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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Sugar Embargo.

THE embargo on the importation of raw sugar is to continue for a further period of three years, as from 1st September, 1928. In announcing this decision of the Federal Ministry recently, the Prime Minister (Mr. S. M. Bruce) said the continuance of the embargo was subject to the same prices and conditions already in existence, and subject to additional provisions that all prices might be revised by the Commonwealth in the event of the British or any Dominion Government reducing the tariff, or enlarging the preference margin of duty on Australian sugar, and that the Queensland Government agree to guarantee the prompt enforcement at all times of the observance by employers and employees of all awards subject to that Government's control or jurisdiction, and affecting in any way the production and transport of sugar.

Mr. Bruce added that, in considering the future protection of the sugar industry, it had to be borne in mind that the policy which had been pursued in the past with regard to the industry had been based upon the primary necessity for the maintenance of a white population in the vulnerable coastal belt of the tropical north of Australia. The sugar industry was at present operating under a three-years' agreement between the Commonwealth and Queensland Governments, which expired on 31st August, 1928. That agreement provided for an embargo against the importation of foreign sugar, in return for which the Queensland Government, on behalf of the Australian sugar industry, agreed to the limitation of the home consumption prices in all capital cities, the provision of sugar for use in exported manufactured goods at a price equivalent to the world's parity, and the bearing of all export losses by the producers themselves. The present policy had ensured a retail price of the world's best cane sugar in all the capital cities of 4½d. a lb., which represented a percentage increase over the pre-war price less than the price increase of practically every other foodstuff and commodity. The Ministry had also make provision for the supply of mill white sugar comparable with high-class Java sugar at 4d. a lb. retail, with corresponding reductions to manufacturers and others. The reason which led the Ministry to adopt the policy of an embargo instead of affording protection through the Customs tariff was the wide fluctuations in the world's parity prices of sugar.

While in New South Wales recently the Premier (Mr. W. McCormack) discussed the sugar question with the Commonwealth Government, and was assured that a general ratification would be sought of the sugar embargo for a further period of three years, which has since been approved by the Prime Minister. In a brief statement to the Press, Mr. McCormack said: "The agitation by certain people in the South is causing some uneasiness. Now that the Prime Minister's approval has been granted, all sections in the sugar industry must pull together, and they should do their best during the coming three years to remove from the minds of the Southern people the objections they entertain towards the continued adoption of the system now in force."

The Banana Industry—Establishment of Experiment Stations.

PURSUANT to the passing of the Primary Products Experiment Stations Act, the Minister for Agriculture (Mr. W. Forgan Smith) convened a meeting for 20th December of those interested in all phases of banana production. The purpose of the conference was to discuss the application of the provisions of the Act to the Banana Industry. At the gathering were representatives of the Banana Sectional Group Committee of the Committee of Direction of Fruit Marketing, the Queensland University, and the Department of Agriculture.

The banana industry in Queensland is worth approximately £750,000 yearly. It is capable of further expansion, and it has been estimated that the population of the Commonwealth is equal to the absorption of bananas up to the value of £5,000,000 sterling per annum, but before consumption can be carried to this point improvement is necessary in the size, quality, condition, and appearance of the fruit marketed.

There are large areas, particularly in Northern Queensland, which are quite suitable for banana production, and there is, in the Minister's mind at least, an impression that the banana lands in the southern parts of the State are not being utilised to the best advantage. There is evidence that much good would be derived by closer co-operation of the banana growers with the science workers of his Department and the University. This applies also in the case of Field Officers of the Fruit Branch of the Department of Agriculture. Growers must be alert to the necessity of carrying into practice improved farming methods and of adopting the recommendations advocated by investigators on the science side.

Bunchy Top and Squirter troubles have been investigated under the direction of Professor Goddard, and financed from funds subscribed by several Governments; the contribution to the fund from the Queensland Department of Agriculture being approximately £3,700. The beetle borer, thrips, and other pests of the banana have been investigated by the officers of the staff of the Entomologist, and their work is being continued. There are now ten field officers either solely or partially engaged in advising banana growers. It will therefore be recognised readily that a considerable amount of money is spent each year by the Department of Agriculture in its efforts to foster and develop the industry.

The Act makes it possible for any section of primary industry to obtain for itself similar advantages to those available and applicable to the canegrowers in the sugar industry. There is no provision in the Act that compels any section of primary producers to come under its operations, but if growers of bananas or any other fruit, by their own volition, so desire, they may take advantage of the full benefits of the legislation. Under a wide, but general classification, it appears to the Minister that the problems affecting the banana industry are covered by (*a*) cultural methods; (*b*) diseases and pests; and (*c*) marketing.

After discussing general matters relevant to the banana industry, those present at the conference with the Minister agreed: (1) That it was desirable to establish an Experiment Station in Queensland. (2) That the Station should be situated in Southern Queensland, preferably on Crown land. (3) That the area should be not less than 100 acres, comprising from 15 to 20 acres of suitable banana land. (4) That the matters for experimentation should include—(*a*) Soil experiments (subsoiling and fertilising); (*b*) selection of plants, suckers, butts and sections of butts; (*c*) the effect of desuckering and the influence of fertilisers on the various plants and on the general and keeping condition of the fruit; (*d*) testing available varieties of bananas for yield, freedom from disease, and hardiness when exposed to transport conditions; (*e*) the inclusion of a small section of seed producing varieties and their cross-pollination with seedling kinds and the testing out of any seedlings produced therefrom which may promise to be worthy of further consideration; (*f*) the effect of distances between the rows and spacing between individual plants; (*g*) the treatment of soil after cropping by the use of artificial fertilisers, green manures, &c., before replanting under bananas; (*h*) determining the effect of dissected bunches against whole bunches in transport; (*i*) the control or elimination of pests and diseases in bananas.

Definite proposals as to the control and conduct of the Station were not formulated, and these and other details for the working of the Station will be given further consideration.

A Board of Agriculture.

A NEW co-ordinating body to be known as the Board of Agriculture has been constituted by the Government. Its purpose is to co-ordinate all the activities of the State that have for their object the development of agriculture and primary production generally. On the Board are represented the Department of Agriculture and Stock, the Department of Public Instruction, the Queensland University, the Queensland Agricultural College, the Committee of Direction of Fruit Marketing, and the several commodity boards concerned with the business side of rural enterprise. In other words, the pooling of interests in primary industry has predicated the pooling of brains. In the course of a Press announcement of the constitution and personnel of the Board, the Minister for Agriculture and Stock (Mr. W. Forgan Smith), who is chairman of the new body, said that for some time past the Government had been much concerned over the possibility of the over-lapping of the interests and activities of several of the organisations connected with the development and extension of agriculture within the State.

It was considered that the need for effective co-ordination among these bodies had arisen, and to meet that need the Board of Agriculture had been constituted.

At present the Department of Agriculture and Stock, the Department of Public Instruction, and the University of Queensland, were each concerned with various phases of agricultural education, scientific research, and field problems and practice, and it would be a function of the Board to prevent the duplication of their activities, to preclude misdirected effort, and to obviate waste of energy. It would also be the duty of the Board to have cognisance of the activities of organisations engaged in similar investigational, instructional, and directional work, under Commonwealth control, and in the other States, and to recognise the need for cordial co-operation with them. It was not intended that the Board should supersede or interfere with the functions of any existing organisation. It would be purely a co-ordinating body concerned chiefly with the scientific side of agriculture.

Included in the functions of the Board were the following:—

(*a*) To collect information as to the work which might be undertaken in connection with agricultural and pastoral problems.

(*b*) To classify such work into correlated groups, and in their order of importance, and submit suggestions as to what portions of the work might be done by the Commonwealth, by the State, and by various institutions and organisations within the State.

(*c*) To secure co-operation of effort as between the Commonwealth and the State, and among the several State Departments and organisations.

(*d*) To arrange for regular reports as to work in progress for the collection of such data as may be necessary, and for the publication of information for the guidance of officers concerned, and the primary producers.

(*e*) To have regard to the economics of agriculture, including the possibilities of agricultural development.

(*f*) Generally to advise the Minister or the Government upon matters pertaining to agricultural and pastoral questions, and such other questions as may be referred to it.

(*g*) That when coming within the purview of the Board full consideration be given to the views of departmental officers engaged upon investigational work, and also the views expressed by the commodity boards, the Council of Agriculture, and cognate organisations.

At the first meeting of the Board a scheme of co-ordination as outlined by the chairman met with unanimous approval, and the opinion was generally expressed that the Board would exercise a very material influence in the development of agriculture in Queensland along sound economic lines.

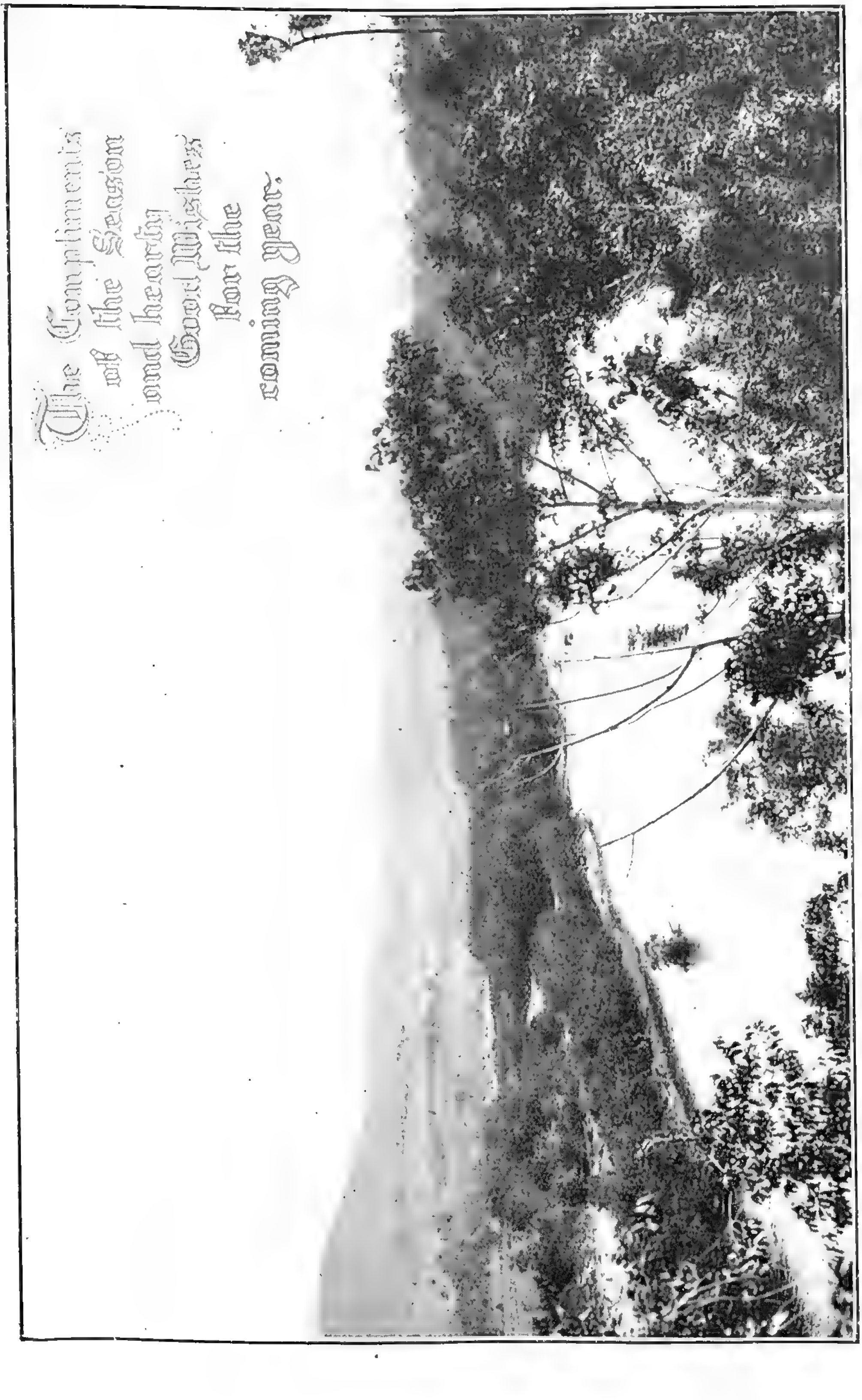

Photo: H. W. Mobsby, F.R.G.S.

PLATE 1.—VIEW FROM THE CAIRNS RANGE ROAD, OVERLOOKING THE MULGRAVE RIVER, CAIRNS DISTRICT, NORTH QUEENSLAND.

The Minister's New Year Message

To the Farmers of Queensland.

DEPARTMENT OF AGRICULTURE,

Brisbane, 31st December, 1927.

A dying year has again bequeathed the blessing of bountiful rains to a New Year just beginning. May the farmers of Queensland enjoy all the prosperity that follows naturally in a fertile land when seasonal conditions are generally good and of which the recent generous rainfall is such a happy augury.

A country cannot thrive without a prosperous rural population—a prosperity based, so far as the human factor may govern, on better farming, better business, and better living. In the year just ending further substantial progress was made in the extension of Queensland's rural policy—a policy embracing the effective peopling of our country districts; a wider acceptance and application of the principles of agricultural economics; improvement in the business organisation of primary industry; promotion of progress in production and prevention of waste by practical education, scientific research and beneficent legislation; sound technical instruction in both new and established rural industries; better cultural methods and improvement in our live stock breeds; and general stabilisation of agriculture and its related enterprises.

In that policy are crystallised the ideas on which are based the efforts of an educated democracy and the ideals by which those efforts are inspired.

Without, however, the active and intelligent co-operation of all concerned along these lines but little progress would be possible. It is for farmers themselves to study carefully the problems, both of the field and of the market, with which farming in Queensland, in common with agriculture in every other country, is confronted. It is for them to apply, where possible, the results of our general and mutual efforts in community and national service.

We have a great country, one of the finest agriculturally in the world—a country where people live more happily, healthily, longer, and in many ways better than anywhere else—and with faith in ourselves and confidence in Queensland we look forward to yet another year of progress and achievement.

I wish the farmers of Queensland all good in the coming year and the years that are to come; that comfort and contentment may remain in their homes; that they will be favoured with the full realisation of all their hopes; and enjoy a long and happy future.

W. Forgan Smith

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the period 21st November to 5th December, 1927, from the Assistant to Pathologist, Mr. E. J. F. Wood, B.Sc.:—

NAMBOUR.

The Gumming and Mosaic problems continue to be as serious as ever in the area, and little progress in the control of these diseases will be made until the farmers rid themselves of the apathy into which they have fallen. While some of the farmers are adopting our recommendations and planting up a good proportion of Q. 813, the majority are persistently planting D. 1135, from fields of which 90 per cent. are gummed. To warn them of the error of their position, I need not do more than point to the situation at Bundaberg, where Gum is causing very severe losses; probably £50,000 would be a low estimate for the district losses due to this disease. Given a season in Nambour favourable to Gumming, the farms growing Badila and D. 1135 will be wiped out. It may not happen next year, but it will do so sooner or later, and in the meantime the farmers are losing by this cane far more than they would lose by planting Q. 813. An effort is being made to obtain other resistant canes, and several promising varieties have been introduced to Bundaberg for trial. In the meantime, Q. 813 is the most useful resister to both Gumming and Mosaic grown in the Nambour district. It should, therefore, be planted extensively, and the areas under other canes be restricted as much as possible. Many farmers find fault with its ratooning qualities, but this is usually due to either cutting before the beginning of September, or to the failure to remove the trash soon enough. I have seen some fine ratoon crops of Q. 813 in the Nambour district.

Of other varieties, Uba is resistant to both Gumming and Mosaic, but its planting on an extensive scale is not recommended. Neither it nor Q. 813 will do on some of the swamps in which they are being planted, and which are totally unsuitable for cane. Malabar, too, is resistant to Gumming, on the Richmond, but is susceptible to Mosaic.

H. 227 resists Gumming but takes Mosaic easily, and the same is the case with B. 147, a cane very like D. 1135 in habit.

D. 1135, H.Q. 285 (known also as Hambledon Seedling, Early Maturer, Milton, Sarina, Mackay, and Nerang), M.1900 Seedling, Gingila, Rose Bamboo, Q. 970, &c., are very susceptible to Gumming and Mosaic, and should be got rid of as far as possible. Badila is fairly resistant to Mosaic, but in the south is very susceptible to Gumming.

An important factor in connection with the control of Gumming is that of drainage. The whole of the Maroochy River is very badly drained, and this is where the disease is at its worst. It has been proved that drainage has an immediate bearing on Gumming, and the recognition of this led to the control of Gumming in the Broadwater area in New South Wales, where it went far to render conditions much better for the farmers. I am aware that lack of money has a retarding effect on the gumming situation at Nambour, but I do not consider that the farmers are doing all that they might in this connection. While many of the farms are drained, the efficiency of the drains is often spoiled by leaky flood gates, wrong levels, and drains being too narrow. The use of "lands" is not understood. If the farmers were to plough a deep water furrow between every few rows, with a drill plough (leaving a 6-ft. space instead of 4 ft. 6 in. to allow for it), and ran these water furrows into furrows along the headland leading the water into the drains, I feel sure that the increased drainage would have a good effect on the crops. In this area, especially in the Coolum swamps, every inch counts in the solution of the drainage problem.

Gumming is at present showing up strongly in the chlorotic phase, by which is meant that the leaves of some of the affected plants are whitish, the white often shading into a normal green near the base of the leaf. The stool becomes sickly and often dies right off, or it may make a temporary recovery. This occurs in the young plants and ratoons. In the standover cane, the yellow leaf streaks may at times be observed, but the general symptom just now is the sickly appearance of the cane tops, and the fact that the cane when cut across gives the characteristic yellow gum.

The areas visited recently include Perwillowen, Mapleton, and Mapleton Road, both banks of the Maroochy River, and Coolum Creek, and in all these areas Gumming and Mosaic are rampant, but gum is worse on the low areas.

The Mosaic control rests on the establishment of resistant varieties such as Q. 813, and the cessation of the practice of planting cane known to be diseased. The losses from this disease in the Nambour district are very heavy, and little is done by the farmers to check it.

It should be noted that owing to the imminence of Fiji disease, no farmer is to sell plants to another farmer in this or another area. Breaches of the Diseases in Plants Act have been observed, one of which has meant serious consequences to the farmers who imported the plants.

If farmers will let the Bureau know some time before they require plants from outside, a visit by an inspector can be arranged, and the man will know that he is getting healthy plants. It will not cost anything, but the little trouble will prove well worth while.

No serious diseases other than Mosaic and Gumming were observed in the Nambour area, but it will require the concentrated attention of every one of the farmers to gain control over these diseases.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Appearance of Small Brown Cockchafer.

During this month, and last month, grubs of the small reddish-brown cane beetle (*Lepidiota frenchi* Blkb.) will continue to eat the roots of young ratoon and plant cane.

Be on the watch for indications of such attack, which are very similar to those caused by grubs of the "greyback."

Upon the first signs of injury, examine the roots of affected stools, and should four or more grubs be present fumigate the soil with bisulphide of carbon. Do not apply the fumigant if the ground chances to be very wet; about four days should be allowed to elapse after heavy rain before treating friable volcanic soils.

On areas liable to infestation by this cockchafer weeds should be kept down, as a dense growth of grass, &c., between cane rows tends to attract egg-laden females of this beetle. On this account it is advisable to maintain clean cultivation on land reserved for early planting, especially during the flighting period of such cockchafers (see last month's Entomological Hints, "Australian Sugar Journal," Vol. XIX., p. 457).

Prepare for Collecting Cane Beetles from Feeding Trees.

In the event of the emergence of "greyback" cockchafers having been delayed until December, owing to continuance of drought conditions, lose no further time in locating the position near headlands of favourite food-plants of these beetles—such as native figs of either small-leaved kinds like the so-called "weeping fig"; or broad-leaved species; or of young low-growing trees of "Moreton Bay Ash" (*Eucalyptus tessalaris*)—from which they may be conveniently collected when the time arrives. Control work of this nature will be found profitable during a period of about six weeks dating from the day of emergence of these cockchafers from the ground.

Canegrowers Take Notice.

Those wishing to obtain a copy of the revised edition of Bulletin No. 3, Division of Entomology, entitled "Notes on Insects Attacking Sugar Cane in Queensland," should make early application to the Director of the Bureau of Sugar Experiment Stations, Department of Agriculture, Brisbane. This handbook, which contains concise descriptions of all our notable insect pests of cane, together with an illustration of each species (drawn to natural size), its mode of injury, and practical methods for its suppression, will be found useful to all interested canegrowers.

Note.—Farmers seeking advice, or applying for the liberation of parasites, are asked to forward at the same time (if not perfectly sure of the identity of the insect in question) a sample of the species or its larval condition. Moth-borer injury is often mistaken for that due to the beetle borer, as both of these insects bore the interior of cane sticks. No less than six different insects attack the shoots of young ratoon and plant cane, all effecting very similar damage, and being responsible for the occurrence of "dead-hearts."

When not sure of the habits or name of any insect found injuring cane, it should be dropped into a small bottle containing methlyated spirits and water (half and half), and posted to the Entomologist at Meringa Experiment Station for identification and advice.

Appearance of Cane Beetles.

Greyback cockchafers commenced to emerge from cultivated areas around Meringa about the middle of December, during a fall of 2.16 inches of rain, experienced between the 15th to 20th of that month. On the evening of the 19th greyback cane beetles were observed in fair numbers on trees growing at the Experiment Station, while great quantities of *Lepidiota rothei* Black., a smaller cockchafer beetle of minor importance as a cane pest, were noticed swarming on the leaves of cocoanut palms and young African tulip trees. Odd specimens of *Lepidiota frenchi* Blkb. were also in evidence circling around small herbaceous plants.

It was remarked that many of these greybacks were badly rubbed, in some instances the elytra being of a uniform brown colour, owing to nearly all the whitish scales having been rubbed off.

Such condition is probably brought about during attempts of the beetle to force a passage to the surface before the ground has become sufficiently moistened to permit of an easy exit from the pupal chamber. This often happens in seasons of drought, when these beetles are forced to remain longer than usual in the ground on account of continued dryness of the soil.

We have been advised that a big emergence of *Lepidiota caudata* Blkb. occurred in the Malanda area on the 14th of December at Kureen, where they have not been noticed flying to any great extent in previous seasons.

Collecting Cane Beetles.

This work can be profitably carried out from the 1st to 10th of January; after which time most of the female beetles will have finished egg laying in the Cairns and Babinda areas.

For advice regarding the most suitable feeding-trees from which to collect greyback cockchafers, see last month's Entomological Hints, in December number of "Queensland Agricultural Journal," and "Australian Sugar Journal."

Grubs Controlled by Means of Clean Cultivation.

Have the soil loosened up and free from weeds by the time greybacks appear on the wing, maintaining such state of clean culture for at least one month from date of emergence of these beetles.

Work the soil as much as possible close to cane rows, while the grubs are in the first instar and quite small. This period, which commences about four weeks subsequent to first appearance of the beetles, occupies from five to six weeks. Encourage vigorous root development, and conditions favourable to conservation of moisture, by judicious manuring and thorough cultivation.

Keep the ground between cane rows free from weeds during the flighting season or period of these cockchafers.

Protecting Young Ratoon and Plant Cane.

Growers should watch the growth of their young cane, with a view to checking if necessary the activities of leaf-eating caterpillars, grasshoppers, and beetles, which, together with various larvæ of moth borers, are able at times to effect serious injury to tender leaves and succulent shoots of cane plants.

