continued. These still maintain the principle that this plant repays careful manuring and that the application of vegetable mulches is the most profitable form of treatment for it.

At the Agricultural School, five boys completed the course of training during the year, and all were successful in being appointed to places, as overseers. There were twenty pupils in the school at the time of the report. The health of the boys continues to be satisfactory, and the reports of the half-yearly examinations show that good progress is being made. On the experiment plots attached to the school, trials were conducted with varieties of ground nuts, cacao, rubber plants, fodder crops and ground provisions. Particulars are given in regard to the stock, large and small, that is kept at the school, and an interesting report appears on a shipment to England of honey that was produced there.

BRITISH GUIANA: REPORT OF THE DEPARTMENT OF SCIENCE AND AGRICULTURE, 1908-9.

Fairly satisfactory progress has been made in the science work at Queen's College, considering the difficulties that have arisen through changes in the teaching staff. In the Cambridge Local Examination of July 1908, the junior candidates acquitted themselves well. Three courses of lectures on Nature Study and on Hygiene were delivered to schoolmasters in the elementary schools during the year. In regard to the hygiene lectures, the attendance and progress were good; but those of the nature teaching were only fair. The attendance at the Model Gardens has greatly improved and the pupils are doing very good work. During 1908-9, the attendance at six model gardens during the visits of the Superintendent Teacher was 14,028; in 1907-8, this was 6,777 for five model gardens. Very satisfactory progress has been made at the Onderneeming School Farm, and, owing to the extent of the work done there, it may now be regarded as the Government Experimental Farm in connexion with products other than sugar and rice, and as the British Guiana Government Stock Farm.

The report on the Botanic Garden gives particulars of the work with various plants. The total number of plants placed out during the year was 20,570; the greater part of this planting has been done in stocking the borders with flowering annuals.

A request has been made, by the Board of Agriculture, to the Commissioner of Lands and Mines, for the carrying out of observations which will lead to the determination of the yield from tapping *Sapium Jenmani.* In consequence of a representation that the rice industry of the colony is suffering owing to ignorance on the part of cultivators, a committee of the Board has been appointed to consider the matter. Arrangements have been made for the drawing up of a Scheme of Courses of Reading and Examinations for the colony, similar to that which has been formulated by this Department.

Arrangements are being made by the Live Stock Committee of the Board for the importation of a bull immune to Texas fever. A bull of this kind has already been imported from the United States, together with three rams. A report of the Exhibition Committee shows that interest in ground provisions is wanting, to a great extent on the part of growers. Statistics issued by the Sugar-canes Experiment Committee show that the area planted with new varieties of cane constituted 52·9 per cent. of the total under sugar cultivation in the colony; the greatest increases have been made by D.625 and B.208. On the part of the Subsidiary Products Committee, 13,500 lb. of seed paddy of the best varieties of rice were distributed free of cost to cultivators. The work of this committee with rubber trees has shown that, under the conditions existing on the coast of Demerara, *Hevea brasiliensis* and *Sapium Jenmani* require shelter from wind and exposure to the sun, if they are to make satisfactory growth.

MANURIAL EXPERIMENTS WITH ONIONS.

Investigations were commenced at the Experiment Station, Nassau, Bahamas Islands, in October 1908, for the purpose of gaining information as to the manurial requirements of onions, under the conditions of the experiment. According to an account in the *Bulletin of the Department of Agriculture*, Bahamas, Vol. IV, No. 3, three sections of land were prepared for the purpose in the following way: First of all, the weeds were taken out and removed. Then the land was forked to a depth of 9 inches, and the manures applied broadcast; for pulverizing the soil and covering the manures, the draw-hoe was used. Next, drills 1 inch deep and 9 inches apart were made, and seeds of red and white Bermuda onions were sown, and covered in evenly by means of the rake. Lastly, the soil was made firm by the pressure of the feet, and the plots were given a liberal quantity of water. As the watering was done by hand, the labour expenses were higher than if a modern system of irrigation had been employed.

The results obtained are summarized in the following table, in which the figures are given for 1 acre. As the plots themselves each had an area of only a small fraction of an acre, and as they were not all equal in size, the results must be taken as being broadly indicative of the actual manurial requirements of the onion, under the conditions of the experiment. The value of the yield was arrived at by taking the retail price of the onions at 1*d.* per lb.

Manurial treatment.	Cost of labour.	Cost of manure.	Value of produce.	Profit.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1 a. 18½ cwt. blood and bone	46 0 0	10 0 0	129 10 0	73 10 0
1 b. 18½ cwt. pulverized sheep manure	,,	6 6 0	107 18 4	55 12 4
1 c. 18½ cwt. cotton seed meal	,,	8 0 0	107 18 4	53 18 4
1 d. No manure	,,	—	43 3 4	–(2 16 8)
2. 36 cwt. cow manure	,,	5 0 0	67 10 0	16 10 0
3. 18 cwt. cotton seed meal	,,	8 0 0	56 0 0	2 0 0

In plot 1c, the cotton seed meal was applied before planting; in plot 3, it was broadcasted and lightly covered in, after the plants had been thinned out. In all cases, the thinning out was to the extent of leaving the seedlings 2 inches apart in the row. The sections were in soils of different fertility. No. 1 (containing plots 1a, 1b, 1c and 1d) was in a soil of what may be termed intermediate fertility. In section 2, the soil was poor, and in section 3 very poor. It appears that, owing to the smallness of the plots, the extra cost of labour in manuring (over the unmanured plot) was negligible.