When noticing "dead-hearts" (death of the central leaves) cut out all such affected shoots, severing same at a point about 2 to 3 inches below ground level, and crush or burn same to destroy the larvæ of moth or beetle borers. For leaf-eating caterpillars or grasshoppers, spray infested areas with arsenate of lead (2 lb. in 50 gallons water), taking care to keep the mixture well agitated during application. In cases of serious outbreaks of either of the above pests, communicate at once with the Entomologist at Meringa Sugar Experiment Station.

FIELD REPORTS.

The Northern Field Officer, Mr. Albert Gibson, reports:—

CAIRNS.

Cairns and a small part of the extensive Babinda cane-producing area were inspected from the 14th October to 15th November.

The Crop.

The 1927 crop failed to make normal winter progress, due perhaps to the water-sodden soil; this condition could have been overcome by timely intertilling. Unfortunately this was not possible in most fields owing to the reclining nature of crops, the result of early high winds and overmuch water. What was left of the 1927 crop looked well. The Cairns crop generally has been short of stem and weight; for this reason harvesting and transportation costs have somewhat increased. One great redeeming feature, however, has been the crop's outstanding sweetness.

Harvesting and Milling.

The area of cane yet to be harvested is speedily vanishing; the lesser crops are being burned prior to harvesting. It has been disappointing to the farmer to find his fields cutting out below expectations. Work in field and factory has proceeded uninterruptedly. The Cairns mills have had a prosperous season.

Harvesting the crop and its transportation are important; this branch of the business does not at all times receive the necessary care and attention it so much requires. Too much burning is practised; too much trash and dirt are permitted; high ground and improper top cutting are too common—all of which are responsible for losses. The high cutting commonly serves to carry over some of the industry's pests, and has a harmful influence on subsequent ratoons, hence the great need of proper ground cutting, also the gathering of rubbish, which in no small degree helps to control the borer and other lesser cane pests. Well-cared-for railroads, with the use of standard trucks and locomotives, cannot be over-estimated.

Cultivation.

Improper field practice, coupled with a faulty drainage system, obviously leads to the creation of harmful soil conditions. The principle cultural operations in progress were as follows:—(1) Ploughing out exhausted stubbles; (2) ratooning; (3) mulching surface of interspace soil by light tractor or horse-drawn implements, and the expensive work of filling the empty spaces in plant cane rows. Soaking seed when the soil is dry is recommended when performing this work. This costly work may be greatly minimised by better soil preparation and better plants. Dry conditions have permitted this work to proceed without interruption. Some farmers seem to think there is not the need for tilling the interspace soil unless weeds are growing in profusion; this is a mistaken idea. When the weather is dry the need is probably greater, for it helps to arrest the continuous upward movement of soil moisture, thereby reducing evaporation. This is the time when most fields are bare and when a greater surface is exposed to sun and drying winds, therefore the need of doing things in the field that will conserve moisture and promote rapid growth.

Planting.

The best plants are not too good; there can be no two opinions regarding the advantages to be gained by skilful plant selection. More ground has been planted to cane in spite of the increasing sugar production. A little planting is under way; the season is rather late, and soil moisture somewhat scanty. Farmers continue to earth up overmuch on the young plant cane; the object is good, but the resulting work frequently is too harmful, as it prevents stooling and sometimes smothers primary plant shoots. The Hodge clipper is a useful implement; it economises time and labour when properly handled. Poor germination of recently planted cane is mainly attributed to soil dryness, overmuch soil covering, the lack of vitality in seed used, and damaged seed eyes, the work of bud or wire worms. Some plants were found to be hollow; it would appear that seed had been taken from a dry area or that the cane used had long arrowed.

Pests.

The amount of damage occasioned seems to vary according to variety and season; generally pest destruction has been less than usual. Pests noted: Some grubs (probably *frenchi*) found severing young cane shoots just above the mother plant;

termites (white ants) devouring the sets (these are generally worse when the soil is dry); wireworms, rats, weevil, big moth and tineid borers, bud worms, and foliage-eating beetles.

Diseases.

Seemingly different varieties are affected by disease in different degrees, and some apparently not at all. Diseases found to be prevalent—Leaf Scald, widespread in Badila and H.Q. 426 at Freshwater, Stratford, Woree, Redlynch, and from Aloomba to Deeral; Leaf Stripe, confined to some four farms at Sawmill Pocket (kinds affected Pompey and D.1135). The farmers whose fields are affected know well the seriousness of this disease, and are endeavouring to have it eliminated as soon as possible by ploughing out and planting a disease-free stock. Gumming is still at Aloomba in variety H.109; one diseased field is to be ploughed out. If the owner of the other diseased farm could be induced to plough it out the district might be freed of this serious malady. The knives used when cutting the diseased crop were not sterilised; this is unfortunate and may serve to inoculate present clean fields. B.147, growing among H.109 gummed cane, was being used for plants; this is an unwise practice. However, the seed was examined and appeared to be disease-free. Mosaic was previously found on three farms in the area; canes affected were Shahjahanpur and H.109. Two more must now be added to this list, the variety affected being B.156—said to have been introduced from Mossman. This is just another instance confirming the great danger of bringing fresh canes from one district to another. Top Rot, though an old complaint and especially severe at times in Badila, was in evidence, yet very little is known regarding it. This is a condition where the growing point decomposes. Chocolate leaf streaks herald the early stages of this disease. In the beginning of October this was found throughout the area on volcanic and alluvial soils alike. This probably is the result of a soil bacteria which requires suitable conditions to make it active. Two fields of cane known to be seriously damaged last year are now showing the early symptoms. Variegated leaves are common and are found in some varieties more so than others. This at times alarms our growers more so than the real disease. Buttercup yellow coloured leaves met with in fields at certain times of the year may be due to the temporary cessation of activities of some nitrifying organisms of the soil. Creamy leaf streaks were plentifully observed in most fields of Badila, and have been noted since 1925. Affected plants frequently perish in dry periods. This condition appears to be occasioned by some root trouble, probably nematode. Some farmers fully realise the need of eliminating cane diseases from their holdings at the earliest possible moment. A pleasing example of this was noted on a big alluvial Badila-growing farm near Aloomba. Some months ago this area was found rather severely affected with Leaf Scald. On this inspection quite a transformation was noted; most of it had been ploughed out and supplanted with apparent disease-free seed obtained from a Hambledon red-soil farm. The change of environment (from a distinct class of soil to another) helps to keep up the variety stamina and is good business, provided, of course, the cane is disease free.

Fertilisers.

It seems apparent that much money is annually wasted in the haphazard use of fertilisers. So few farmers avail themselves of the great opportunity of having their different sorts of soil analysis; the results would aid considerably in ascertaining what food constituents are required. A soil may have a superabundance of two of the plant food essentials, yet be deficient in another; this being so makes it unfruitful The tendency is to add more of which there is abundance and neglect that which is lacking. The principle manures being added are sulphate of ammonia as a top dressing, B_3, Howe's mixture, and blood. Molasses had been applied rather indiscriminately over a Mulgrave mill farm in the year 1925 and still refuses to grow cane in the parts having received overmuch.

Leguminous Crops.

The growing of cover crops is sadly neglected; this method of manuring is worthy of more encouragement, for it has a wonderful all-round beneficial influence on all agricultural soils. The general practice is to broadcast the seed; sometimes it is drilled in. One great drawback to the growing of Mauritius beans on the very porous volcanic red soil is the problem of ploughing it in, due mainly to the lack of soil resistance, which prevents cutting the tangled mass. Corn is not generally recommended owing to its being too similar to cane and is credited with harbouring similar insects and diseases.

It is yet early to state with any degree of certainty what the 1928 harvest will be, other than at the moment it looks most promising. Given timely rain there is every chance of its being a record.

The Central Field Officer, Mr. E. H. Osborn, reports for the period 10th November to 10th December:—

MACKAY.

Flaggy Rock.

This locality has progressed since my last visit twelve months ago, for some 3,000 tons of cane will have been railed to Plane Creek this season, and with probably a far larger tonnage for next year. Some thirteen growers are living hereabouts, with the farthest about 4 miles from the railway, and practically all are farming upon the rich pockets adjoining the creek. Some very good cane was noticed, principally M. 1900, but Q. 813, H.Q. 426, N.G. 15, and E.K. 28 were also doing well. One paddock of fourth ratoons M. 1900 was growing luxuriantly upon a creek pocket, and cutting at the rate of 35 tons per acre. Owing to showery weather weeds had obtained a good hold upon most of the farms, and ratooning was also rather backward. Being practically a new area, very little fertilising has been so far carried out. A couple of stools of young first ratoons M. 1900 were noticed to be affected with Leaf Stripe, otherwise the cane seemed very clean.

Carmila and Carmila North.

About forty-eight growers here have sent in about 19,000 tons this season, which proves how this locality is also moving ahead. Crops generally showed good growth. Heavy weed growth was also evident. Ratooning has been delayed by the weather. Canes noticed were N.G. 15 (Badila), M. 1900, H.Q. 426, Q. 813, E.K. 28, Pompey (7 R. 428), and a little B. 147 and Innis. N.G. 15 is grown in considerable quantities and on the richer soil does well, one fourth ratoon crop cutting about 32 tons per acre. M. 1900 is also a favoured cane on land not good enough for N.G. 15, and when cut late gives very satisfactory returns, both for tonnage and density. Q. 813 and E.K. 28 on the poorer lands promise well, quite a large area of the latter having been planted. H.Q. 426 (Clark's Seedling) is good in odd places, but is a delicate cane. As for Innis and B. 147, they are only represented by small areas, and will probably be allowed to die out.

Fertilising and Green Manuring.—Owing to Carmila being such a new area, very little has so far been in use, but a few observant growers who are fertilising the poorer of the forest soils are well satisfied. Liming has been carried out on a small scale, but in at least one case has not had a fair trial as the land had not been previously drained sufficiently, and it cut up badly when worked. Bedding up into 2-row beds on this class of country would greatly improve the growers' chances of better yields, for it is impossible to grow cane successfully upon such low-lying portions.

Disease.—No disease was noticed; growers are advised to use their own seed and avoid introducing cane from elsewhere with the chance of its subsequently developing a disease of which so far they seem free.

Koumala and Inneston.

Koumala has also grown considerably and now presents a very prosperous appearance. Many extra cane paddocks were noticed, with most of them looking extremely well.

Some good ratoons were observed, third ratoons of M. 1900 and Q. 813 cutting up to 20 tons per acre on forest soil. Here, as at Flaggy Rock and Carmila, weeds had got ahead of the growers, but a few weeks cultivation will alter this.

Inneston surprised the writer with its extent of rich, low-lying cane land. Drainage had been the chief trouble, but is being overcome by opening up deep and lengthy leading ditches, and filling up unsuitable ones, with the result that the surplus water has now a better chance to get away. Some splendid N.G. 15 and M. 1900 were noticed, a fourth ratoon crop of the former cutting about 25 tons per acre with really good stools. A nice paddock of H.Q. 426 young plant was also showing up well.

Naturally, under such conditions, weeds were well represented, but were being kept under by scarifying.

Fertilisers.—Both Koumala and Inneston growers use a fair proportion of fertilisers, and there was no doubt as to the increased crop growth where used.

Diseases and Pests.—None of the former was to be seen, and only rats seemingly had done damage, and then only on the low-lying lands.

Sarina.

One hundred and twenty-five thousand tons was the expected mill supply. Large as this tonnage is, it should be easily exceeded next year, for besides the extra area under cane, the young cane both plant and ratoon look exceptionally well, a big percentage of the cane being "out of hand" now, at the commencement of what is really the growing season. With such favourable prospects a bumper crop should be milled in 1928.

Varieties.—M. 1900, N.G. 15, Q. 813, H.Q. 426, D. 1135, H.Q. 285, E.K. 28, &c., are all grown in fair quantities. Possibly M. 1900 and Q. 813 are the most popular on the older lands. D. 1135 is grown on several areas where grub damage may be expected, but most of this variety seen by the writer was of a thin type and is not up to samples of the same cane seen elsewhere in the Mackay area. E.K. 28, although only grown in small quantities so far, has been favourably commented upon, and as it has a strong root growth might stand up to grubs better than, say, a shallow rooter like Q. 813. H.Q. 285 on some of the forest land gave good tonnage and density, and seems to have ratooned well. Several good paddocks of young H.Q. 426 were also seen.

Cultivation.—As Sarina had also had a lot of showery weather, much leeway wanted making up, but given a few weeks suitable weather this will be attended to. Growers certainly were doing their best to cope with this work.

Disease.—As far as can be ascertained from the mill management and reliable and observant farmers Red Rot did very slight damage this past season, and most probably the very favourable growing conditions experienced throughout the season had much to do with this. Mosaic in young plant and ratoon H.Q. 426 and M. 1900 was noticed, but only to a small extent, and in both cases on broken country adjoining hillsides.

Pests.—At Tara Creek and Lower Alligator Creek greyback beetles were said to be on the wing, and as many as possible should be collected and destroyed.

It is also strongly recommended to cultivate the top soil as much as possible during the flying period of this pest. Growers are also advised to read the Entomological Notes by Mr. E. Jarvis, published each month by this Bureau.

Netherdale.

Nearly all the cane had been harvested when this area was visited, most growers having cut slightly over their estimate.

Showery weather had interfered with cultivation and many of the farms wanted cleaning up badly. The canes noticed were M. 1900, N.G. 15, Q. 813, and H.Q. 426, possibly the first named is grown most extensively; although N.G. 15 on the richest of the creek farms should give better returns. Some very good H.Q. 426 and Q. 813 young plant was noticed.

Diseases.—Mosaic was found to a slight extent in H.Q. 426 plant and ratoons on four and three farms respectively, and in E.K. 28 plant and M.1900 ratoons in one case each.

The Southern Field Officer, Mr. J. C. Murray, reports, from 14th November to 14th December:—

In the course of the past month work has been carried out in the Gin Gin, Nambour, Maryborough, and Bauple canegrowing areas.

Taking the areas generally, it can be said that the early plant cane came up slowly, although the growers finally did not have to do much supplying. The early cut ratoons are not satisfactory on the whole. The cane that was cut after the middle of September, however, ratooned very satisfactorily, and it is from this crop that the greater part of next year's cane will come. It is to be hoped that in the future the aim of the people engaged in the sugar industry will be in the direction of shortening the sugar season and operating, if possible, between the months of August and December. This would mean more time for spring planting, better ratooning, and better sugar content. Naturally, following better returns for the growers, there would be more employment for the field workers after the cutting.

However, taking everything into consideration, there is, at present, a much more cheerful outlook in the industry, probably due to what sugar-growers call "a return to the old seasons." There was a very heavy rainy season extending over the beginning of 1927, unfortunately following a dry spring. This year it looks as if the rainy season is setting in early. The cane, however, has had the benefit of splendid spring rains. It will be fairly safe to prophesy that most of the southern districts will have heavy crops next year.

As having some small bearing on the prosperity of the Queensland sugar industry, the writer would like to call attention to the large number of foreign-made implements of simple construction used in the industry. Take, for example, the cane knife. There are approximately 7,000 sugar-growers in the State, and each one buys at least one cane knife a year. Then there are hundreds of workers who use a good many knives in a season. These knives are nearly all bought in America. Does it not seem ridiculous? We have steel works in Australia where cane knives could be made, and handles could be put on in Bundaberg, Maryborough, and other industrial centres.

Taking conditions in detail, the following remarks apply to the areas visited:—

Gin Gin.

The crushing season was drawing to a close. The manager stated he had had a good run. The cane forwarded had been of good height and quality, although at intervals the effect of gum was noticed in treating the juice. The control of gumming disease is possible only in the field, when the growers, on detecting this disease, should communicate with the Director, Bureau of Sugar Experiment Stations, for recommendations regarding control measures.

Losses were in evidence in regard to the cane grub. Farmers seeking information in relation to this pest are advised to get in touch with the Assistant Entomologist, Bundaberg Sugar Experiment Station.

Cane varieties mainly grown at present in the Gin Gin district are:—M. 1900, D. 1135, N.G. 24 (Brown Goru), Black Innis, H.Q. 285, Petite Senneville, Q. 813, and Q. 855. Some of these varieties possess very weak features from canegrowers' point of view, but until better are forthcoming the farmers must continue to use them. No good purpose can be served in indicating the disabilities of a certain variety unless a better available one can be pointed out. The growers are advised, however, to plant Q. 813 as extensively as they can. Gum, as stated earlier, is present in the district, and as this cane is very resistant to this disease, the reason for planting it is obvious. Growers in the Gin Gin district are advised not to go outside their own districts for plants, nor are they advised to forward cane from their own areas to other districts. Disease is widespread enough at present, and if the growers give it a further spread by haphazard distribution the consequences might be extremely serious. Growers in the Gin Gin district have not done a great deal of green manuring.

Naturally, erratic seasons are against success in this direction, but now that regular rainfalls are occurring a special effort should be made to obtain green crops for ploughing under. The Queensland Acclimatisation Society does a certain amount of work in regard to experiment with green manure crops, also Gatton Agricultural High School and College, and canegrowers could, no doubt, get a good deal of information regarding values of different kinds of leguminous crops from these institutions, particularly the latter. Cowpea and Mauritius bean are the most favoured in canegrowing areas.

Nambour.

As this area is one that has been proclaimed disease-infected it was considered necessary to make a final visit before the end of the year in the event of any growers requiring permits to transfer plants. The usual amount of field work was carried out, and generally there is nothing fresh to comment upon since last visiting this area. The writer was accompanied by Mr. Ferguson Wood, Assistant Pathologist, whose work in connection with disease control and investigation is appreciated by the growers.

Practical application of manure in this district is showing that a complete mixture containing 10 per cent. of potash is giving good results on September ratoons. Manuring pays the farmer, but he must use the correct mixture. The writer would ask the growers not to neglect the all-important matter of local experiment, as it is going to greatly increase their efficiency. How to carry this out has been indicated many times on the farms and in monthly reports.

Maryborough.

Crushing is over in this area and the farmers are busy ratooning and doing general cultivation work. Special efforts are being made to get rid of Fiji disease, and the canegrowers are to be congratulated on the common-sense view they have taken of the very necessary restriction placed on the transfer of plants.

A noticeable improvement has taken place here in the last few years in the standard of farming. The rotary cultivator is responsible for a great deal of time saving.

Regarding cane varieties, the two most favoured canes at present are Q. 813 and H.Q. 285. Both these canes are resistant to Fiji disease.

Bauple.

Heavy rain has set in here, rendering the roads bad and the fields boggy. The ratoons are doing well. The plant cane is fair, although the strike in many cases was unsatisfactory. The mill had a good run and is now finished for the season.

The sugar content of the crop milled was fair, although some of the outside cane was low in value. The varieties that gave the best results were Q. 813, H.Q. 285, and M. 1900.

The ground is now in a thoroughly soaked condition, and, with the cane as forward as it is, good crops can be looked for next year.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1927 AND 1926, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1927.	Nov., 1926.
North Coast.	In.		In.	In.
Atherton	2·01	26	0·20	0·68
Cairns	3·92	45	0·43	1·86
Cardwell	4·03	55	0·77	1·27
Cooktown	2·64	51	0·50	0·53
Herberton	2·46	40	1·13	2·17
Ingham	3·49	35	1·25	3·08
Innisfail	6·04	46	2·32	3·09
Mossman	3·52	14	1·13	2·21
Townsville	1·81	56	0·08	0·60
Central Coast.				
Ayr	1·67	40	0·69	0·15
Bowen	1·27	56	1·04	0·10
Charters Towers ...	1·44	45	0·06	0·23
Mackay	2·86	56	2·25	1·09
Proserpine	2·76	24	1·62	0·81
St. Lawrence ...	2·23	56	1·88	0
South Coast.				
Biggenden	2·63	28	3·98	1·48
Bundaberg	2·47	44	5·27	0·13
Brisbane	3·75	76	5·82	1·73
Caboolture	3·26	40	8·21	0·60
Childers	2·65	32	3·73	0
Crohamhurst ...	4·34	35	7·23	0·25
Esk	3·14	40	6·09	1·29
Gayndah	2·77	56	6·89	0·75
Gympie	3·12	57	4·16	0·29
Kilkivan	2·44	48	2·31	0·67
Maryborough ...	3·08	55	3·86	0·12
South Coast—continued:	In.		In.	In.
Nambour	3·78	31	6·87	0·22
Nanango	2·61	45	2·56	0·71
Rockhampton ...	2·15	40	3·42	0·03
Woodford ...	3·17	40	4·87	0·45
Darling Downs.				
Dalby	2·63	57	4·41	0·77
Emu Vale ...	2·65	31	2·75	0·76
Jimbour	2·28	39	4·17	0·44
Miles	2·37	42	3·45	0·51
Stanthorpe ...	2·71	54	4·03	0
Toowoomba ...	3·24	55	4·85	2·15
Warwick	2·57	62	4·66	1·14
Maranoa.				
Roma	2·06	53	2·58	0·04
State Farms, &c.				
Bungeworgorai ...	2·27	12	1·47	0·02
Gatton College ...	2·75	27	4·53	2·13
Gindie	2·11	27	2·50	0·06
Hermitage ...	2·76	20	2·97	1·07
Kairi	2·02	12	0	1·25
Sugar Experiment Station, Mackay	2·56	29	3·15	1·13
Warren	3·31	12	1·70	0

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1926, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

NOTES ON BANANA INSECT PESTS.

By JOHN L. FROGGATT, B.Sc., Entomological Branch.

In banana-growing, as in other branches of primary industry, production is more or less markedly affected by the losses occasioned through the attacks of insect pests, the control of which is a vital necessity if the best returns possible are to be obtained from the plantation.

The following notes are not intended as an exhaustive account of those insects enumerated, but rather to place on record the observations made to date on the various forms and types of damage done, and of those insects which, as a result of field observations combined in many cases with breeding in the laboratory, have proved to be actual causative agents of such damage; in addition certain other economic insects collected with, or bred from, material collected on banana plants are also mentioned.

Two of the pests referred to—the banana weevil borer (*Cosmopolites sordida* Chev.) and the banana thrips* (*Scirtothrips signipennis* Bagnall) —have been treated in considerable detail in other publications, consequently only a brief résumé is given of both of these. In other cases investigational work has been initiated, and each one will be dealt with in detail when the investigations are completed.

INSECTS INFESTING THE BULB.

The only insect pest infesting the bulb of the banana plant in Queensland is the weevil borer.

The Banana Weevil Borer† (*Cosmopolites sordida* Chev.).

This is the most serious insect pest affecting the banana industry; as a result of its ravages the yield of fruit is reduced, and the economic life of the plantation is shortened.

The larvæ tunnel through the bulb of the plant, and destroy a considerable amount of tissue; also decay often sets in along the tunnels, thus causing further loss of tissue for food storage for the plant. As a result of infestation, the vitality of the plant is very seriously impaired, resulting in a weakly plant and a poor bunch of fruit; plant suckers may be completely destroyed before they have been able to attain sufficient growth to maintain themselves in spite of the borer infestation. Under normal conditions, the adult weevil will live for more than two years, while under adverse conditions it has exhibited remarkable powers of endurance and vitality.

Cavendish, Lady Finger, Sugar, Plantain, Gros Michel, and Dacca varieties are all equally subject to attack by this pest, the effect of such on the plants being particularly accentuated during a protracted spell of dry weather. Banana plants growing in all classes of soil, and in elevated or low situations, appear to be attacked with equal frequency and severity.

This pest is very generally distributed through the banana-growing districts of Queensland, and in the scrubs of North Queensland it has been found to be breeding in the bulbs of the native banana, *Musa banksii*.

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* This species has previously been referred to as *Anaphothrips signipennis* Bagnall.

† This pest has been dealt with in detail in Bulletin 4 and Leaflet 5 of the Division of Entomology and Plant Pathology.

Apart from Queensland, *C. sordida* has been recorded as a banana pest from New South Wales, Western Australia, Philippine Islands, Java, New Guinea, Bismarck Islands, Solomon Islands, New Hebrides, Fiji, Tonga, Samoa, Cook Islands, Martinique, Jamaica, Porto Rico, Florida, Costa Rica, Bermuda, Brazil, Madeira, Guinea, Uganda, Belgian Congo, Mauritius, Madagascar, Seychelle Islands, Ceylon, and Southern India. It is thus seen to have a wide distribution throughout banana-growing countries.

INSECTS DAMAGING THE FRUIT.

The Banana Thrips (*Scirtothrips signipennis* Bagnall).*

The most serious pest on the fruit is the banana thrips. Where present on the bunches in numbers, these minute insects, as a result of their feeding, give rise to roughened reddish-brown areas on the skin. The popular name of "rust" has been given to this damage, which, on account of rendering the fruit unsightly, deleteriously affects their market value, although in the great majority of cases it in no way impairs their edibility. Where damage, more especially to immature fruit, is very severe, however, the skin may be toughened to such a degree as to inhibit the normal development of affected fruit; under such conditions the pulp may be rendered dry and inedible.

The thrips form colonies in between the fruit on the bunches, and in dry places underneath the leaf sheaths on the "stem"; they are also plentiful in all bud ends attached to the bunches. When a colony is exposed the insects scatter rapidly in all directions, taking shelter as soon as possible; both adults and larvæ have, however, been observed in numbers on the foliage after sundown, and they may also crawl over an exposed surface on the fruit even during the day.

The adult banana thrips is a minute yellow insect about $\frac{1}{25}$ of an inch in length, possessing two pairs of very fine wings fringed with long hairs. The mature larvæ are slightly smaller than the adults, and are paler in colour, while the young larvæ are white.

The association of a species of thrips to the "rust" of banana fruit was first recorded by Tryon in 1910; "rust," as such, however, was a well-known cause of loss to banana-growers in the Cairns and Goondi areas as far back as 1897.

The species was originally described from a "female specimen collected on the under surface of a banana leaf at Peradynia, Ceylon," but no record is known of any damage to banana fruit in Ceylon due to thrips attack.

In North Queensland, this species has been collected from the bunches and under the leaf bases on the "stem" of the native banana, *Musa banksii*, throughout the area Cardwell to Cairns, and also at Mantaka and on Palm Island; it has been collected in the flowers of the cunjevoi (*Alocasia macrorrhiza* Schott) in the Innisfail district.

In so far as our information goes to date, the native banana does not grow south of the Herbert River. We have had the opportunity of examining the wild bananas over the greater part of the northern areas of the State with the exception of the Herbert River sector, and have found *Scirtothrips signipennis* in constant association with this native plant, and also with "rust" on the wild banana fruit; on this host it has

* This pest has been dealt with in detail in Bulletin 2 and Leaflet 7 of the Division of Entomology and Plant Pathology, and in "Calcium Cyanide Dusting for Banana Thrips," "Q.A.J.," January, 1927.

been collected not only in proximity to but also at a distance of fifteen miles from banana cultivation. From the data in hand it appears that this species is indigenous on the wild bananas in North Queensland, and has spread from them into the cultivated plantations. Dispersion of the pest into other portions of the State in which the wild banana does not occur has been brought about by the transportation of suckers from infested areas. The species is generally distributed throughout the cultivated areas in North Queensland, and is more or less prevalent at St. Lawrence, in the Rockhampton and Pialba districts, in portions of the Gympie area, and at Nerang and Currumbin; it has also been reported from the Tweed River area in New South Wales.

In the northern areas there is another species of thrips (Thrips sp.) which has been found to cause damage similar to that caused by *S. signipennis* of the fruit when the bracts first lift off the hands. This species is only present on the fruit while it is well protected by the covering bracts, but is found in larval, pupal, and adult stages in the curled-up bracts while they are to any degree fresh, and in the bud ends of more mature bunches; it is often found in association with *S. signipenni*, but not invariably so. The adults have the thorax and head reddish-orange in colour with the antennæ and abdomen dark; the larvæ and pupæ are pink in colour.

This species has been collected throughout the area Cardwell to Cairns and at Palm Island from the young bunches on cultivated banana plants, and from Innisfail to Cairns in the young bunches and bud ends of the native banana, *M. banksii*; before the flowers wither they are present in all parts of the blossom and all over the young fruit, often in considerable numbers. The species has been collected in the Innisfail area from flowers of the cunjevoi (*Alocasia macrorrhiza*) and lantana. Specimens of this species, which had been collected in association with banana fruit, have also been received from Fiji.

Fruit Flies.

Infestation of bananas by fruit flies is not of very great moment in Southern Queensland, but in the northern areas of the State it is a problem of major importance.

In the south *Chætodacus tryoni* Froggatt and *Rioxa musæ* Froggatt have been bred from fly-infested bananas, the former being the principal species concerned. *C. tryoni* does not usually "sting" banana fruit before they are mature, although often still quite green in colour; infestation by this species occurs principally during the summer months.

In the northern portion of the State, however, quite a distinct species, *Chætodacus musæ* Tryon (Plate 2) causes the whole of the damage to banana fruit, its activities extending through the greater part of the year, although at its worst in the spring and early summer. This species may, and sometimes does, "sting" fruit in a very immature stage of development, while fruit on a bunch scalded as a result of undue exposure to the sun are particularly susceptible to infestation; the fruit on any bunch two-thirds matured are liable to attack whenever this species is operative. When even a single banana on a bunch has been "stung," the flies appear to concentrate on that bunch until practically, if not completely, all the fruit on it have been infested, while many of them may have been punctured a number of times. As many as twenty-five "stings" have been counted on a single fruit, and as many as twenty-four eggs in one puncture, with an average of ten; 100 maggots of this species matured on one occasion in a single banana collected in the field and kept under observation in the laboratory.

Fig 1 x 6

Fig 2 x 6

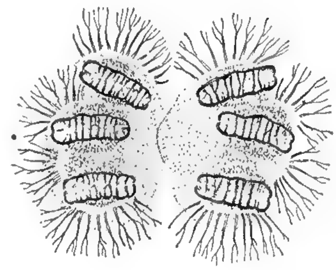


Fig. 2a. x 210.

Fig 2b x 30

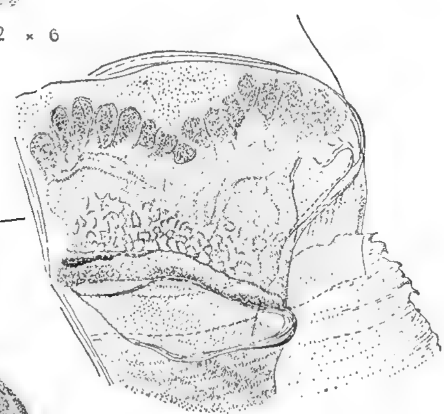


Fig 2c x 210

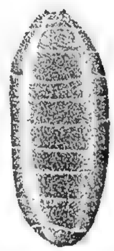


Fig. 3 x 5

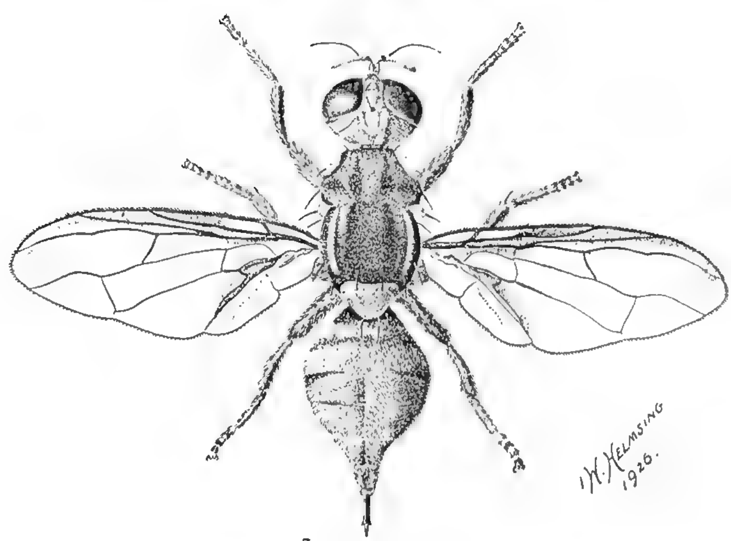


Fig 4 x 6.

Plate 2.

The Banana Fruit Fly (*Chætodacus musæ* Tryon).

Fig. 1. Eggs x 6. Fig. 2. Larva x 6. Fig. 2a. Stigmal discs of larva x 210. Fig. 2b. Jaws of larva x 30. Fig. 2c. Anterior spiracle of larva x 210. Fig. 3. Pupa x 5. Fig. 4. Imago x 6.

The puncture made by the ovipositor does not completely pierce the skin of the cultivated banana fruit, the eggs (Plate 2, Fig. 1) lying massed together in the loose tissue just above the pulp; the site of the puncture is marked on the surface by a small black spot surrounded by a dried drop of fluid which has exuded after the withdrawal of the ovipositor. The maggots (Plate 2, Fig. 2), on emerging, feed on the surface of the pulp, later penetrating it and giving rise ultimately to a general breakdown of the fruit; when full fed the maggots leave the fruit and pupate in the soil. The adult flies (Plate 2, Fig. 4) are reddish-brown in colour with yellow blotches on the thorax, and are little less than one-third of an inch in length.

The southern limit of distribution of *C. musæ* in so far as is at present known is Cardwell, but further field collection may show a wider dispersion. It is met with generally throughout the area from Cardwell to Cairns along the coastal belt, and has been bred from banana fruit collected at Mantaka.

The only other host from which *C. musæ* has been bred is the fruit of the native banana, *Musa banksii*; from this native fruit the species has been bred from material collected throughout the area Cardwell to Cairns, and also from Mantaka and Palm Island.

Fruit Spotting Bugs.

In certain portions of the Rockhampton district a considerable loss of banana fruit is brought about by the depredations of bugs which, both as nymphs and adults, puncture the skin of the fruit from the time the flower bracts lift until the fruit is mature and ready to cut, the more immature fruit being the stage most particularly favoured.

Around the site of the puncture a dark area rapidly develops, which eventually becomes circular in outline and depressed with a slightly raised spot in the centre. For some considerable time after the puncture has been made the point of insertion of the rostrum (piercing organ) of the insect is plainly visible as a small opening in the middle of the central spot, the tissue being slightly curled back around the orifice in most instances.

Where the attack is made on very immature fruit, a corky pit usually develops which generally splits across the centre; in some cases the split may extend into the skin for a distance on either side of the pit, usually exposing the pulp; the fruit is thus rendered unmarketable. Where more mature fruit are punctured the dark circular areas remain merely as unsightly blemishes on the skin of such varieties as the Cavendish and Gros Michel, but with the thinner skinned fruit of the Sugar banana a hard lump develops in the pulp underneath.

In some cases every fruit on a bunch is more or less severely affected, whereas in others damage is confined to comparatively few. Punctures are not confined to the outer, more exposed surface of the fruit, but are also made on the inside of the hand and in between the fingers. The average loss is estimated by growers at about 33 per cent. of the total cut during the period when the bugs are actively operating.

The pests show their greatest activity from February to May, and are least active during the winter months; adults and the early nymphal instars usually make their appearance again in the early part of September. From June to August the nymphs are not met with in the banana plantations, and it would appear that at this period of the year breeding is inoperative in these situations.

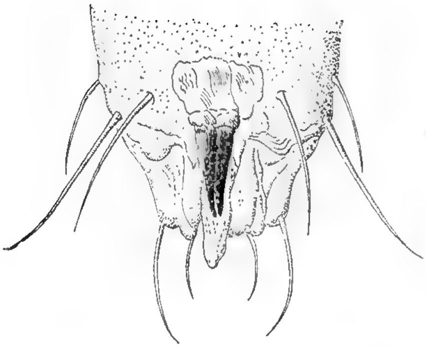


FIG. 1 × 225

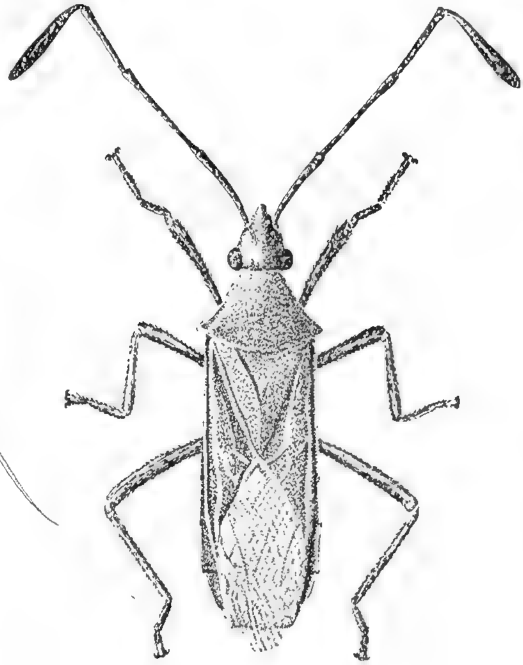
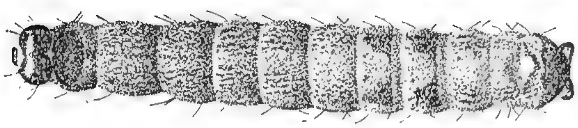


FIG. 2 × 4

FIG 3 × 1½



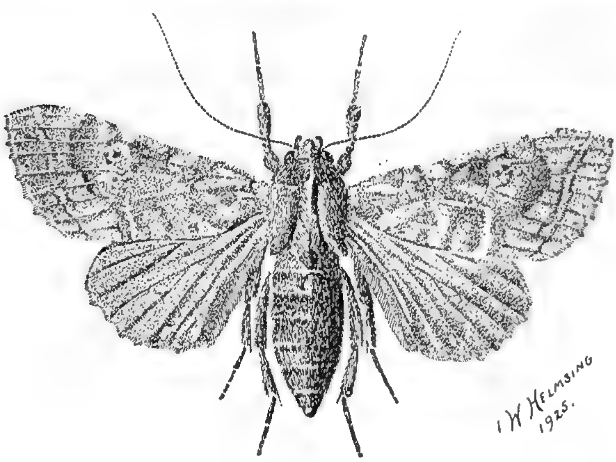


FIG 4 × 1½.

PLATE 3.

Fig. 1. Anal segments of male of *Scirtothrips signipennis* Bagnall. Showing genitalia x 225. Fig. 2. Imago, *Pendulinus fuscescens* Dist. x 4. Fig. 3. Larva, *Tiracola plagiata* Wlk. x 1½. Fig. 4. Imago, *Tiracola plagiata* Wlk. x 1½.

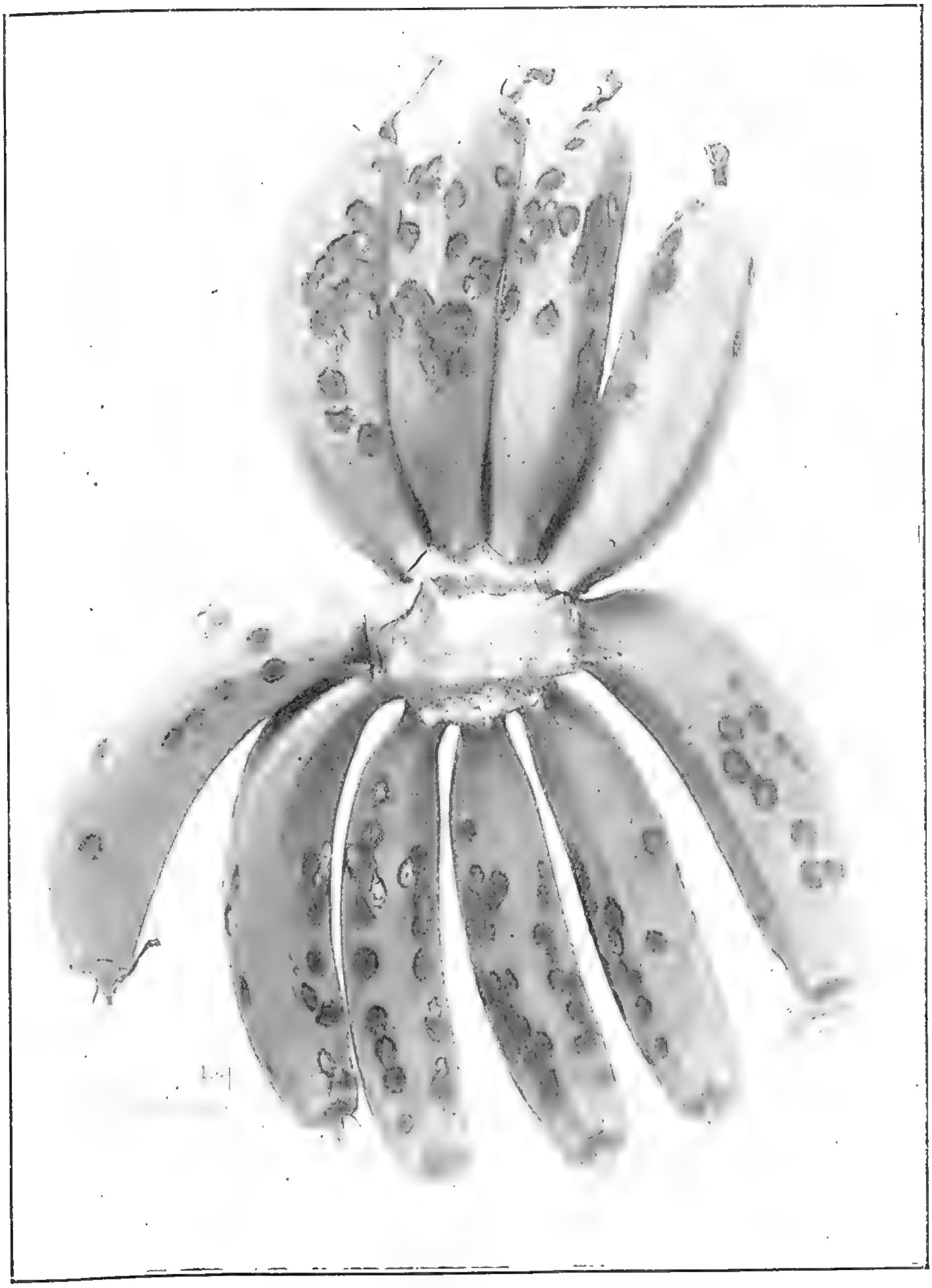


PLATE 4.—DAMAGE CAUSED BY FRUIT-SPOTTING BUGS.

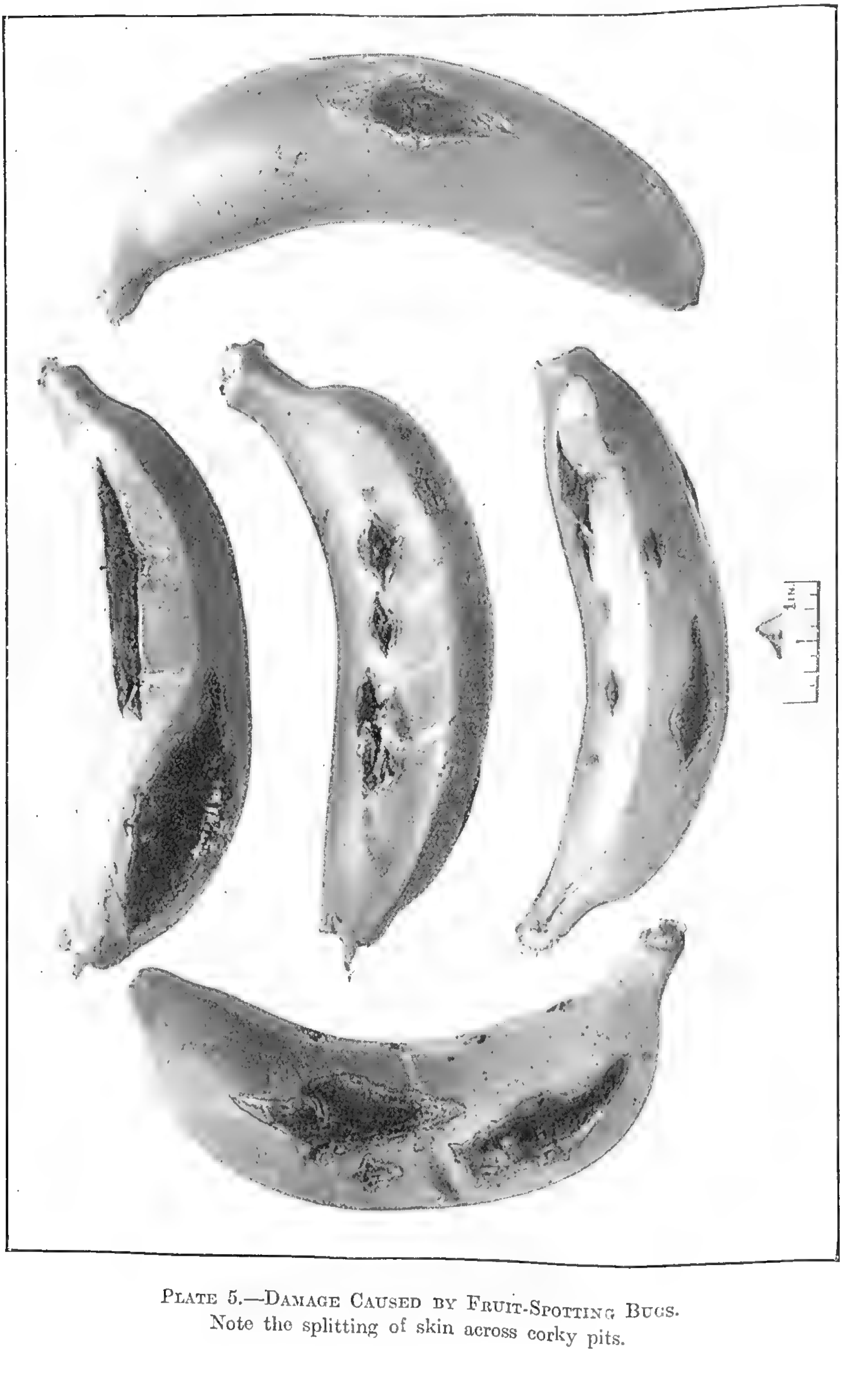


PLATE 5.—DAMAGE CAUSED BY FRUIT-SPOTTING BUGS.
Note the splitting of skin across corky pits.

There are two species of bugs (Plate 3, Fig. 2) associated with the damage to banana fruit in the district referred to; both belong to the family Coreidæ, genus *Pendulinus*, *P. lutescens* Dist. and *P. fuscescens* Dist. The former species appears to be the worst pest, occurring in the largest numbers during that period of the year when the maximum damage is done, whereas the latter species is the predominant one during the winter months. The seasonal variation and relative frequency of occurrence of these two species is a matter requiring further study.

The adult *Pendulinus lutescens* Dist. is rather a light-green in colour, whereas *Pendulinus fuscescens* Dist. is a very deep reddish-brown on the upper surface and green underneath; both species are about half an inch in length. The early stage nymphs of the former are remarkable for the great length of the antennæ as compared with that of their body and their general bright red colour.