In considering these results, it must be remembered that the experiments were carried out on an intensive scale. By this is meant that minute pains were taken in the matter of the cultivation, manuring, and care of small plots, in order that a large yield may be obtained from them. Similar work would be difficult in the case of very large areas.

It seems that these experiments are worth repeating, the conditions as regards soil being made similar in every case.

WILD IPECACUANHA AND STOCK.

On page 222 of the current volume of the *Agricultural News*, it is stated that the question as to the poisonous effect on cattle of the wild ipecacuanha (*Asclepias curassavica*) had recently been raised. Since then, notes in connexion with this have appeared on pages 261 and 363. An interesting practical investigation of the subject has recently been made by the St. Kitts Agricultural and Commercial Society, the particulars of which are given below, from a report furnished by the Honorary Secretary (Mr. F. R. Shepherd):—

At a meeting of the Agricultural and Commercial Society, St. Kitts, it was decided that a sum of £5 should be placed at the disposal of the Secretary for the purpose of conducting experiments with a young ox, in order to find out if it would eat the plant, and if any evil consequences to the animal followed its administration. The trials were carried out in the following manner:—

(1) Attempts were made to cause the ox to eat the bush of its own accord, by concealing the plant in the fodder given it at night, and by covering the plant with molasses and offering it in this state to the animal. In both cases the ox refused to taste the bush.

(2) The whole bush was then finely cut up, and well mixed with oilmeal and molasses, in balls, on which the animal was fed every day for seven days, by their being forced down its throat. No ill effects resulted from this.

(3) A strong infusion of the plant was made by boiling it in water. Two large bottles of this were given to the ox, when, as before, there were no ill effects; on the contrary, the animal seemed to improve under the treatment.

The committee which was appointed to conduct these experiments came to the following conclusions, as the result of its observations: that cattle will not eat the plant when it is growing on pastures; that when the plant is given to them in the crude state, or as an infusion, against their will, no ill effects take place; finally, as following what has just been stated, that this plant is not poisonous to cattle.

Such are the results of a very interesting practical enquiry into this question. The Department has already asked for information on the subject, and is indebted to those who have so far complied with its request. This request is now repeated, and it is hoped that those who have made any actual, practical observations in the matter will communicate them, in order to provide material which may aid further in the inquiry.

MARKET REPORTS.

London,—The West India Committee Circular, November 23, 1909; Messrs. E. A. de Pass & Co., November 12, 1909.

Arrowroot—$1\frac{3}{4}d.$ to $2d.$
Balata—Sheet, 2/6; block, 2/- per lb.
Bees-wax—£7 17*s.* 6*d.* to £8 2*s.* 6*d.*; darkish, £7 15*s.*
Cacao—Trinidad, 52/- to 62/- per cwt.; Grenada, 50/- to 55/6 per cwt.; Jamaica, 47/- to 52/6.
Coffee—Jamaica, 37/- to 56/6.
Copra—West Indian, £24 per ton.
Cotton—Fully Fine, $18\frac{1}{2}d.$; Floridas, 16*d.*; St. Croix West Indian, $17\frac{1}{2}d.$
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet; common to good common, 42/- to 48/- per cwt.; low middling to middling, 49/- to 53/-; good bright to fine, 54/- to 65/-.
Honey 30/.
Isinglass—No quotations.
Lime Juice—Raw, 11*d.* to 1/- per gallon concentrated, £17; Otto of limes, 5/9 to 6/.
Logwood—No quotations.
Mace—Steady.
Nutmegs—Quiet.
Pimento—Common, $2\frac{3}{16}d.$; fair, $2\frac{5}{16}d.$; good, $2\frac{3}{8}d.$ per lb.
Rubber—Para, fine hard, $8/1\frac{1}{2}$, fine soft, 7/-; fine Peru, 8/1 per lb.
Rum—Jamaica, 2/8 to 5/-.
Sugar—Crystals, 15/3 to 16/-; Muscovado, 12/6 to 15/-; Syrup, 12/9 to 14/9; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., November 26, 1909.