In January, 1927, *P. fuscescens* was found in the Byfield area of the Rockhampton district in enormous numbers as last stage nymphs and newly emerged and emerging adults on a native tree, *Pisonia brunoniana* (Family Nyctagineæ). In the instance quoted the sticky fruit had largely fallen from the tree, but there was no possible doubt but that *P. fuscescens* had been feeding and developing on the fruit. At various other times of year this tree had been examined for these bugs, but no trace of the nymphs or adults could be found on any part of it.

P. lutescens and *P. fuscescens* are met with on pawpaw trees, to the crowns and fruit of which both larval and adult forms do considerable damage in the Byfield area. In the Rockhampton district *P. lutescens* has been found to cause damage to cassava plants and has also been collected on citrus trees.

Pendulinus lutescens is fairly plentiful at Ashgrove, Brisbane, on a native shrub, *Nephelium semiglaucum* (Family Sapindaceæ), and has been recorded from the Gympie district. It has been collected in both nymphal and adult forms on papaw trees in the Cardwell district, North Queensland, and at Maadi (Innisfail area), North Queensland, as the adult on bananas, while at Redlynch (Cairns district), North Queensland, it has been collected in both nymphal and adult stages on granadilla fruit. *Pendulinus lutescens* has also been recorded from Dunk Island, off the coast of North Queensland, while *Pendulinus fuscescens* has been recorded from Carmila, North Queensland. It is therefore evident that these species have a wide range of dispersion, and it is remarkable at the present time they are only known as pests of the banana in the one district —Rockhampton.

In some portions of Southern Queensland a Pentatomid bug, *Calliphara inperialis* Fabr., is reported to mark the banana fruit in a somewhat similar manner to that referred to from Byfield; the damage caused by this species, however, appears to be only sporadic, and even then not of particularly great economic importance. This bug is about three-quarters of an inch in length, and has almost the whole of the upper surface of the body a bright red in colour with the tip of the abdomen, legs, and under surface a metallic green.

Fruit-eating Caterpillars.

There are several species of moths, the caterpillars of which cause damage to banana fruit. In some cases all larval instars erode only the surface skin; in others only the early instars feed in this way, while the later ones eat through the skin and feed solely on the pulp.

As a result of surface skin erosion, unsightly scabby areas develop as the fruit matures, rendering it of less market value than would otherwise be the case. Where such damage has been done to very immature fruit the skin may ultimately crack; in such instances, as also when the skin has been punctured and the pulp eroded, the fruit is useless for market.

The species at present known to be associated with damage to the fruit are as follow:—

NOCTUIDÆ.—*Tiracola plagiata* Wlk., *Aginna circumscripta* Wlk., *Plusia chalcites* Esp., *Simplicia robustalis* Guen.

PYRALIDÆ.—*Notarcha octosema* Meyr. (Pyraustinæ), *Tirathata rufivena* Wlk. (Galleriinæ), *Conogethes punctiferalis* Guen.

Tiracola plagiata Wlk., *Notarcha octosema* Meyr., and *Plusia chalcites* Esp., are the most important of these, although *Conogethes punctiferalis* Guen. is not uncommonly met with and *Aginna circumscripta* Wlk. has been taken on several occasions; the other two species are, so far as existing data go, of only very minor importance.

Tiracola plagiata Wlk.

The adult moth (Plate 3, Fig. 4) is generally a dull brown in colour with the markings on the wing, though somewhat variable, presenting a general mottled appearance; it measures about 2 inches across the outspread wings. The caterpillars (Plate 3, Fig. 3) feeding on bananas are of a general brown colour, and are about 2 inches in length when full fed; when they have reached maturity they enter the soil to pupate. The young larvæ erode the surface skin of the fruit, but when about one-half to two-thirds developed they may, and often do, eat through the skin and gnaw out cavities in the pulp; in some instances after forming these cavities they will remain inside the fruit until they have reached maturity, feeding meanwhile only on the pulp. The caterpillars of this moth occurred in plague proportions along the coastal belt in the early part of 1927, and caused very considerable and widespread damage in banana plantations; during this time they also fed freely on the foliage. This species is met with all through the year in banana bunches, and has been collected over an area extending from Currumbin to Cairns. It is probably responsible for the major part of the caterpillar damage in the southern areas, and causes a marked proportion of the damage in the northern sector.

Notarcha octosema Meyr.

In so far as is recorded to date, this species is not known to occur south of Cardwell; further field observations may, however, extend its known range of distribution, which is Cardwell north to Cairns and Mantaka.

The eggs are evidently laid adjacent to, or in, the hand of the fruit on the bunch shortly after the flower bracts lift, and the caterpillars on emerging may travel downwards through the hands, more or less marking all the fruit on the bunch. They are purely surface feeders, and apparently only attack the very young fruit; they also breed in the bud ends left hanging on the bunches. In the course of their feeding they give rise to an appreciable amount of silken webbing in the hands, in the strands of which excreta and other waste material become entangled. The larvæ when fully developed are about 1 to 1¼ inch in length and pinkish-grey in colour; in the base of the hand in which they have been feeding they spin a light silken cocoon inside which the transformation to the pupa, or chrysalis, takes place. The pupa is pale-brown in colour and slightly less

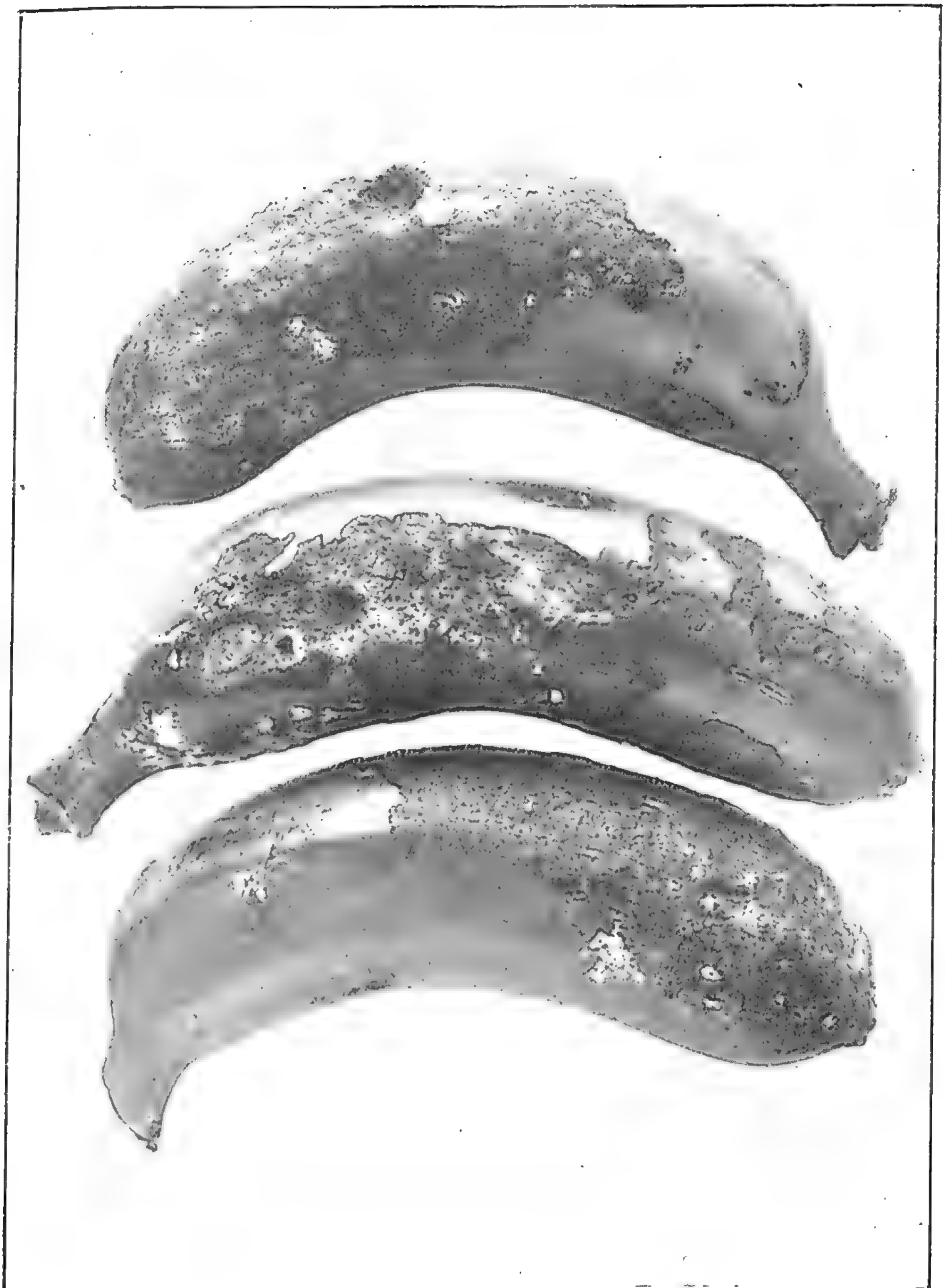


Plate 6.—Damage Caused by Fruit-eating Caterpillars (*Tiracola plagiata* Wlk.).

than 1 inch long. The adult moth is a greyish-brown in colour, measuring about 1 inch across the outspread wings, the most noticeable markings being two black dots towards the front margin of each forewing, and one black dot towards the front margin of each hindwing.

The larvæ of this moth have been collected on the immature fruit on the bunches of *Musa banksii*, in the Innisfail district. It may here be stated that practically every bunch of fruit of the native banana shows typical caterpillar damage on at least the two top hands.

Notarcha octosema has also been recorded from the Dutch East Indies, Samoa, and Fiji as a pest of banana fruit, giving rise to the formation of "scabs."

Plusia chalcites Esp.

The caterpillars of this moth, when young, erode only the surface skin of the fruit, generally feeding over a small area and then moving to another spot; at a later stage of development the larvæ eat holes through the skin into the pulp. They never eat deeply into the pulp, however, but move from fruit to fruit, often only making one hole in each banana attacked. Several hands on a bunch may, in this way, have several, or even all, fruit on each "holed" by the caterpillars, thus giving rise to an appreciable loss.

The larva is green in colour and about 1 to 1½ inch in length when fully developed. The adult is of a general dark colour with a golden sheen on the fore wings, together with two small silvery dots towards the front margin; it measures about 1 to 1¼ inch across the outspread wings.

The caterpillars of this species have been collected from banana fruit at Montville and in the Rockhampton and Innisfail districts, between September and March, and have also been observed feeding on the foliage.

Aginna circumscripta Wlk.

The larvæ of this moth not only erode the surface skin of the fruit, but also eat through the skin into the pulp, on which they feed extensively. The caterpillars, measuring about 1½ inch in length when full fed, are lightish-brown in colour "dusted" with minute black spots. The moth is dull brown in colour and about 1¼ inch across the outspread wings.

From field observations to date this species does not appear to be of major importance; the larvæ have been collected on several occasions at different times of the year in the Byfield district, a single caterpillar causing damage on occasion to most of the fruit in as many as three hands in a bunch. Growers have stated that at times these caterpillars are fairly numerous and cause an appreciable loss of fruit. It would therefore appear that this species is an established banana fruit pest—at least in the locality referred to.

Simplicia robustalis Guen.

Larvæ of this moth have been collected on banana bunches in the Gympie district feeding on the skin of the fruit. The caterpillars are a dull brown in colour, while the adults are light brown, with a fine creamy line across each wing; they measure about 1 inch across the outspread wings.

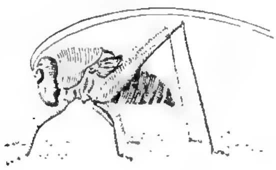


FIG 1

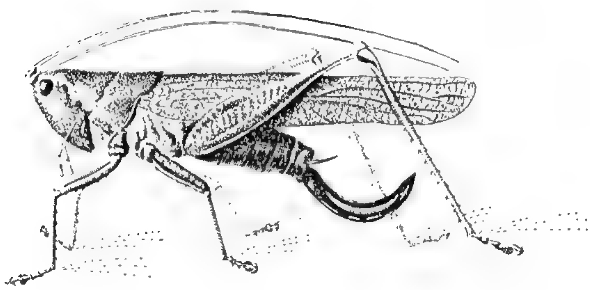


FIG 2

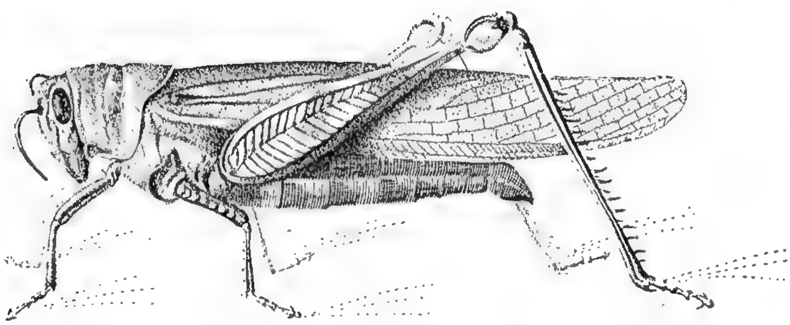


FIG 3.

I.W. HELMSING 1925

PLATE 7.

Fig. 1. Nymph of species of Locustid. Fig. 2. Female imago of species of *Locustid*. Fig. 3. Imago, *Cyrtacanthacris* sp.

Tirathata rufivena Wlk.

The caterpillars of this species have been collected on different occasions in the Innisfail district eroding the surface skin of the fruit, and are about 1½ inches in length. The moth is about 1¼ inches across the wings, and is of a brownish-grey colour, the veins of the wings sometimes being reddish in colour.

Conogethes punctiferalis Gn.

The caterpillars of this moth bore straight into the fruit from the flower end, fruit in an immature state of development being that most commonly affected. The larvæ feed on the pulp and give rise to a black tip on the fruit not unlike the so-called "cigar end," but readily distinguished from it by the presence of fine webbing intermixed with excreta from the enclosed caterpillar. When full grown the caterpillars are about 1 inch in length, and are generally a creamy pink in colour with silvery grey spots; the moths, deep yellow in colour, with the wings strongly marked with small black dots, measure about 1 inch across the outspread wings. The caterpillars of this species have been collected in banana fruit in March and April in districts between Brisbane and Gympie, and in July in the Rockhampton district.

This moth is a serious pest of many other economic crops, but is as yet not a serious one on bananas.

Locustidae.

At least two species of the so-called long-horned grasshoppers (Plate 7, Figs. 1 and 2) in both nymphal and adult stages feed on the skin of green banana fruit. The resulting damage is usually slight, the area eroded being small, but on certain occasions they have been observed to eat off areas of the skin more than 1 inch across and even penetrate to the pulp, feeding occurring on a number of fruit on a bunch. In the former case the resulting blemishes are only slight, but in the latter the affected fruit are spoilt for market. When the pest is plentiful the quantity of fruit that has to be discarded may be fairly large.

Specimens of these insects feeding on the banana fruit have been collected all along the coastal belt to as far north as Cairns. The commonest species concerned with this damage is about 2 inches in length and green in colour.

Snails.

In the Byfield district a species of small snail (*Thersites* (*Sphærospina*) c.f. *incei Pfr.*) feeds on the skin of banana fruit, causing a very slight surface erosion. Although young fruit appear to be preferred, more fully developed fruit may be, and often are, fed over. The snails do not, as a rule, remain feeding on the one spot, but wander all over the fruit, thus giving rise to meandering tracks. As a result of the erosion, unsightly scabby areas develop, marring the appearance of the fruit, and although the loss in fruit that has to be discarded as a result of snail damage is not great, it is still quite appreciable, and is much worse in some seasons than in others.

The light erosion and wandering nature of the tracks serve to distinguish snail damage from that caused by caterpillars.

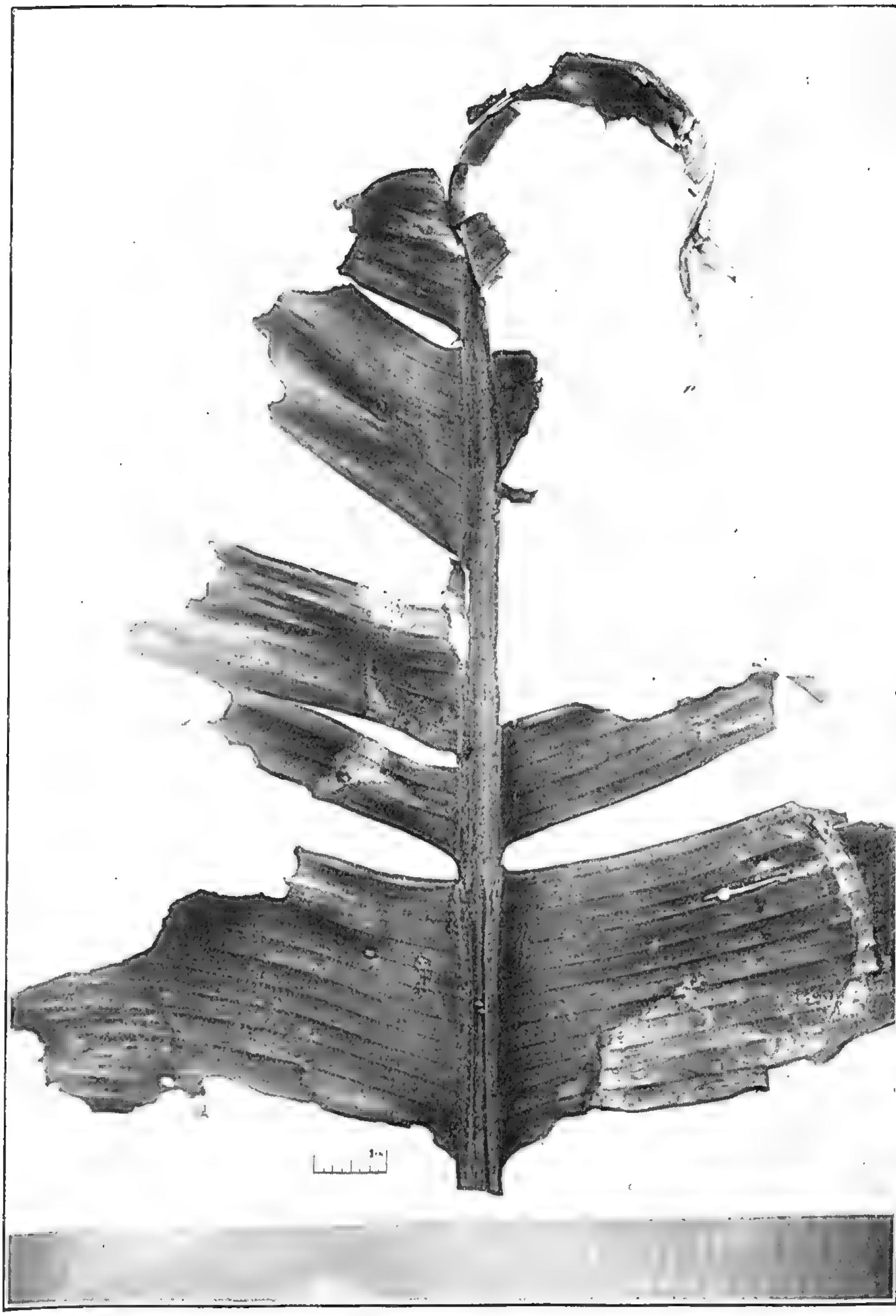


PLATE 8.—PORTION OF BANANA LEAF, SHOWING NATURE OF DAMAGE TO LEAF TISSUE BY *Cyrtacanthacris* sp.

Fruit-sucking Moths.

In cases where banana fruit is allowed to fully mature and begin to turn yellow before being cut, a practice adopted at times when supplying nearby centres, the fruit is at times very liable to attack by fruit-sucking moths.

Where such conditions occur the loss resulting from the depredations of these pests may be considerable. In the northern areas of the State these moths were very bad in the spring of 1927, *Othreis fullonica* Linn. and *Argadesa materna* Linn. being two species concerned with the trouble. These are large brightly coloured moths equipped with a sharp-pointed sucking tube by means of which they are enabled to penetrate the skin of the fruit and suck up the juices of the pulp beneath. Affected fruit rapidly decay, and have therefore to be thrown away.

INSECTS ATTACKING THE FOLIAGE.

Acridiidae (Short-horned Grasshoppers).

A species of the genus Cyrtacanthacris (Plate 7, Fig. 3) in some seasons causes an appreciable amount of damage to banana plantations by devouring the foliage. When these insects are particularly numerous it is by no means uncommon to see the blades of the leaves completely eaten away, leaving the midribs standing bare; under such conditions the centre (uncurling) leaf may often be eaten down almost to the throat of the plant. This species, in both larval and adult stages, sometimes feeds on the skin of the fruit, giving rise to scabby blemishes on the surface.

It is a large insect measuring about 3½ inches in length from the front of the head to the tip of the folded wings. The nymphs are green in colour, while the adult is a dull brown, the markings on the wings and thorax being very variable.

Prodenia litura Fabr.

This species (Plate 9), although a minor pest of banana plants, is an important pest of other economic crops. The caterpillars (Plate 9, Figs. 1 and 2) are met with throughout practically the whole year, and have been collected in plantations all along the banana belt; they are a dark greenish-black in colour, and when full fed are about 1¾ inch in length. The adult (Plate 9, Figs. 6 and 7) is dark with the fore wings marked with light-coloured lines and bands, the hind wings being silvery grey; it measures about 1¾ inches across the outspread wings.

The eggs are deposited in a mass on the foliage, usually the youngest leaf on the plant; the young larvæ emerging in considerable numbers first swarm over the leaf on to which they have emerged, later migrating to one or more older leaves on the same plant. They feed almost wholly on the surface tissue, leaving only a skeleton of the veins; this damage is characteristic of *Prodenia* on the banana foliage, although more mature larvæ may completely devour small sections of the tissue of young leaves. When fullfed the caterpillars leave the plant and enter the soil to pupate. Usually the resulting damage caused does not extend to more than two or sometimes three leaves per plant.

This species has proved an extremely difficult one to breed through to the adult stage under artificial conditions in the laboratory, due partly to very decided carnivorous habits exhibited by the larvæ when they are

Fig 1 x 1½

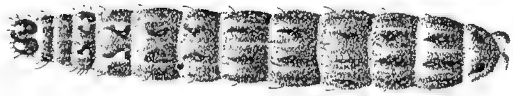


Fig 2 x 1½

Fig 3 x 1½

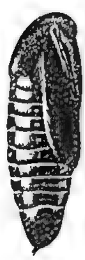


Fig 4 x 1½

Fig 6 x 1½

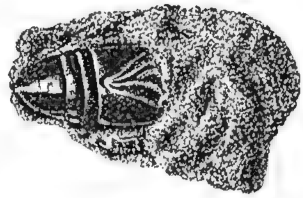


Fig 5 x 1½

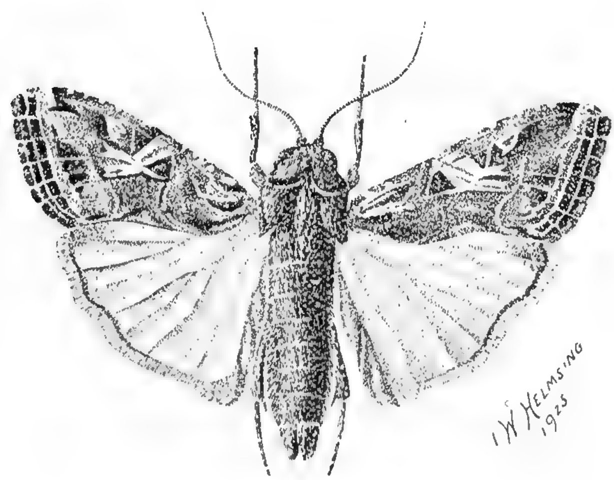


Fig. 7 x 2

PLATE 9.

Prodenia litura Fabr.

Fig. 1. Larva, lateral view x 1½. Fig. 2. Larva, dorsal view x 1½. Fig. 3. Pupa, ventral view x 1½. Fig. 4. Pupa, lateral view x 1½. Fig. 5. Pupa within earthern cocoon x 1½. Fig. 6. Imago, wings closed x 1½. Fig. 7. Imago, wings expanded x 2.

about half-grown, and partly to the more or less rapid dying off of the caterpillars after displaying these cannibalistic tendencies. For the successful rearing of the adults the caterpillars have had to be kept in separate jars. This habit may account for the sudden diminution in the number of caterpillars on the leaves as observed in the plantation.

Rhyparida discopunctulata Blackb.

This small Chrysomelid beetle has been met with constantly in the Innisfail area feeding on the tissue of the leaves and flower bracts of banana plants. The adult insects are a shiny black and slightly less than ¼ inch in length. They apparently prefer the young unfurling leaves, and congregating, often in considerable numbers, on such they will continue to feed on it until only shreds of the original leaf remain. They shelter within the leaf during the day. On older leaves they feed on the upper surface along the outer edge of the midrib, causing leaves so attacked to turn yellow prematurely; in these cases the beetles will generally be found sheltering in the heart of the crown of the leaves. The beetles also shelter in curling flower bracts on the bunches. It is, however, only a minor pest of bananas as far as our knowledge goes to date.

This species has also been reported as damaging canna plants at Pawngilly, North Queensland, and has been collected in large numbers on hibiscus shrubs and rose bushes at Kennedy, North Queensland, to both of which plants they were causing considerable damage.

Rhabdocnemis obscura Boisd.

This weevil has been collected on several occasions in the Innisfail district feeding in the axil of the leaves on the tissue of the midrib; in some cases the leaves had broken down at the point where these beetles had been feeding. This species is the beetle borer of sugar-cane. On one occasion adults of *R. obscura* were received from the Mackay district, which had been collected with the banana weevil borer in an old rotten butt of a banana plant, but there is no proof of their breeding in banana plants in Queensland. The sugar-cane beetle borer is readily distinguished from the banana weevil borer by the flatter dorsal surface, reddish-brown colour with distinct dark markings on the thorax and wing covers of the former, while the latter is more rounded on its dorsal surface and is of a uniform black colour.

Opogona glycyphaga Meyr.

The larvæ of this small Tineid moth were collected at Gordonvale in September, 1925, feeding under the leaf bases on the stem of banana plants just underneath the axil. It is, however, a minor feeder on banana plants.

Aphididae.

The banana aphis, *Pentalonia nigronervosa* Coq. (Plate 10, Fig. 1) is distributed throughout the banana districts of the State. It may be met with all through the year, although it is most plentiful during the warmer months. On the plant it is to be found on the foliage during dull weather or late in the day, and in the bases of the hands or on the young fruit on young bunches, and around the throat of the plant and under the outer leaf bases on the pseudostem; in the two latter situations they often congregate in very large colonies, and in the latter may extend from near

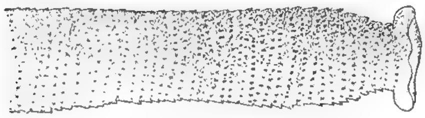


FIG 1B x 210

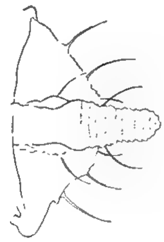


FIG 1C x 210

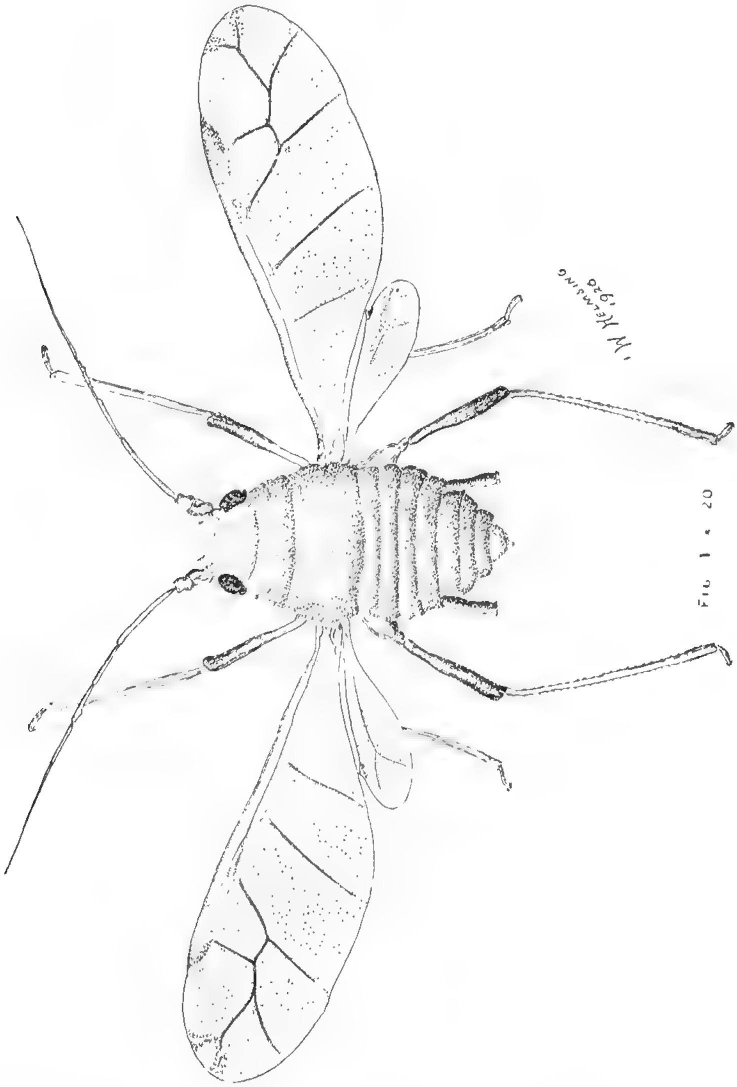


FIG 1 x 20

FIG 1A x 210

PLATE 10.

THE BANANA APHIS (*Pentalonia nigronervosa* Coq.)

Fig. 1. Winged adult x 20. Fig. 1A. Segments 3 and 4 and portion of 5 of antenna of adult, showing sensory organs x 210. Fig. 1B. Cornicle of adult x 210. Fig. 1C. Anal segment of adult x 210.

ground level upwards; they are also to be found in the soil around the stool. They derive their nourishment by puncturing the surface of that portion of the plant on which they are present by means of a sharp-pointed trunk through which the plant sap is drawn up into the body.

This species is a small dark-coloured insect about one-twenty-fourth of an inch in length, and in the winged forms about one-third of an inch across the outspread wings; the wings are characteristically marked by strongly accentuated dark bands along the nervures. Both winged and apterous forms may be present in the one colony, but the latter are the more numerous.

The economic importance of this insect lies in its being the vector of the virus of the Bunchy Top disease of banana plants. In districts in which this disease is non-existent it is doubtful whether the aphids cause any material damage. Where they are particularly plentiful on young suckers, the plants may receive a check in their growth; it has been recorded* that where infestation of young plants by *P. nigronervosa* had been particularly heavy, the collection of large quantities of "honey dew" around sheathing bases of the leaves fermented, causing a decay of the petioles; where such plants were not sprayed to reduce aphid infestation, the plants died. Where large colonies are present on young fruit the punctures caused as a result of the feeding of the aphids may be the primary cause of "specking," which sometimes develops as the fruit matures.

P. nigronervosa has been collected throughout the area Cardwell to Cairns, and at Mantaka, and also on Palm Island under the leaf bases on the pseudostems of *Musa banksii*. In other parts of the world this species has been recorded in association with banana plants.

Monolepta rosea Blackb.

This small Chrysomelid beetle is sometimes met with in considerable numbers on young banana bunches while in the flowering stage, when it feeds on the petals on the flowers. It is sporadic in occurrence, however, and is of minor importance as a banana plant feeder, although it is a serious pest of other economic crops. It has been collected along the coastal belt to as far north as the Cairns district, and also at Kuranda.

Scale Insects.

In addition to the insects already referred to there are two species of Coccidæ (scale insects) which, although not actually important pests of the banana plant, are yet of sufficiently frequent occurrence thereon as to be worthy of mention.

The species *Aspidiotus cydoniæ* Comst., has been collected on the foliage of cultivated banana plants in the suburbs of Brisbane, at Redland Bay, and in the Cairns district, and on the foliage, leaf bases, bunch stalk, and fruit of the native banana, *Musa banksii*, in the Cairns district.

A second species, *Saissetia nigra* Neitn., has been collected on the foliage on cultivated banana plants in the suburbs of Brisbane, in the Gympie district, and in the Byfield area of the Rockhampton district; it has occasionally been found in very large numbers on young suckers.

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* Bulletin No. 30, Council of Scientific and Industrial Research, Melbourne, p. 45.

Nematodes (or Eel Worms).

The presence of these minute parasites is manifested in gall-like swellings on both the main roots and lateral branches. If a thin slice is taken off the surface at these points, either black spots, representing the worm cysts, or tiny glassy flask-shaped bodies may be seen often in considerable numbers; the latter are the mature females which develop into sacs of eggs, whereas the males and larvæ are minute thread-like forms. The tissue comprised by these swellings ultimately dies and decays, and by this means the eggs and young worms gain access to the soil.

Infestation of nematode-free stock is brought about by the tiny parasites present in the soil gaining entrance into the tender superficial layers of the roots. The parasites can be readily distributed by any means which will transport soil from one place to another, or by the introduction of infested plants.

On account of the action of these minute worms the normal structure of affected roots is very markedly altered around the sites of infestation, as a result of which the absorption of water and mineral salts by the roots is very seriously impaired. As a general rule the roots of banana plants are not subject to such severe attack by nematodes as are some other economic crops, although a number of instances have been observed where the root systems of banana plants were practically destroyed; the soil in these cases was of a light loose loamy nature.

The rapidity of the destruction of infested roots is influenced very considerably by soil conditions favouring or facilitating decay of damaged tissues.

Nematode infestation is met with generally throughout the banana-growing areas of the State, and is most marked on the roots lying close to the surface of the soil, those lying deeper being but slightly affected, if at all.

PAYABLE SIDE CROPS FOR THE NORTHERN BANANA GROWER.

On practically every banana farm there is some land which cannot profitably be planted with bananas. As a rule these small plots are treated as waste land and have to be kept clean simply to prevent forming a breeding growth for weeds and pests in the plantation. This necessitates a certain amount of unprofitable work. These plots could, however, in the majority of cases, be made to pay for the time expended on them by planting with one of the following crops.

Where the land is broken, such as in a blind gully, saplings could be thrown across from bank to bank and passion fruit or granadillas trained on them. Passion fruit can also be grown on dividing fences. These fruits are harvested early in the North, and consequently realise good prices.

The papaw is a fruit which should also receive more attention from the banana-grower. It is grown very easily, and thrives in almost any situation, and there is a fairly good local market for the fruit.

Pineapples thrive well on well-drained land, and will be found a profitable crop with which to fill up a ridge unsuitable for bananas. This crop is also early ripening in the North, and falls on a bare market.

All the abovementioned fruits are fairly quick-growing and will be in full bearing inside two years, small crops being probably obtained in the first twelve months. Beyond keeping reasonably clean they will not require the expenditure of much additional time, and therefore will not lead to neglect of the bananas.—S. E. STEPHENS, Inspector Diseases in Plants.

HOME-MADE CHEESE.

METHOD OF MANUFACTURE.

By C. F. McGRATH, Supervisor of Dairying.

Take, say, 10 gallons of milk, which should not be sour, but should have developed sufficient sourness or lactic acid necessary to be present in milk intended for conversion into cheese. Milk drawn from the cow at the evening and kept overnight, when mixed with equal quantities of morning's milk (freshly milked), and providing the evening's milk has not gone sour, generally meets the requirements. The evening's milk should be stirred and cooled after milking, and be kept in well-scalded vessels in a cool, clean atmosphere. This milk should be put into a clean tinned vessel about 2 feet long by 1 foot wide by 1 foot deep, which should stand in another vessel 2 feet 6 inches by 1 foot 6 inches by 1 foot 3 inches deep, and should rest on three pieces of wood laid on the bottom of the larger vessel, which will bring the top edge of inside vessel a little higher than the outside one. Hot water is then poured in the outside vessel, and the milk in the inside vessel should be stirred with a wooden pat till it reaches a temperature of 86 degrees Fahr. Should the water used at this period be of sufficient warmth to further heat the milk it should be drawn off by a water cock inserted in the bottom of the outside vessel; this water can be put back into the heating boiler if desired. When the milk is 86 degrees Fahr. add about fifteen drops of cheese colour and stir thoroughly; then add about ½ oz. of rennet, and stir for two minutes; then cover with a cloth (a piece of calico answers), and let the milk rest until coagulated and of such firmness that, when you insert the finger into it and raise the finger to the surface bent forward, the junket will make a clean break in front of the finger. This stage usually takes from twenty-five to fifty minutes from the time of adding the rennet, according to the sourness of the milk and the strength of the rennet.

Careful Attention Necessary.

This stage of the process requires careful attention. When the junket reaches the condition above described it should be cut into cubes about ½ inch square. For this purpose a vertical and a horizontal curd knife are used. The curd is first cut lengthwise with the horizontal knife, then crosswise and lengthwise with the vertical knife. The curd is then stirred for a minute with the hands or a pat; then more hot water is run into the outside jacket, and the curds and whey brought up to a temperature of 100 degrees Fahr. This should take twenty to thirty minutes. By this time the curd should become firm to the touch. A small piece of the curd (about the size of a walnut) should be taken and squeezed dry in the hand, and placed on an iron which has been heated to almost redhot. The curd should be firmly placed on the iron on a part that is just hot enough to hold the curd but not burn it; then draw the curd gently away from the iron. If sufficient acid is developed it will be noticed that small threads about ¼ inch long adhere to the iron. If the cord has not developed an adequate amount of acidity these threads will break away, or, if very sweet, the curd will not show any threads at all. In the latter cases the curd must be kept at the above temperature or not allowed to fall below 98 degrees Fahr. until it shows thickly populated threads ¼ inch to ½ inch long on the hot iron. When this is accomplished the whey should be drawn from the curd. This can be done by shifting the curd to one end of the vessel and dipping the whey out at the other. The end of the vessel should then be raised to allow the whey to drain away from the curd.

Draining off the Whey.

After the whey is drawn off the curd will readily become mattered. It should then be cut into blocks about the size of bricks and turned over; the turning should be repeated about every fifteen minutes to allow the whey to drain off. In the course of about forty minutes the hot iron test is again brought into requisition, and a piece of curd applied as before, and when the curd shows fine threads about 1 inch long the correct acidity for cheese purposes has been attained. This usually takes from about an hour to an hour and a-half after drawing off the whey. The curd is next cut into pieces about the size of broad beans. There is a mill for this purpose, but a small quantity of curd can be cut with an ordinary butcher's knife. This completed, the curd is stirred with the hands just sufficient to separate any pieces that may have united. Stir and keep from matting for about thirty minutes. Then add 4 oz. of fine salt (or at that rate) and mix thoroughly.

Hooping and Pressing.

In seven to ten minutes the curd is now ready for hooping and pressing into cheese. For this amount of curd two 5-lb. 7-inch cheese hoops and one half-dozen yards of 7-inch binder are required. The half-dozen yards of binder are sufficient for 100 cheese of the weight above mentioned. After the curd is put into the hoops it should be pressed for twenty to twenty-four hours under a ton pressure. If the milk is too sweet at the outset it takes a long time to get the required acid (hot iron test), or if too sour the acid is developed too rapidly, and the cheese will be sour and probably leak on the shelves. Try to strike the medium. A nice time for completion of the process is about four to five hours from the time the rennet is added to the milk until the curd is in the hoops, preparatory to the application of pressure. In connection with the manufacture of cheese from separated milk for home use, it will be found to be of advantage to the product if about one-third of whole milk be added to the separated milk.

PRIMARY EDUCATION IN QUEENSLAND.

A COMPREHENSIVE CO-ORDINATED SYSTEM.

COUNTRY CHILDREN SHARE EQUALLY IN EDUCATIONAL OPPORTUNITY.

The system of education in Queensland is fairly claimed to be comprehensive, elastic, and adapted to every community need. In recent years, schooling facilities for country children have been greatly amplified. Primary instruction is given to children living even in the remotest corners of the State; travelling domestic science and manual training schools operate in thinly peopled districts, and in the towns and cities facilities for primary, secondary, vocational, and technical education are generously provided. In 1916 the expenditure on education was £634,000. Last year the appropriation amounted to £1,673,000. The aim of the Queensland Government is to widen the scope of educational opportunity in every possible direction, and this is being done particularly in respect to the establishment of rural schools and vocational classes in inland centres.

Rural Schools.

Special attention to the adaptation of country schools to the needs of a country population led to the establishment of Rural Schools, the first of which was opened at Nambour in 1917. Since then Rural Schools have been established at Boonah, Home Hill, Clifton, Gordonvale, Murgon, Gayndah, Imbil, Beenleigh, and Stanthorpe. Children in the higher classes enter upon the study of elementary agricultural science and the practice of agricultural operations. They are employed in learning manual arts likely to be useful to them as farmers, dairymen, fruitgrowers, &c.—arts such as carpentry, leatherwork, metal working (including plumbing), and fruit packing. Girls are instructed in domestic arts and science—cookery, laundry-work, dressmaking and millinery, fruit preserving, &c. Both boys and girls learn how to keep household accounts and gain a knowledge of such ordinary commercial transactions as they may be called upon to execute in their future vocations.

Home Projects Scheme.

An organised attempt has been made in connection with the "Home Projects" scheme to establish clubs in a number of schools. Up to the present, says the Annual Report of the Department of Public Instruction, attention has been confined mainly to dairy-farming districts, and it is expected that by July, 1927, club work will be in operation in over fifty schools. The clubs already established are chiefly pig clubs, and, in conjunction with them, agricultural clubs. In 1927 it is expected that poultry club work will be greatly extended. Show societies, as a rule, are quite willing to provide classes for entries for club work and to allocate a sum of money for prizes. When a school club day is held arrangements are made to have pens constructed on the school grounds to accommodate the pigs for one day. School committees and parents are generally found to be willing to undertake the work of erecting the pens.

The following fine set of plates, which we are able to reproduce through the courtesy of the Department of Public Instruction, give some idea of the extent and value of the effort to extend educational services to every town and hamlet and to the remotest settler's home.

PLATE 11.—A TECHNICAL SCHOOL ON WHEELS—QUEENSLAND'S ENTERPRISING EDUCATION SERVICE.
Cars in position at Railway Siding—Pupils in attendance, Herberton, North Queensland.

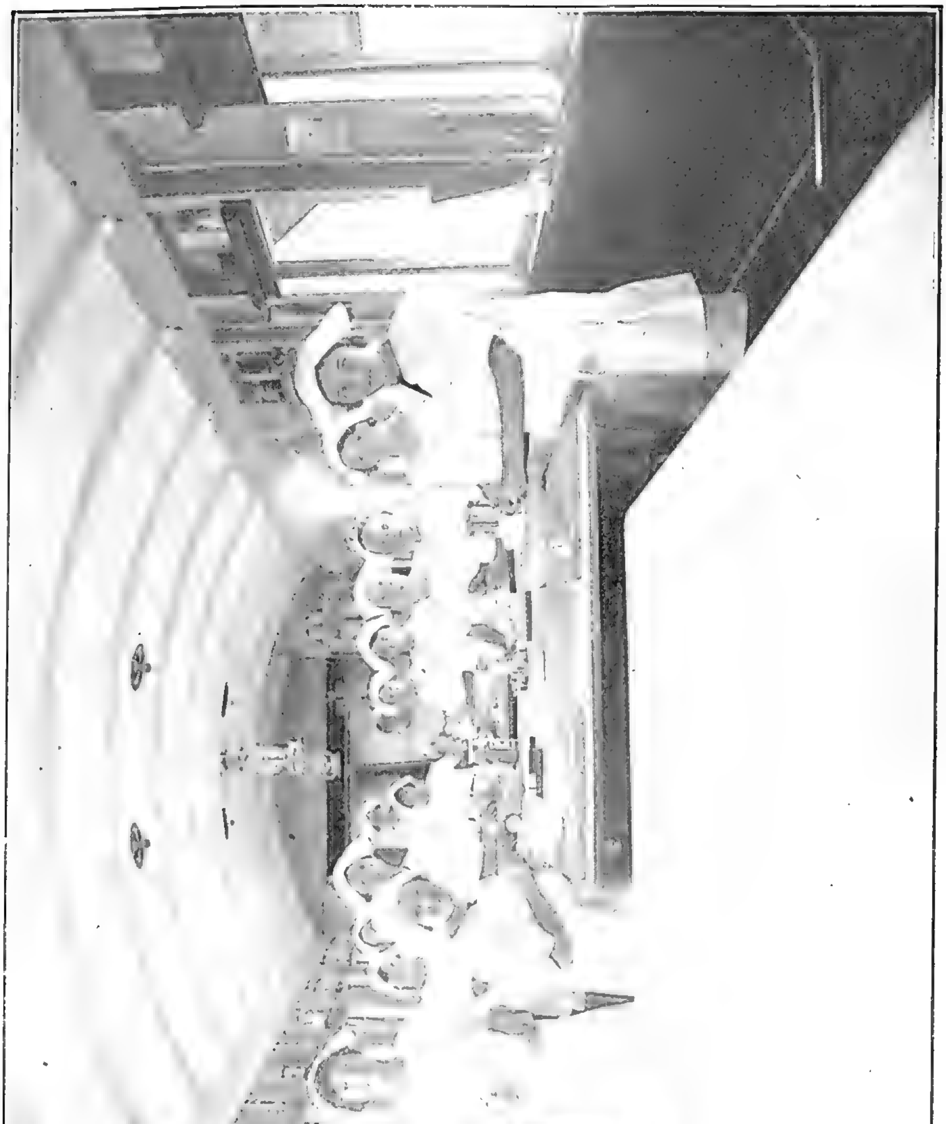

PLATE 12.—TRAVELLING DOMESTIC SCIENCE SCHOOL—A COOKERY CLASS.

PLATE 13.—BRINGING THE TECHNICAL SCHOOL TO THE FARM. TRAVELLING MANUAL TRAINING SCHOOL—A LEATHER-WORK CLASS.
An example of the comprehensiveness of Queensland's Educational Service.

PLATE 14.—READY FOR HOME—STONE SCHOOL, NEAR INGHAM, NORTH QUEENSLAND.

This is an every-day, informal, mounted parade at many Country Schools in Queensland. The Schools are well staffed and equipped, and where conditions are favourable School Gardens are established. Tennis Courts and Basket Ball Areas are a common feature in School Ground lay-out, and in larger centres, where practicable, spacious Swimming Pools are provided, and every youngster is encouraged to learn to swim.