Cacao—Caracas, $11\frac{1}{4}$c. to 12c.; Grenada, $11\frac{1}{4}$c. to $11\frac{1}{2}$c.; Trinidad, $11\frac{1}{2}$c. to 12c.; Jamaica, $9\frac{1}{2}$c. to $10\frac{1}{2}$c. per lb.
Cocoa-nuts—Jamaica, select, \$33·00 to \$34·00; culls, \$19·00 to \$20·00; Trinidad, select, \$32·00 to \$33·00; culls, \$18·00 to \$19·00 per M.
Coffee—Jamaica, ordinary, $8\frac{1}{4}$c. to $8\frac{1}{2}$c.; good ordinary, $8\frac{3}{4}$c. to 9c.; and washed, from 10c. to 11c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, no quotation; Barbados, 53c. to 55c.; St. Thomas, St. Croix, St Kitts, 48c. to 50c. per lb.; Antigua, 50c. to 52c., dry flint.
Grape Fruit—\$2·50 to \$3·25 per box.
Limes—Dominica, \$6·00 to \$8·00 per barrel.
Mace—34c. to 40c. per lb.
Nutmegs—110's, 9c. to $9\frac{1}{4}$c. per lb.
Oranges—Jamaica, \$1·00 per box.
Pimento—$4\frac{1}{2}$c. per lb.
Sugar—Centrifugals, 96°, 4·36c. to 4·42c. per lb.; Muscovados, 89°, 3·86c. to 3·92c.; Molasses, 89°, 3·61c. to 3·67c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., December 11, 1909.

Cacao—Venezuelan, \$11·65 per fanega; Trinidad, \$11·15 to \$11·50.
Cocoa-nut Oil—92c. per Imperial gallon, cask included.
Coffee—Venezuelan, $10\frac{1}{4}$c. per lb.
Copra—\$4·10 per 100 lb.
Dhal—\$4·20 per 2-bushel bag.
Onions—\$3·75 to \$4·00 per 100 lb.
Peas—Split \$6·00 to \$6·25 per bag
Potatos—English, \$1·70 to \$1·80 per 100 lb.
Rice—Yellow, \$5·00 to \$5·10; White, \$5·00 to \$5·10 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., December 4, 1909; Messrs. T. S. Garraway & Co., December 6, 1909.

Arrowroot—St. Vincent, \$3·60 to \$3·75 per 100 lb.
Cacao—\$11·00 to \$12·00 per 100 lb.
Cocoa-nuts—\$14·00.
Coffee—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., scarce.
Hay—\$1·20 per 100 lb., unsaleable.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00 per ton.
Molasses—No quotations.
Onions—Strings, \$2·75 to \$3·00 per 100 lb.
Peas—Split, \$6·00 per bag of 210 lb.; Canada, \$3·40 per bag of 120 lb.
Potatos—Nova Scotia, \$1·75 to \$2·75 per 160 lb.
Rice—Ballam, \$4·85 to \$5·00 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, December 11; Messrs. Sandbach, Parker & Co., November 26, 1909.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	\$8·25 to \$8·50 per 200 lb.	\$9·00 per 200 lb., market dull
Balata—Venezuela block	32c. per lb.	Prohibited.
Demerara sheet	48c. per lb.	50c. per lb.
Cacao—Native	11c. to 12c. per lb.	12c. per lb.
Cassava—	\$1·08	No quotation
Cassava Starch—	\$6·00 to \$6·50 per barrel of 196 lb. Sales—scarce.	No quotation
Cocoa-nuts—	\$12 to \$16 per M.	\$16 per M., peeled and selected.
Coffee Creole	12c. to 13c per lb.	12c to 13c. per lb.
Jamaica and Rio	$13\frac{1}{2}$c. to $13\frac{3}{4}$c. per lb.	$13\frac{3}{4}$c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal	\$4·05 to \$4·10 per bag of 168 lb.	\$4·25 per bag of 168 lb.
Green Dhal	\$5·50 to \$5·75	— —
Eddos—	\$1·44 per barrel	— —
Molasses Yellow	22c. to 25c.	—
Onions—Teneriffe		No quotation
Madeira	4c. to $4\frac{3}{4}$c. per lb.	$3\frac{1}{2}$c. per lb.
Peas—Split	\$6·50 to \$6·60 per bag (210 lb.)	\$6·40 to \$6·50 per bag (210 lb.)
Marseilles	None	\$5·00
Plantains—	24c. to 60c. per bunch	— —
Potatos—Nova Scotia	\$2·50	\$2·40 to \$2·50
Lisbon	No quotation	No quotation
Potatos-Sweet, Barbados	\$1·68 per bag	—
Rice—Ballam	No quotation	\$4·75
Creole	\$3·80 to \$4·00	\$4·00 to \$4·30
Tannias—	\$2·16 per bag	—
Yams—White	\$2·64	—
Buck	\$3·00 per bag	—
Sugar—Dark crystals	\$2·55	\$2·45
Yellow	\$2·90 to \$3·00	\$2·80 to \$3·00
White	\$3·70 to \$3·80	\$3·60 to \$3·80
Molasses	\$2·00	\$2·00 to \$2·30
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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Volume X. No. 1. Flower-bud Maggot of Cotton ; Bourbon Cane in Antigua ; Bourbon and other Varieties of Cane in Barbados ; Soils of Nevis ; Cotton Selection in the Leeward Islands ; Leguminous Crops and Soil Inoculation. No. 2. Central Factories ; The Underground System of the Sugar-cane ; The Cotton Industry in the West Indies ; Observations on Molasses ; The Treatment of Orchard Soils in Cultivation in the West Indies ; The Scarabee of the Sweet Potato. Price 6*d*. each. Post free, 8*d*.

PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is fifty-nine. The following list gives particulars of all the pamphlets which are still available. The missing numbers are out of print and can no longer be supplied :—

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
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