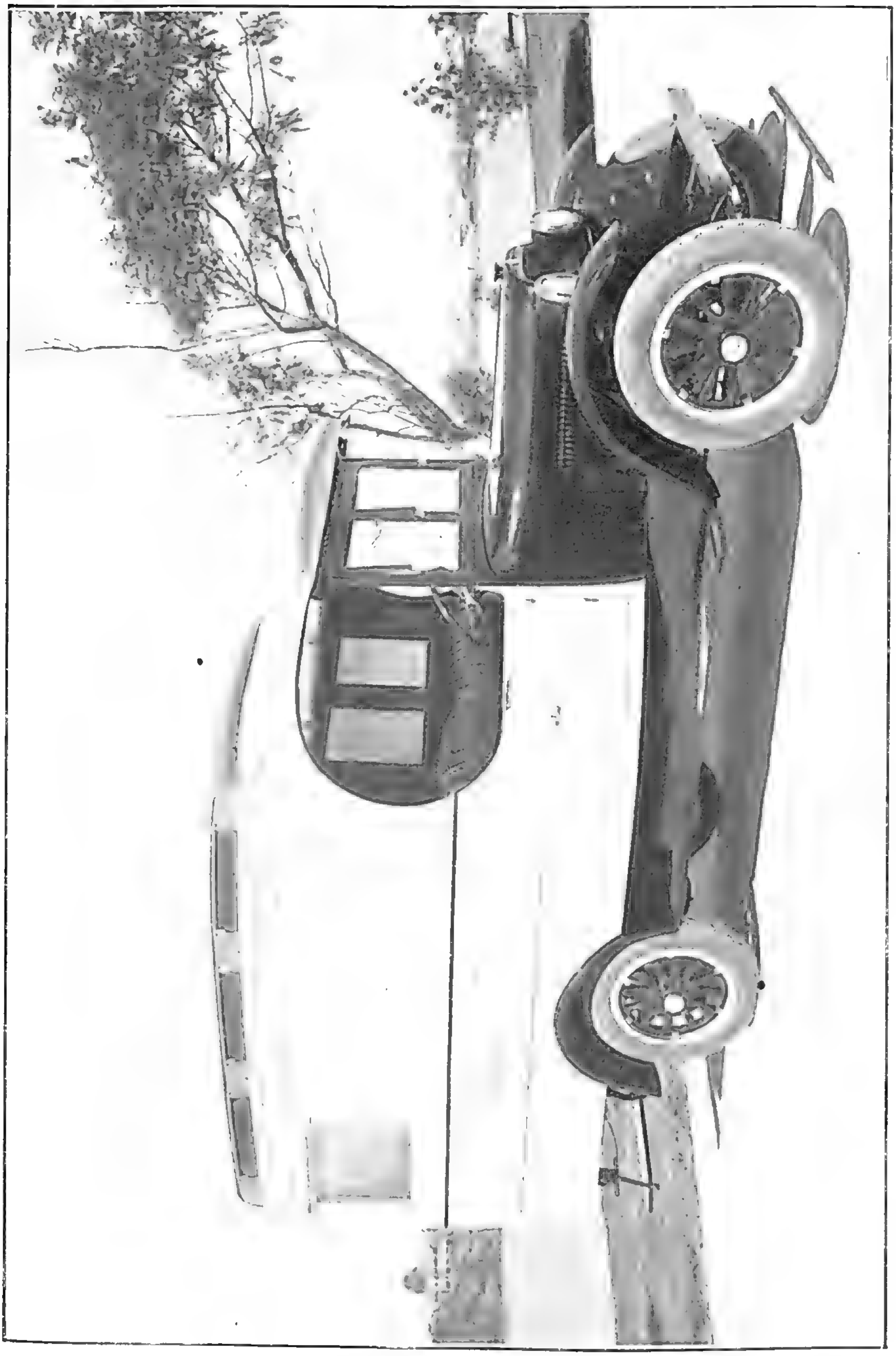

PLATE 15.—READY FOR THE ROAD. SPECIAL PANEL BODY, EQUIPPED AS DENTAL SURGERY.
Department of Public Instruction, Queensland.

PLATE 16.—INTERIOR, DENTAL TRUCK.
In use in Queensland's back country by the Department of Public Instruction.

EYE WORM OF POULTRY.*

Subjoined are presented, for the benefit of Northern poultry raisers and others interested, notes on original research work carried out by Mr. J. W. Fielding, of the Australian Institute of Tropical Medicine, Townsville, and which are reprinted from "The Australian Journal of Experimental Biology and Medical Science," in which they first appeared as a "Preliminary Note on the Transmission of Eye Worm of Australian Poultry."

Poultry raisers in districts other than the coastal belt north of Rockhampton who have experienced trouble with the Eye Worm would assist the Department by notifying its occurrence.—Editor.

In our observations, which have been carried out over a number of years, worms have been recovered alive in the mouth, œsophagus, and crop; and the eggs in the mouth, œsophagus, crop, along the alimentary tract, and in the droppings. These eggs hatched after varying periods from twenty-four hours upwards. The adults have been kept alive in various solutions for a number of days under laboratory conditions. Drinking water has been examined systematically after being centrifugalised, with negative results. The blood was examined on numerous occasions, but found to be negative in all cases for larvæ. The eye fluid was also examined for the presence of eggs or larvæ, with negative results. The pus-like material which is found in the eyes of infected birds was examined, and it was found that there are two kinds of matter: Firstly, a hard mass of old-standing material, and, secondly, a fresher and softer material, both of which, in our opinion, are the result of decomposition of the worms themselves. When a heavy infection takes place it is usually associated with catarrhal conditions, which block the passages; in consequence there is no outlet for the worms, which are in great numbers, and they eventually die and decompose. In the hard or old-standing material no eggs were seen in numerous examinations, but in the fresher and softer pus eggs were frequently recovered.

Examinations of the shady portions of the infected yard, where the fowls are in the habit of gathering together, revealed the fact that the ground was invariably riddled with filariform larvæ, and showed a tremendous increase in the positive findings of nematode larvæ over other portions of the yard. Concentrating on the possibility of the parasites being mechanically transmitted by flies, a number of bottle fly traps, containing various solutions, were set. These solutions were taken to the laboratory for examination. They were centrifugalised, and the sediment examined with a $\frac{1}{6}$-in. objective. This was done daily for six weeks, but only a single nematode larva was seen, which was obviously not the worm under consideration.

An examination of a number of chickens and young ducks was carried out, and showed the presence of eye worms, in the case of the chickens after the age of ten days had been attained, and in the case of ducks fourteen to twenty-one days. This suggested placing a number of older birds, which had been given a course of treatment and kept under observation for three weeks and found negative,† in a special pen in an infected yard, with no precautions. After six weeks they were examined, and 83.3 per cent. were found to be heavily infected. In a somewhat similar experiment, but in this allowing the birds to mix with the other stock, and examining the eyes every three days, three birds were started; one was found to be infected after the expiration of twelve days, one after fifteen days, and the remaining one became infected after thirty-five days.

The preceding observations tending to show, as they did, that the parasites were fairly well developed when introduced into the fowl, suggested a new line of attack—viz., that the infection was insect-borne, and an attack was made on the insect population of poultry yards.

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* "Preliminary Note on the Transmission of the Eye Worm of Australian Poultry," by J. W. Fielding, of the Australian Institute of Tropical Medicine, Townsville, reprinted from "The Australian Journal of Experimental Biology and Medical Science," Vol. III. (1926).

† This treatment was given irrespective of whether the birds were infected or uninfected before proceeding with an experiment, on account of the fact that almost all yards were more or less infected.

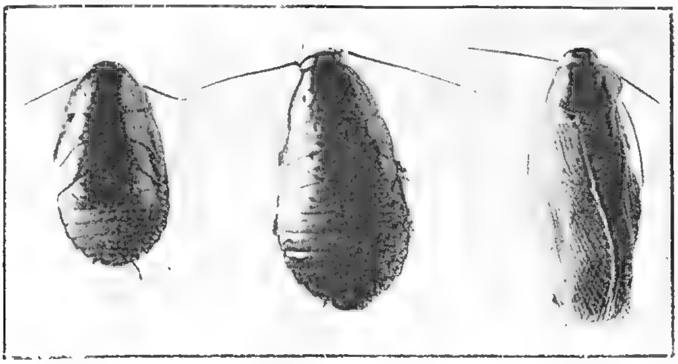


Fig. 1. × 1·7.

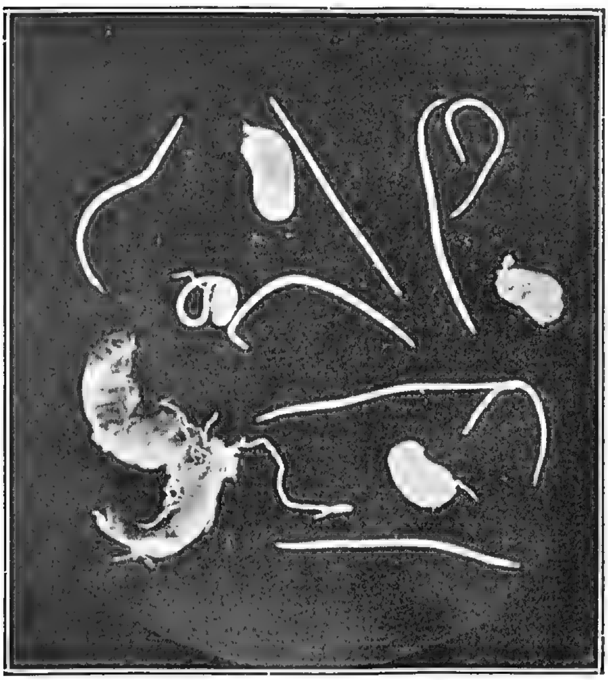


Fig. 2. × 3·8.

Photos.: F. H. Taylor.

PLATE 17.

Fig. 1.—Showing adult male and miniature females of cockroach, *Leucophaea surinamensis*, Linn.

Fig. 2.—Showing worms, cysts, and portion of gut with cysts attached, taken from *Leucophaea surinamensis*.

The first to receive attention was the fowl tick, *Argas persicus*, but a long series of dissections and examinations proved negative; fowl lice, *Menopon* sp., gave the same results; the flies, *Sarcophaga* sp., *Musca domestica*, *Stomoxys calcitrans*, and a small unidentified fly also proved negative, as also did a large series of examinations of mites, *Dermanyssus gallinæ*, and a number of crickets, *Nemobius* sp. Attention was then directed to the cockroaches, *Periplaneta australasiæ* Fab. and *P. americana* Linn., and a number of adults and young forms gave negative results. But on concentrating on another species of roach, *Leucophæa surinamensis* Linn., we were immediately struck by the presence in the body cavity, in the nymphal and adult stages, of filariform worms, which appeared macroscopically and microscopically to be immature stages of the eye worm.

There were also usually associated with these worms numerous capsules containing larvæ. These capsules varied in size as the development of the larvæ proceeded in them, sometimes attaining 3 by 1.5 mm., of four measured accurately the measurements being 2.7 by 1.3 mm., 2.3 by 1.4 mm., 2.2 by 1.3 mm., and 1.8 by 1.1 mm.

On examining a long series of cockroaches, dividing them into three batches, the percentage of infection was as follows:—

(*a*) Young and very young forms, no infection present.
(*b*) Intermediate forms showed an infection rate of 38 per cent.
(*c*) Adult forms, an infection rate of 93 per cent.

This gave a percentage infection rate of the total examined of 56 per cent. The number of worms obtained from each cockroach averaged twenty-one. In numerous individuals the total number recovered was small—viz., two and three, but in one case a total of 108 worms and capsules were obtained, and in others similar high numbers were observed.

An examination of a number of cockroaches was carried out, with a view to obtaining information regarding the length of time the worms could live after the death of the insect. Some of the roaches were just on the point of dying; others had been dead for varying periods up to a maximum time of sixty-four hours, The examination showed that the activity of the worms was just as great in the roaches which had been dead the maximum time, even though in these cases decomposition was in an advanced stage. Further work is proceeding on these lines. Arrangements were then made to carry out experiments to prove whether the worms so obtained were eye worms. Young birds were obtained from an uninfected yard, and were kept under observation for some days prior to experiment. The young ducks were hatched in the ordinary way, but the young chicks were incubator bred.

Experiment 1.—One duckling, about a week old, was fed with four cockroaches in the nymphal stage; it was examined seventeen hours later, and found to be infected with eye worms.

Experiment 2.—Four ducklings from the same batch as (*a*) were fed with three cockroaches, each in the nymphal stage, by pushing them whole down the throat, and when examined seventeen hours later were all found to be infected.

Experiment 3.—One duckling was given seven worms, extracted from infected roaches, the worms being placed on the tongue with a camel hair brush. On examination seventeen hours later it was found to have worms in both eyes. Control ducks were kept, and remained negative during the time the birds were under observation.

Experiment 4.—One duck, seventeen days old, was given cockroach entrails with capsules attached (one worm was just emerging), the whole being placed in the mouth at 12.46 p.m.; when examined at 12.58 p.m., twelve minutes after introduction, worms were found in both eyes. Control negative.

Experiment 5.—One duck, seventeen days old, was given five worms, taken from cockroaches; thirteen minutes after introduction into the mouth they were found in the eyes. Control negative.

Experiment 6.—One duck, seventeen days old, was given ten cockroaches which had been etherised. It was examined ten and twenty minutes afterwards. There being no sign of eye worms, a further five roaches were introduced, and the examination carried out at five-minute intervals. At the expiration of fifty-five minutes worms were found in both eyes. No control kept.

Experiment 7.—Eight young chickens, nine days old, were each given four whole cockroaches in the nymphal stage; a few extra roaches were then scattered in the box, and were picked up by the chickens. Two and a-half to three hours afterwards the chicks were all infected. Controls negative.

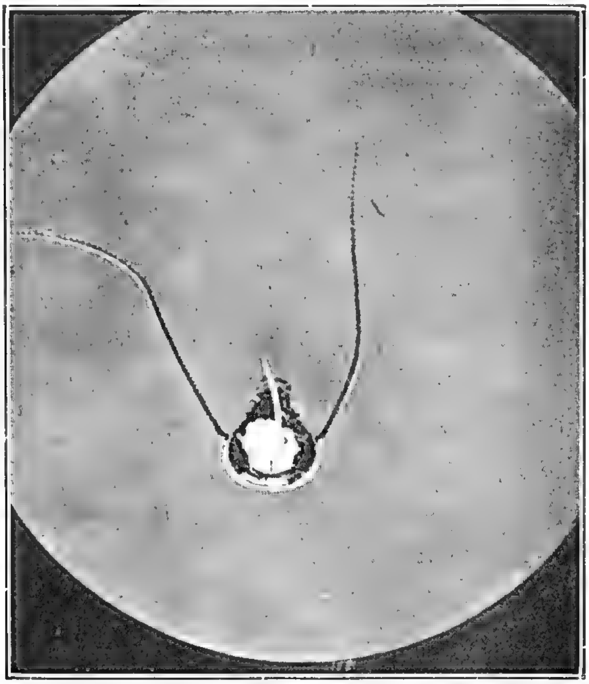


Fig. 3. × 3·8.

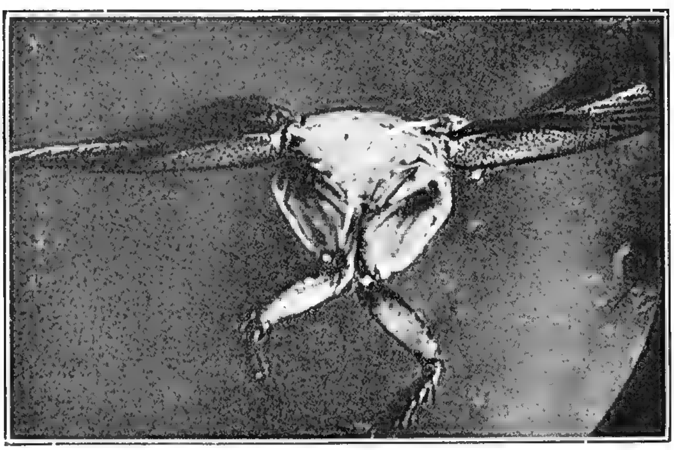


Fig. 4. × 3·8.

Photos.: F. H. Taylor.]

PLATE 18.

Fig. 3.—Showing head of *Leucophaea surinamensis* with worm protruding.

Fig. 4.—Showing third pair of legs and portion of body of *Leucophaea surinamensis*, with two worms protruding.

Experiment 8.—Three young chicks, ten days old, were given one adult cockroach each, between 3.35 and 3.40 p.m. They were then constantly examined for the presence of worms in the eyes; this occurred at 3.58—i.e., eighteen to twenty-three minutes after the introduction of the cockroaches. Care was exercised in introducing the insects to the birds, so as to ensure that the former should not be ruptured during the process. Control negative.

Experiment 9.—One chick, eleven days old, was given three adult cockroaches, care being taken not to rupture them. The chicks were then kept under constant observation, and in exactly seventeen minutes after the feeding worms were noted in the eyes. No control was kept.

Experiment 10.—One adult muscovy duck, which was examined thoroughly for the presence of eye worms, and found to be negative, was then given eight cockroaches, taking care not to rupture them. The mouth and eyes were then kept under constant observation, and exactly eight minutes after the introduction worms were seen on the roof of the mouth and on the tongue, nine worms in these positions being counted. After this the eyes were watched constantly, but worms did not appear until thirty-one minutes from the start—i.e., twenty-three minutes after their presence in the mouth. It was interesting to note that worms were seen on five occasions passing into the eyes from the naso-lachrymal duct. No control was kept.

It was thought advisable, in view of the theory that the cockroaches do not go beyond the crop before the worms are liberated, and considering the short space of time occupied between the introduction of the cockroaches and the appearance of the worms in the eyes of the bird, to note the fate and position of the cockroaches in an allotted time. For this purpose four young chicks were killed at varying intervals—viz., five, ten, fifteen, and thirty minutes—after the introduction of the insects.

Experiment 11.—A chick, sixteen days old, was given one adult cockroach, and after an interval of five minutes was killed, the insect being found at the entrance of the crop, on the top of the contained foodstuff. On examination of the roach there was no apparent change noted. No free worms were observed.

Experiment 12.—A chick, sixteen days old, was given one adult cockroach, and after an interval of ten minutes was killed. Except that the cockroach was in the middle of the foodstuff, no difference was observed. No free worms were seen.

Experiment 13.—A chick, sixteen days old, was given one adult cockroach, and after fifteen minutes was killed, the roach being found at the entrance to the crop, on top of the foodstuff. The skin of the insect was observed to be in a fairly soft condition, and a worm was seen just emerging from the soft part of the under-surface of the body, between the third and fourth leg. No free worms were seen before dissection.

Experiment 14.—A chick, sixteen days old, was given two adult cockroaches, and after thirty minutes the chick was killed; the roaches were on top of the foodstuff, at the entrance of the crop, and were found to be very soft, and easily broken at the slightest touch with the dissecting needles. No worms were noted until the cockroaches were dissected, when a fair number were found.

It would appear, although only one escaping or escaped worm was seen in the preceding series of experiments, that the cockroaches do not pass beyond the crop within the limits of the time necessary for an infection to take place, and that the digestive juices are responsible for the softening of the tissues, and probably the increased temperature has a stimulating effect on the worms, which break through the softer portions of the body. This probably applies only in cases where the roaches were swallowed intact, which would occur only in a small percentage of cases, as it is very noticeable that the birds peck at the insect, and by so doing rupture most of them, thus making an easy exit for the escape of the worms.

From the foregoing experiments there appears to be indisputable evidence that the cockroach, *Leucophæa surinamensis* Linn., is a responsible agent for the transmission of the eye worms of fowls and ducks. The cockroaches apparently ingest the young larvæ from the droppings and from the ground. Having attained their objective, the larvæ then pass through the wall of the alimentary tract, on the outside of which they encapsulate. In the capsules development takes place, and on attaining the stage of infectivity they leave the capsules and wander about in the body cavities. They have been recovered from both the thoracic and abdominal cavities, as well as the legs. The infected cockroaches are in their turn taken up by the poultry, and in our opinion do not pass further than the crop before the worms which have attained the infective stage escape from the intermediate host; the parasites then pass up the œsophagus to the mouth, and eventually through the naso-lachrymal duct to their destination. There now remains to examine in detail two stages in the life history of this parasite. It is anticipated that this will take some considerable time to complete, as in (*a*) it will be necessary to feed one or two fowls with large numbers of infected cockroaches, so that heavily infected birds may be available for ascertaining the life history of the worm in the fowl, particularly the number of ecdyses and changes that occur in the worms before they attain maturity and reproduction begins, and (*b*) to obtain information regarding the time taken by the larvæ to reach the infective stage after entering the cockroach.

It would appear that there are five distinct stages in the development of this parasite, quite apart from any changes which occur during each stage:—

(1) Embryonic stage, portion of which is spent in the parent worm, portion in the alimentary tract of the bird, and portion on the ground.

(2) Larval stage, portion of which is spent in the ground, and portion in the alimentary tract of the cockroach.

(3) Cystic stage, in capsules on the outside of the alimentary tract.

(4) Free or infective stage, in body cavities, legs, &c.

(5) Pre-adult and adult stage, in the eyes of the birds, where development is completed.

Treatment.

The first necessity in getting rid of eye worms, now that there is a known intermediate host, is obviously a concentrated attack on all cockroaches, and it would appear that the best method is trapping, since poisoning and fumigation are too dangerous to poultry. The yard should be cleaned of all droppings, and sprayed well with a good disinfectant frequently. The poultry should then be treated, preferably by placing a few drops of turpentine in the eyes, and allowing it to remain for half an hour, then irrigating with lukewarm water or boracic water, and removing worms from the eyes with a small camel hair brush. Although this treatment is undoubtedly severe, it has the advantage of being quick in action. Weak Condy's fluid is also recommended, but is much slower, and requires some days to obtain the required results. Some poultry-keepers use kerosene, and find that it gives good results.

RADIO LECTURES ON AGRICULTURE.

By arrangement with the departments concerned by the Director of the Queensland Government Radio Service (Mr. J. W. Robinson), through his Markets Reports Officer (Mr. Robt. Wight), forthcoming wireless lecturettes on agricultural and related subjects are listed as follows:—

Tuesday, 3rd January, 7.45 p.m.—"A Talk on Sheep and Wool," by Mr. J. Carew (Assistant Instructor in Sheep and Wool).

Wednesday, 4th January, 7.45 p.m.—A lecturette arranged by the Queensland Agricultural High School and College.

Monday, 9th January, 7.45 p.m.—"Care of Pigs in Summer"—Mr. E. J. Shelton (Instructor in Pig Raising).

Wednesday, 11th January, 7.45 p.m.—A lecturette arranged by the Queensland Agricultural High School and College.

Thursday, 12th January, 7.45 p.m.—"Progress of Agriculture in Queensland"—Mr. J. F. F. Reid (Editor of Publications).

RURAL ROUTES IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

The work of the Main Roads Commission as set out in its Sixth Annual Report was reviewed briefly in our last issue. Through the courtesy of the Commission we are able to present herein the balance of the plates with which the report was illustrated and which indicate the value of this phase of the widely-embracing rural policy of the Queensland Government.

PLATE 19.
LOW-LEVEL BRIDGE, STUART RIVER.

PLATE 20.
DOCK LOADING FROM SIDE-TIPPING TRUCKS—CONGLOMERATE QUARRY, MAIN SOUTH COAST ROAD.

PLATE 21.
ROLLING, WATERING, AND BROOMING, HARRISVILLE-ROSEVALE ROAD.

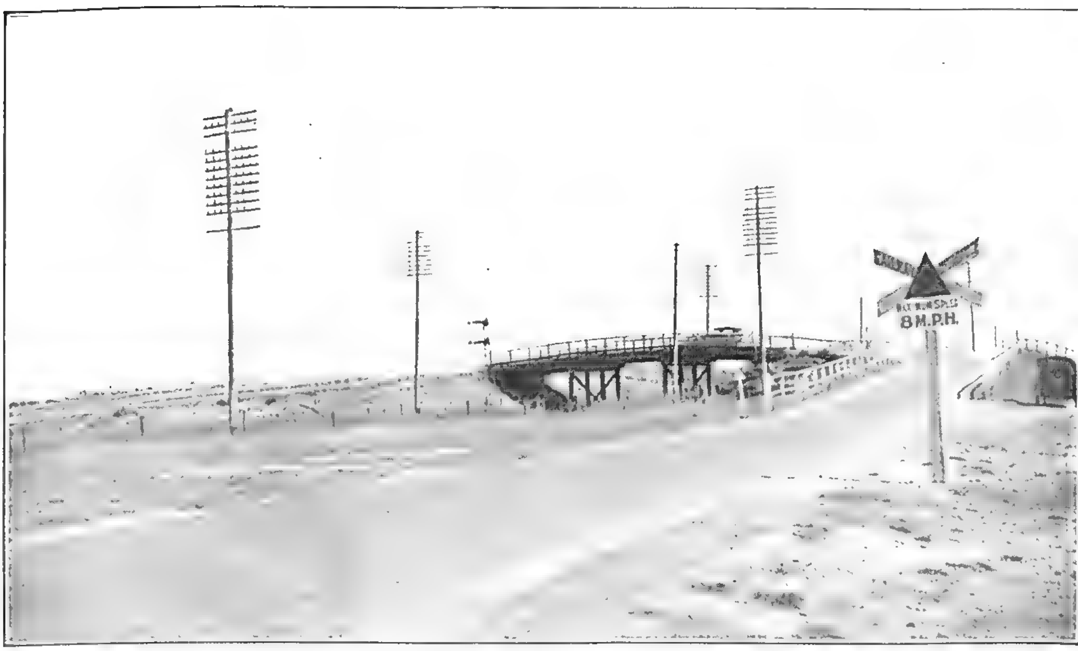


PLATE 22.
IPSWICH ROAD, REDBANK, AFTER CONSTRUCTION, SHOWING CONGLOMERATE ROAD SURFACED WITH BITUMEN. STANDARD WARNING SIGN DISPLAYED.

PLATE 23.
IPSWICH ROAD, REDBANK, BEFORE CONSTRUCTION.

PLATE 24.
GORDONVALE-LITTLE MULGRAVE. SECTION THROUGH JUNGLE.

PLATE 25.
REDCLIFFE ROAD. BEERBURRUM TRACHYTE SURFACED WITH BITUMEN, AFTER SEVERAL YEARS' WEAR.

PLATE 26.
DON RIVER BED, NEAR BOWEN. A LOW-LEVEL BRIDGE WILL BE ERECTED UP STREAM FROM THIS SITE.

PLATE 27.
CHARLEVILLE-ADAVALE ROAD. LOW-LEVEL CONCRETE BOX CULVERT, WARREGO ANA BRANCH.

PLATE 28.
REDECKING STONE RIVER BRIDGE. INGHAM-UPPER HERBERT ROAD.
This bridge is a dual-purpose tramway and road structure.

SELECTING THE BREEDING SOW.

POINTS TO BE OBSERVED.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

There is no more important job associated with the introduction of pig raising activities to the farm than that of knowing just what to do, where to go, what price to pay, and how to select the breeding stock. The points to be observed in the selection of the sow (as is also the case in selecting the boar) are the same, whether one sow or 100 sows are being selected; hence a general outline of the method of procedure and of the various points to be looked for will be of value. Mr. Shelton's notes on these matters are the outcome of a lifetime's experience and should be of particular interest to all those associated with the pig industry.—Ed.

In selecting the breeding sow, the essential points to be looked for are as follows:—

(1) Knowledge of her ancestry.
(2) Healthy and vigorous constitution.
(3) Easy feeding propensities.
(4) Capacity to produce and rear numerous progeny.
(5) Indications of milk production.
(6) Gentle, matronly, temperament.
(7) Evenness of type and conformation.
(8) Value of breeding sows.

(1) Hereditary Factor.

It is essential, first of all, to remember that no matter how good the boar may be nor how efficient the system of management, unless the breeding sow is capable of producing, suckling, and rearing satisfactory litters, the business of pig raising will be a failure. The author has heard breeders say of their sows that money could not buy those sows, this indicating the paramount value they placed on these animals.

Therefore, the first essential is to ascertain whether the sow it is proposed to purchase comes from parents that are of a prolific, easy feeding, quick maturing strain. As with the boar, it is not possible to determine these qualities by appearance alone. The only reliable guide to her inherited qualities is the pedigree with stud records, litter records, and fecundity records (if they are available), together with the assurance of the breeder and of his records.

(2) Strong Constitution.

The sow's constitution is important. By this is meant the innate bodily strength and the ability to withstand adverse conditions and disease. The vigour and health of the sow is dependent upon her constitution. This is indicated in particular by a full, broad, deep, capacious chest, good width between the ears and eyes, and the fineness of the skin and hair.

(3) Easy Feeding.

Easy-feeding sows are necessary for they are most apt to transmit that quality to their pigs. The more pounds in weight pigs can put on in a given time on a given amount of food, the greater the production and the less the cost. Successful breeding depends upon the production of more pounds of bacon and pork from the same feed.

(4) Capacity to Produce and Rear.

The capacity of the sow to produce and rear numerous progeny is also largely inherited. Certain it is that the capacity to produce small, weedy, and unsatisfactory litters will replace the more valuable characteristics unless special care and attention be given to their importance. Big coarse "beefy" sows of masculine appearance

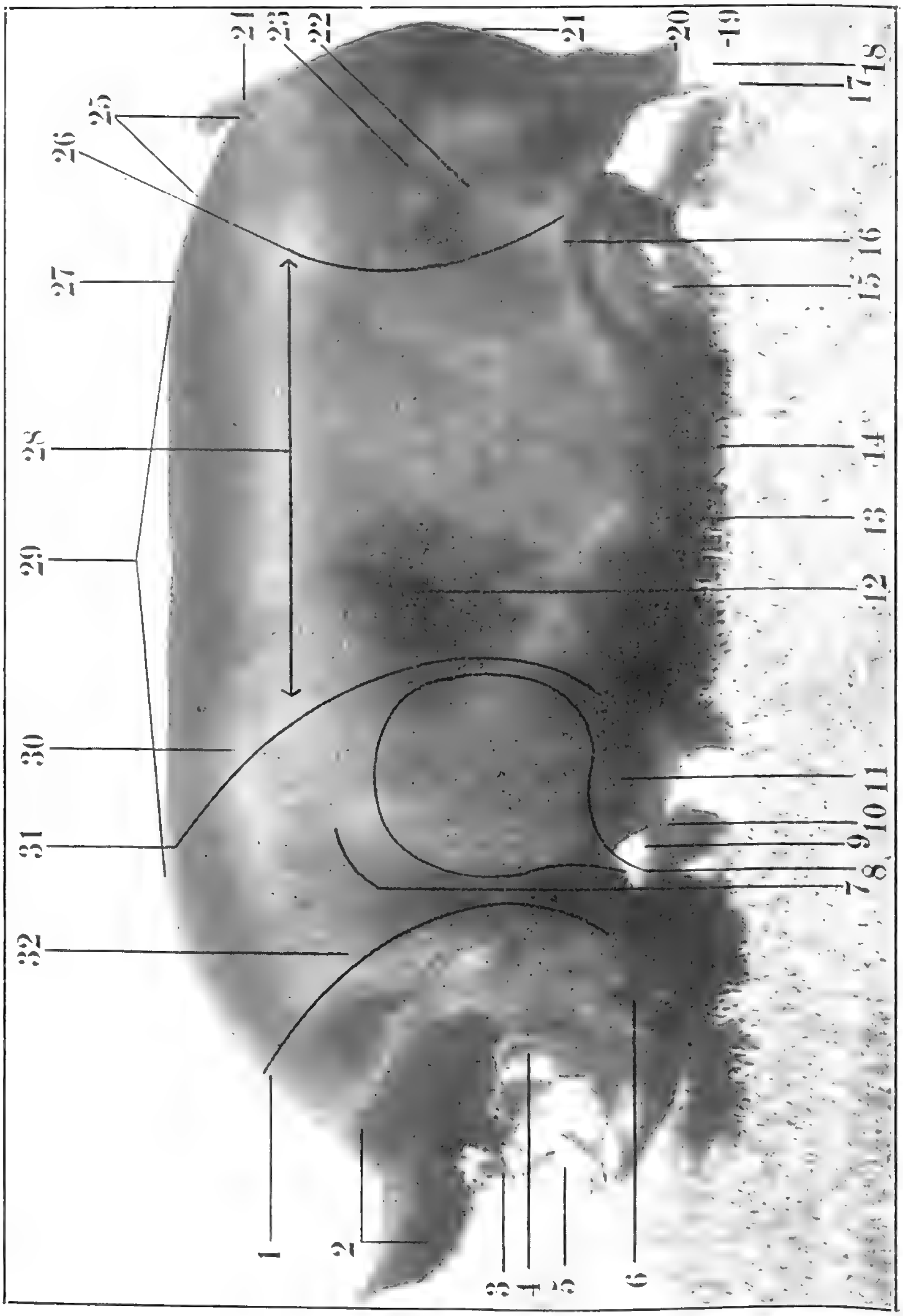


PLATE 29 (*Fig. 1*).—THE POINTS OF A PIG.

DESCRIPTION OF PLATE 29.

Principal Points of the Pig.

1. Head.	9. Chest.	17. Foot and Hoof.	25. Rump.
2. Ears.	10. Knee.	18. Pastern.	26. Hindquarter.
3. Eyes	11. Forearm.	19. Dewclaws.	27 Loin.
4. Face.	12. Side and Ribs.	20. Fetlock with Hock Joint close to the figure 21.	28. Middle Piece.
5. Nose or Snout.	13. Belly.	21. Site of Testicles in Males—At top of line above figure 21.	29. Back.
6. Cheek or Jowl.	14. Site of Sheath in Males.	22. Stifle.	30 Top of Shoulder.
7. Shoulder.	15. Teats.	23 Ham	31 Forequarter.
8. Shield or Shoulder in Males.	16. Flank.	24. Tail.	32 Neck.

and of a "don't care" type are decidedly objectionable. Effeminate, matronly (not necessarily "fussy"), good tempered, easy dispositioned mothers are the ones that earn the title "rent payers."

Sows need to be roomy, lengthy, and very deep in the body in order to be able to develop to advantage. Short tucked up, podgy sows are of little value.

(5) Heavy Milk Production.

The indications of heavy milk production are largely bound up in the appearance of the animal together with well developed and prominent udders and teats. These teats should number from twelve to fourteen and be evenly placed equidistant along the belly. Avoid sows with very small "buttons" and with blind, dummy teats and poorly developed udders.

Some strains and some animals are noted for heavy milk production, others are shy milkers and equally shy breeders. Much information can be obtained along these lines by a personal inspection of the herd from which sows are being selected.

(6) Even Temperament.

Never select a nervous, fidgety animal for she will make a poor mother and generally a poor suckler. In order to save more pigs at farrowing time, the sow must have an even temperament. She should be easy to handle and not become irritable when the attendant enters the pen.

Savage, vicious sows (sometimes erroneously referred to as "man eaters") are to be strictly avoided. Care should be taken to avoid classing a sow as a "man eater" if she is suddenly disturbed while sleeping with or suckling a new born litter, especially if disturbed by a stranger whose attention she is unaccustomed to. It is but natural for a sow to protect and care for her progeny (the boar usually sees to this too if he is about) especially while they are very young and unable to care for themselves to the extent that is possible as they grow older.

A good breeding sow is as careful with her babies as is a good matronly hen mothering fifteen to sixteen chicks. Many sows are of a coarse "don't want to breed" type that simply flop down on top of their young ones and smother them one by one till all but one or two of the strongest and most cunning ones remain. Other and better sows take the greatest care possible in rising or lying down in order to give their young ones a chance to escape being crushed. These matronly qualities are certainly inherited and transmittable.

Similarly, good breeding sows of the domesticated race of pigs appear to have enough common sense to know that their owners are watchful and careful and are not out to rob them of their suckers.

(7) Evenness of Type and Conformation.

The breeding sow should be fairly low set, of good length, good constitution, deep-bodied, strong in the back, broad and deep in the ham, and be symmetrical throughout. She should stand squarely on her feet and legs; her head should be refined, indicating quality, and representing the feminine type. A good breeding sow invariably has a neat feminine head.

The neck should be short, fitting smoothly into the shoulders, which should be broad, deep and smooth on top, well fleshed, but free from any sign of coarseness. The back should be long and straight, with no sign of weakness or falling away (sows that have a weak or hollow back rarely produce good pigs); it is an advantage to have the back slightly arched. The width of the back is also important, as this influences the width of the loin connecting the back to the hams in a strong arched fashion.

The sides should be long, deep, and smooth, and free from wrinkles; the top line and underline straight and even. The rump should be broad and well topped up; the tail set high and on a level with the back; the tail should be curled, as this is an indication of health and vigour. The rump should not fall away or droop. The hams should be wide, deep, and well fleshed down to the hock; the legs straight and strong, with good, strong bone. One very common fault is weakness of the knees and pasterns. The leg bones should be fine and close in texture, not round or porous; the feet comparatively small and not splayed.

One of the most important parts of the sow is her udder; this should not be coarse nor flabby. There should be twelve to fourteen or more teats evenly developed and of good size; the flanks should be thick and carry a good proportion of flesh, as the belly of a side of bacon is considerably increased in value if the flesh is thick and firm.

PLATE 30 (Fig. 2).—A BONNY LITTER JUST READY FOR WEANING.

A Prize-winning Litter at Sydney Show, exhibited by the owner, Mr. M. Marshall, Herdsman for Mr. Ralph Joyce, of Kyabram, Victoria. These pigs were sired by the champion boar, "Drayton's Chief," and were from that well-known prize-winning sow "Leona."

There is nothing wrong with the sow that is capable of rearing a litter like this. [Pigs of this quality are not difficult to handle. The sow herself is worth a good deal more than her actual market value to the breeder who is prepared to care for her properly.

The Teeth, Tongue, and Eyes.

In general, the breeding sows do not develop tusks to the same extent as the boar, though some sows have quite prominent teeth. Attention should be paid in the selection of breeding stock to note that their teeth are in order, though it is a difficult job at any time examining a pig's teeth. Occasionally one notices breeding sows (in particular) with long overshot top or lower jaws, and with the tongue permanently protruding either from the front or side of the mouth.

The writer considers these faults as very serious ones which are decided by hereditary tendencies, and faults that should on no account be overlooked either on the farm or in the show ring. Undershot crooked jaws, bad teeth, a crooked snout, or a snout with a decided hump are all to be avoided.

Similarly, roached or hollow-backed animals with "cow licks" or tufts of hair turned up or awry on the shoulder back or rump are to be avoided. It is wise also to pay special attention to an inspection of the eyes, for, strange as it may seem,

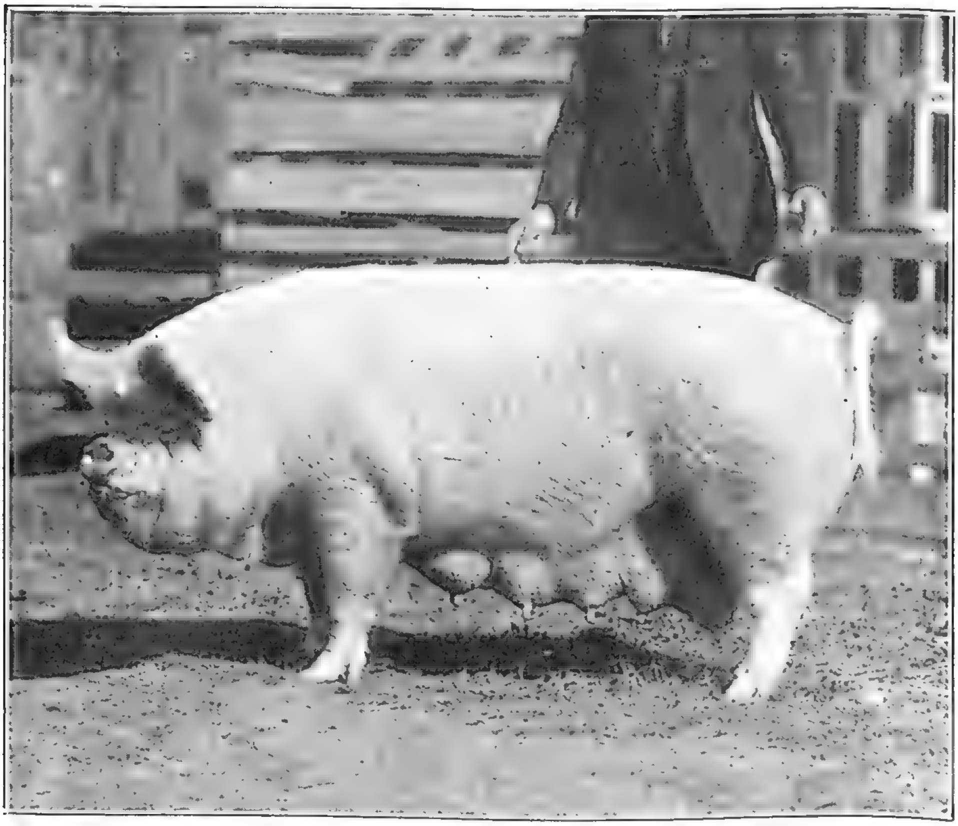


PLATE 31 (Fig. 3).—TYPICAL BREEDING SOW OF THE MIDDLE YORKSHIRE BREED. Mr. J. H. Thorburn's "Oatlands Enid" 2740.

A sow capable of rearing large, thrifty, early-maturing pigs. Note the wonderful development of udder and teats, indicating the capacity to produce large quantities of rich milk.

She was about two years old at time photograph was taken, and won the Reserve Championship at the Melbourne Show, Victoria.

some sows, particularly of the short, fat breeds are quite unable to see. In some cases, individual animals will be noted with no eyes visible at all. On more than one occasion the writer has culled breeding sows on account of blindness, and has been offered stock so affected.

Occasionally this defect develops with age in much the same way as weakness of the eyes does in humans. The matter is sufficiently important to warrant attention. On one occasion the writer was offered (by a very prominent breeder) a really choice boar pig suitable for show purposes, that on inspection turned out to be a barrow.

The vendor (manager of a large piggery) admitted he had always inspected by standing in the passage outside the pen while the pigs were being fed and admiring their broad, even, well-developed backs.

Sows might, of course, be non-breeders without exhibiting any external indication of this very serious defect, though to the experienced eye there is something in the appearance of an animal that acts as a fairly reliable guide, but not an infallible one in cases of this description.

Strength of legs is desirable in the sow as in the boar. It is equally essential to avoid selecting sows showing any indication of umbilical or other forms of hernia (rupture). Some Poland-China sows (in particular) show remarkably heavy development of loose skin in the "twist"—that portion of the hindquarter between and at the back of the legs. In some instances there is an appearance as of a scrotal sac, though this is not usually an indication of hernia or malformation.

8) Value of Breeding Sows.

It would be well for the beginner, especially if he or she does not know the value of breeding stock, to get in touch with some reliable, and as it were, disinterested person with a view to enlisting their assistance in these all-important matters. It is first of all necessary to value the animals to be selected in association with the environment under which they have been developed. The very fact that a stud sow or boar (none other than selected animals would be offered unless by special arrangement) was being selected from a stud like, say, Hawkesbury College, Gatton, Dookie, or Roseworthy Colleges, or from the studs of other breeders equally as well and favourably known, immediately indicates that it has a value a good deal

Plate 32 (Fig. 4.).—A Matronly Large Black Sow, two years old, Property of Master George Davison, of the North Arm Pig Club, Queensland.

As indicating the value of a selected sow of a type in demand, it might be mentioned that this sow was purchased at a cost, delivered to her owner in crate at North Arm, of approximately thirty guineas. She has since reared two litters, one of eleven and one of nine, her first two litters. Sales of her young pigs to date (December, 1927) at an average of six guineas each at four months old, for boars and sows, indicate that there is money in pigs. Three sows of the first litter were retained as breeders, and are now productive and profitable breeders. These were valued at fifteen guineas each as yearlings. Several pigs of the second litter are still available for sale. In round figures more than 100 guineas worth of stud pigs have been produced by this sow in less than two years from date of birth. Note her ideal quality and her depth and compactness.

above that of ordinary "meat" market stock. The reputation of the stud in this case is a guarantee of value, though, of course, unfortunately, no breeder can absolutely guarantee that any one or other of the animals offered or sold will turn out to the seller's or to the buyer's expectation. The health and well-being of an animal is dependent to a very considerable extent upon the health and well-being of other animals in the same stud, and in this way also added value is given to the animal selection from reliable healthy studs.

The breeding, pedigree records, &c., all add value, for it is but right that a specially selected, registered (or eligible for registration) animal should carry a higher value than common unregistered stock. Again stock that have been properly prepared for sale, have been well advertised, and are in the pink of condition at time of inspection, will command higher values than stock not properly prepared or from studs that do not bother about these things. A good wash and clean-up and bright glossy skin and hair are recognised the world over as additions to the toilet that add considerable value, and that in their own particular way are extremely important items, though one does not want to pay an excessive price for soap, water, and oil, unless the quality and guarantee of breeding are there.

Value is added to any article in accordance with the manner in which it is placed before the prospective buyer, and this refers to stock in just the same way as it refers to any other line of merchandise. There are, of course, the "go-getters" in the stock world, just as there are in the commercial world, but at any rate value is added to the animal that is correctly described and is placed before the prospective buyer to the best advantage possible. The pen, sty, yard, paddock or other enclosure in which an animal is confined whilst awaiting inspection, adds its quota of value or detracts from same. If the prospective buyer has to wade through mud and slush inches deep, and has to run the risk of being splattered with mud whilst inspecting the stock, his idea of their value will be on an entirely different plane to that which would be effective if the animal were offered in a clean, cosy, comfortable pen in an environment that indicated that the comfort of the buyer was pre-eminent in the mind of the seller. The purchase of breeding stock that have been awarded prominent and valuable prizes at agricultural shows, and that come from prize-winning strains, well-known, adds a value which is difficult to estimate in pounds, shillings, and pence.

The first pick of a litter or of a special line is, of course, always placed at a higher value than the second, third, or later selection; this is, of course, but natural and is quite in order in the business world. All things considered, then, it is somewhat difficult to indicate just the amount one might have to pay for any particular line of stock offered.

In general, however, it might be taken as a fairly reliable guide under Australian conditions that a good breeding sow is worth not less than three guineas at from two to three months old. This is a low value in the South, where the demand is more permanent, and where the value of stock is better appreciated. "Six guineas each," the Victorian breeder would be inclined to remark if asked the question referred to above, and much the same conditions rule in New South Wales. In the other States values of from three to five guineas each at two or three months rule. Boar pigs are usually considered more valuable than sows. Some studs—like Gatton College in Queensland—have a range of values allowing one guinea more per head for boars than for sows. It is all a matter of arrangement.

For ordinary breeding sows (not pedigreed) values must be based on the actual "meat" value of the animal. One cannot expect to purchase selected breeding sows at less than their market value. In fact, a seller is justified in asking a higher value for the pick of the stock available. In the case of ordinary breeding sows, therefore, values may be placed at from three guineas to, say, six guineas at from, say, four to eight months old with lower or higher values according to age. Ordinary breeding sows quoted as "in pig" should be worth ten guineas each upwards if they are of good quality and breeding.

Stud sows could be valued at not less than three guineas at two to three months old up to, say, twelve guineas or more as yearlings. Sows quoted as "in pig" are worth more than sows that have not been stinted (mated), though there can be no guarantee that a sow will hold to the service of the male, and no responsibility should be accepted by seller or buyer unless by special arrangement.

Especially selected show sows and prominent prize-winners would, of course, carry a higher value than the above. The same also applies in the case of the boar, and values of from fifteen to fifty guineas might be referred to as reliable where the quality and reputation of the animal justifies the payment of higher values.

In each case it is a matter of arrangement as to whether the price covers cost of delivery in crate on rail, steamer, or other conveyance, and as to whether crate is to

PLATE 33 (Fig. 5).—A THRIFTY, PROFITABLE SOW AND HER LITTER OF FOURTEEN.

Litter of Berkshire-Tamworth Pigs, fourteen in number, 8 weeks old, the property of Mr. George Stanfield, "Stanberry," Wondai, Queensland. The sire was a pedigreed Berkshire boar, purchased at Wyreema, and the dam a Gatton College Tamworth sow. She was a really good breeder, having a capacious body and a wonderful flow of milk. It is difficult to see the sow at all in this picture, so large and thrifty are her litter.

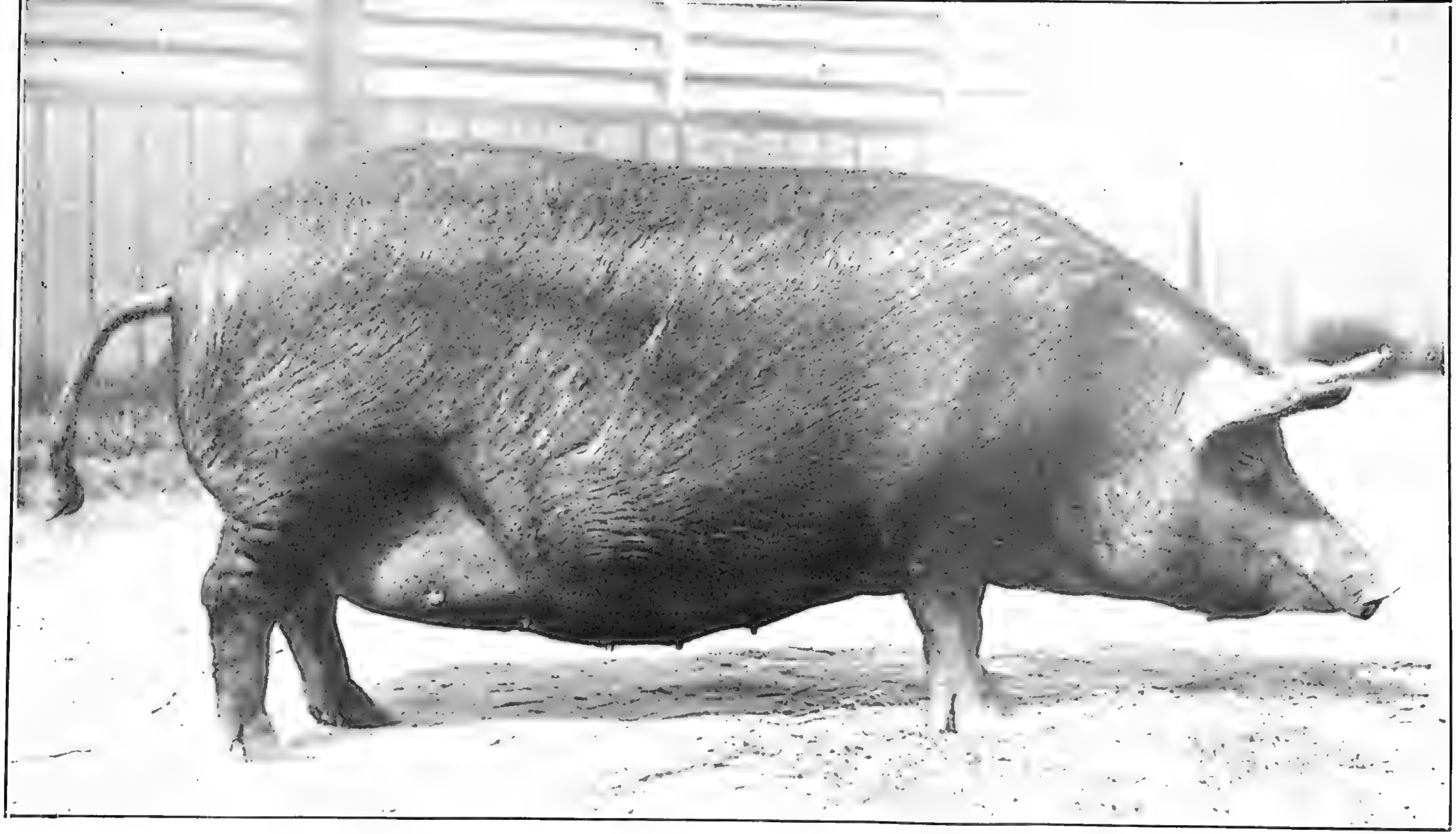


PLATE 34 (Fig. 6).—CHAMPION PRIZE-WINNING TAMWORTH SOW "MANNING ELNORA" (243).

This sow appeals as one of the most typical and up-to-date Tamworths yet exhibited at Australian Shows. This sow was also a prize-winner at Brisbane Royal National Show. Note her compactness, width, and depth of ham and side and the fine quality hair and skin. An ideal type of breeding sow. She reared many successful litters and is of a type much sought after. She was valued at more than thirty guineas at an early age and produced several hundreds of pounds' worth of stud stock.

be returned or be paid for. Crates in themselves are worth from twenty to thirty shillings or more each if well made and suited to the job. Rail freights and other expenses must be arranged for, and unless otherwise specified, it can be taken for granted that the buyer takes all risks once the animal is safely delivered at point of despatch.

A word in conclusion in regard to the condition of animals at the time of despatch. Nothing is more disgusting to the buyer than when the stock he has purchased arrive at their destination in a dirty, filthy condition, infested with hog lice or other parasites. The seller's reputation is at stake in all these matters; hence every effort should be put forward to ensure safe and satisfactory delivery.

It should be needless to add that in a country like Australia, where distances are great and where means of transport are often comparatively slow, ample notice should be given of the despatch of stock; and when the stock are despatched, especially stud stock, the breeder should see to it that all pedigrees, prize records, and other information are promptly supplied.

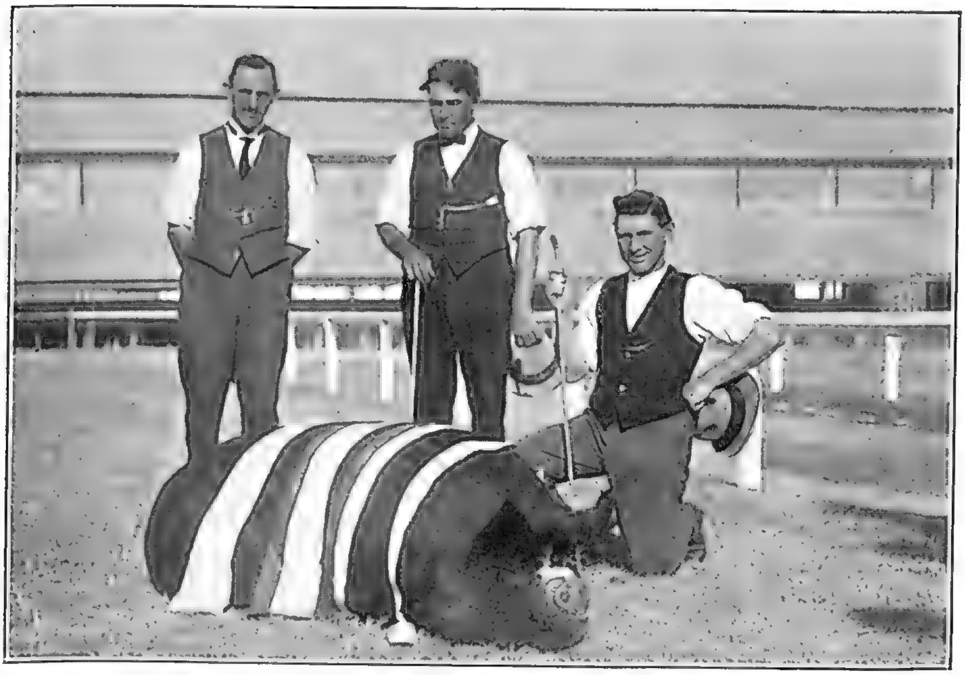


Plate 35 (Fig. 7).—The Champion of Champions.

A unique photograph of that famous Sow, "Brentwood Dorothy," now deceased. She realised at public auction at the Sydney Show Stud Pig Sales, six years ago, 130 guineas. This Sow was a profit-maker of the highest order, and was just as good as she looks. The purchasers, McPhee Brothers, of the Richmond River District (to the right of the picture), are shown in company with Mr. H. J. J. Honey, another enthusiast in Pig Breeding and in Stud Stock.

Flushing the Breeding Sow—An Old World Practice.

In perusing the pages of several of the older established text-books on "Animal Husbandry" one frequently comes across the term "flushing" as applied to "flushing the mare" or the ewe or the sow or cow or as the case may be, in each instance prior to the time the female is mated.

This "flushing" is not a common term in Australian live stock literature nor is it a regular practice on our farms, consequently an explanation of the term "flushing the sow" before mating will be of interest to readers of this Journal.

The term flushing simply means a general stimulation of the whole of the internal organisation of the animal, the object being to increase the number of pigs produced at farrowing time. The purpose is accomplished by increased feeding of grain or by the use of fresh or more succulent pastures than have previously been available.

The practice is understood and practised more by the sheep man than by the breeder of pigs or of most of the other classes of live stock; still it is a well recognised old time as well as modern practice. The sheep man follows it by turning the breeding ewes into a fresh succulent pasture just prior to "joining the rams," the time when the ewes are to be mated, the objective here being to secure a larger percentage of twins or a higher general average at lambing time.

There is no reason why the pig breeder should not adopt the same practice with his breeding sows, especially with sows that are advancing in age and that might otherwise produce rather unsatisfactory litters.

The most beneficial results are obtained when the flushing begins two or three weeks before the breeding season opens. Supposing that the sows have been running on pasture alone during the greater part of the "off" season; at the beginning of the breeding season or when the sows are about to be mated they should be turned into a fresh patch of rape, lucerne, or other green stuff that would furnish an abundance of the most succulent forage.

In the case of a single sow, the breeder might begin by feeding a slop composed of milk and barley or wheat or maize meal, &c., and give more than the usual supply of green food. The idea is to stimulate the whole system without putting on any great amount of fat. It is, of course, expected that the animals will begin to gain a little more rapidly in early spring or as the breeding season opens, and the majority of breeders will see to it that their stock put on flesh at this time, but it is important that the sows should be in medium breeding condition only and be gaining in weight and flesh at the time when they are mated. After the sow has been mated, continue the practice for a week or two before turning her out to pasture again.

All sows should, of course, be kept in good breeding condition during the gestation period, but there is no necessity that they should be "rolling" in fat.

THE JOURNAL IN NEW ZEALAND.

Thus a Dunedin reader (22nd September, 1927):—"Your Journal is very interesting and maintains a high standard of quality. The account of the Agricultural Exhibition or Show, as we call them, is splendid. . . . And here let me congratulate you on the quality of your photographs. . . . I am able to appreciate good work, and yours is very good indeed. . . . The statistics of your dairying industry rather surprise me. I had not realised how you were advancing in this direction. I intend sending the Journal to some farming friends in North Otago. . . . I know it will surprise them, too. There has been an impression here that your land was too warm for good dairy production. . . . It is good to see others doing things, especially the things we did not expect. . . ."

AN INFORMATIVE JOURNAL.

A Kingston reader writes (15th November, 1927):—"It gives me great pleasure to renew my subscription to the Journal, which contains a wealth of valuable information for the man on the land. I am very interested in the mechanical side of farming and welcome the extracts and illustrations that from time to time appear in the Journal. Labour-saving devices, repairs, house and mechanical design, and construction design, &c., play an integral part in modern farming, and progress can only be gauged by the most scientific, efficient, and up-to-date methods used in agriculture, and towards this end the 'Queensland Agricultural Journal' plays an important part."

FARM TRACTORS.

By E. T. BROWN.*

On the correct adjustment of the chains depends, in great measure, the easy, silent running of the machine as a whole. In addition, a well-adjusted chain will last considerably longer than one that is too tight or too slack, and, moreover, it is less severe on the sprocket wheels. The best results are obtained when there is a certain degree of play in the chains. The upper part of the chain should give a matter of 2 or 2½ inches when forced upwards. This, generally speaking, is correct for all chain-driving tractors. The adjustments can be made very easily. All that is necessary in the majority of makes is to shorten or lengthen the radius rod by means of its screwed end. It is important to see that both chains are working with the same amount of play, otherwise a severe strain may be put on the transmission.

Fuel Storage.

The introduction of steel barrels has rendered the storing of fuel a simple matter. The old-fashioned wooden casks were apt to leak, were difficult to tap, and have been known to burst with rough handling. The fuel can be kept in 40-gallon steel casks and no inconvenience is experienced. The bung is in the form of a screw tap, and, consequently a screwed tap can be fitted quickly and easily. The contents is unaffected by weather conditions and, therefore, the barrels can be carted right into the field where the work is being conducted. If they have to remain in the open for a considerable while no harm will come to them or their contents.

A Tractor's Capacity.

To calculate the capacity of a tractor in the case of ploughing, there are two factors that must be taken into consideration. These are the nature of the soil and the size and depth of the furrows to be turned. An average for medium soils is 6½-lb. pull per square inch. An ordinary furrow is 6 inches by 10 inches, which at 6½ lb. per square inch requires a pull of 390 lb. If a three-furrow plough is being used, the total pull necessary would be 1,170 lb. A pull of 1,500 lb. is developed by a ten-brake horse power tractor travelling at 2½ miles an hour, or 1,212 lb. is shown by the same machine travelling 3 miles an hour. Consequently it would be capable of drawing a three-furrow plough, turning a furrow 6 inches by 10 inches at 3 miles an hour, if the ground be level.

Starting Troubles.

Tractor engines are not particularly easy to start up, especially those of the larger size, but by priming and making use of the impulse starter or compressor, if either of these be fitted, and knowing how to swing the engine, it becomes more easy of accomplishment. The majority of tractors are fitted with dual tanks; one for petrol for starting up and the other for kerosene for use when the engine is working. The reason why the former is the better for starting up is that it is a lighter, more volatile liquid, and, consequently gives a more perfect combustible mixture when the engine is cold.

The ignition should always be fully retarded when starting up. When the spark is advanced the explosion takes place a fraction of a second before the piston reaches the top of its stroke, but owing to the fact that the explosion is not absolutely instantaneous the full force of the liberation of the power is not felt by the piston head until it is at the extremity of its upward stroke. When the engine is being turned over slowly by hand for the purpose of starting up it is necessary to retard the spark, otherwise the explosion would occur too soon, with the result that the force would tend to make the engine revolve in the opposite direction. Failure to pay attention to this point may easily result in grave injury being done to the operator.

Priming.

To ensure the cylinders receiving a charge of the explosive mixture it is usual to inject a little petrol into them. Compression taps on the cylinder heads are generally provided for this purpose. Only a small quantity of petrol should be used for priming, the object in view being defeated if a too liberal supply be injected. The amount of "swinging" or turning the starting handle that is required depends in great measure on the efficiency of the engine. An engine that is well tuned up, that is, with all parts properly adjusted, can always be started more easily. The crank shaft should, in the first place, be turned round slowly so that one cylinder

* In the "Farmer and Settler."

may become charged with compressed mixture, and then swung round as rapidly as possible. As soon as the engine has started to work the spark should be advanced.

It is necessary to allow the engine to become thoroughly warm before moving it. A certain amount of heat is essential before the power developed is sufficient to propel the vehicle. It is usually necessary to allow the engine to tick over for five or ten minutes. On no account, however, should it be allowed to race during this period—it is sufficient if it be throttled down to such an extent that the engine is only just running.

SILAGE FOR DAIRY COWS.

That there is a proper stage at which to cut different crops intended for silage is not generally appreciated. To produce a good silage the dairy farmer should cut the particular crop when it contains the maximum food nutrients in a condition that will make good silage.

Maize and sorghum are two of the best crops that can be grown for ensiling. Maize should be cut when the grain is glazed or well dented, the lower leaves on the stalk yellowing, but the stalk itself full of sap. At this stage it will contain maximum food value, and at the same time sufficient moisture to pack well in the silo. Sorghum should be harvested when the heads are reaching maturity, and while the grain is still in the dough stage—hard enough to be crushed between finger and thumb with difficulty. As with maize and other bulky fodders, sorghum makes the best silage when chaffed, as only then does it pack well into the overhead or pit silo. Surplus material should be placed in a silo stack, this being built with the heads of the sorghum towards the centre and the butts to the outside. Sudan grass, which belongs to the sorghum family of plants, should be cut when the seed has formed but is still in the milk stage. This crop is particularly valuable in the drier parts of the State, where it can be satisfactorily grown in good years.

Maize and sorghum can be cut with the least labour by means of the maize harvester, but where that implement is not available, cane knives, short hoes, reaping hooks, or scrub scythes may be used. A slide fitted with a scrub scythe blade and drawn by a horse is used by many farmers.

Wheat, oats, and barley should be cut just after the ears are well out. Many farmers before cutting these crops for hay wait until the grain is well formed and the straw has become somewhat dry. Crops intended for silage should not be allowed to reach this stage, as plenty of sap is required in the plant to ensure a good sample when the silo is opened up. These three crops—wheat, oats, and barley—are cut with the reaper and binder.

Unlike hay, silage may be made at any time irrespective of the weather. Rain causes inconvenience, but it need not delay the work.

Put the material into the silo the same day as it is cut. To get the best results the cut crop must be ensiled in a succulent condition, and drying out should be guarded against. The teams should, therefore, follow up the harvester, carting the stuff immediately to the silo. Slides are very useful for hauling the crop to the silo, especially as the material has not then to be lifted to any height.

All crops must be chaffed before being put into the overhead silo in order to ensure close packing and to prevent fermentation. The chaffed pieces should be about ½ inch in length, and the cutting can be done either with a silage cutter fitted with a blower for filling the silo, or with an ordinary chaffcutter with a chain elevator. The silage cutter with blower is useful when large quantities are being handled, but for the ordinary sized farm a chaffcutter with an elevator is, on the whole, more satisfactory, as it requires less power and fewer men to operate it, and the knives are easier to sharpen. Chain elevators can be easily fitted to almost any chaffcutter. When silage cutters are used a fairly high-powered engine is required, but a 4 or 5 h.p. engine will drive a chaffcutter.

Improper packing of the material in the silo is the cause of much spoiled silage, and of much disappointment on the part of the dairy farmer. It is a well-known fact that the more the material is tramped down in the filling process the less it settles afterwards. When the material settles in the silo it tends to draw away from the walls, leaving an air space which results in spoiled silage. The best method is to build the material up about 2 feet around the walls and sloping to the centre, and to trample this down well; then fill the centre up and tramp it around the walls equally; then again, build up around the walls, and so on. If this method is adopted the silage will settle down without drawing away from the walls. At the top the silage is rounded off by being made higher in the centre, and within a few days it will settle until nearly level. Tramping is more important in the upper half and top of the silo, because this section of the silage has less weight bearing on it to force it down.

THE 1927 WHEAT CROP COMPETITION.

The following notes have been taken from a report on this year's wheat crop competition, promoted by the combined Agricultural Societies of Queensland with the assistance of the Wheat Board, submitted by the Director of Agriculture, Mr. H. C. Quodling.

First, second, and third places were allotted in the Toowoomba district competition to Messrs. Ziesemer Bros., Bongeen, 122 points; H. C. Sharpe, Milmerran, 120 points; J. Ritson and Sons, Clifton, 118 points; and similarly in the Warwick district to S. P. Cutmore, Swan Creek, 125 points; P. O'Mara, Tannymorel, 119 points; and J. E. Tucker, Freestone, 118 points; the Grand Championship prizes being awarded in the order named to —

S. P. Cutmore, Swan Creek (125 points), "Clarendon."
Ziesemer Bros., Bongeen (122 points), "Currawa."
H. M. Sharpe (120 points), "Warrior."

It is to be regretted that owing to the unfavourable season in the Maranoa district it was not possible for the combined Agricultural Societies at Roma and Wallumbilla to take an active part in the competition.

Of the fifty-one crops entered, twenty-five were in the Toowoomba and twenty-six in the Warwick district respectively. Judging commenced on 17th October in the Toowoomba area and concluded on 2nd November; and similarly in the Warwick district on 3rd November and 11th November respectively.

In the matter of a closing date for entries some latitude was no doubt necessary in this, the first competition of its kind in Queensland. Uniformity, however, in this respect is advisable in the case of future competitions, cognisance being taken of the normal harvesting dates in the respective districts.

Methods of Judging.

The substantial prizes being offered should assist in promoting the popularity of crop competitions generally. If this desideratum is reached, then the present system of adjudicating would automatically require to give place to the system adopted elsewhere—the district Agricultural Societies conducting and judging their own local competitions, the winner in each competition being entered for the championship of a particular division, the judging of the latter being allotted to an officer of the Agricultural Department.

Objects of the Competition.

The general excellence of the competing crops necessitated their close examination in order that the points allotted might represent a true and accurate appraisal of the merits of the individual crops in conformity with the requirements set out under the several headings embraced in the conditions of the competition.

Briefly, these were interpreted as having been designed—

(*a*) To raise the standard of the wheatgrowing industry generally;

(*b*) To encourage growers to adopt methods of cultivation to permit of rain entering the soil, percolating into the subsoil, and retaining it there by a worked surface mulch for the ultimate benefit, yield, and stability of the crop.

(*c*) To bring about the use of pure, clean, graded seed of prolific, rust-resistant or rust-escaping varieties.

(*d*) To prove the efficacy of soil and seed treatment; to overcome wheat diseases; and to show that the infestation of cropped land by wild oats, foreign seeds, and weeds is inimical to the interests of the grower.

Comments.

Rainfall records were available only on a limited number of farms; those of the nearest recording stations were consequently taken, but an irregularity of this character precluded individual comparisons being made which might otherwise be of value in any summary of results.

The single crop entry from Inglewood was handicapped right out of the competition by droughty and other conditions, and allowances require to be made accordingly.

Regarding the season from January to the date of the last crop inspection, 11th November, certain features were pronounced:—The summer rainfall on the Darling Downs was good generally. Little or no rain fell in May. In June good soaking rains were experienced, which proved invaluable in germinating the seed wheat and in promoting the development of the young crop; its ability to carry on until the beginning of October, when relief rains were forthcoming, was influenced to a degree by the character of the soil and by the cultivation it received; the heavier yielding crops being found invariably on the heavy textured soils—the deep brown and black soils of the slopes and plains.

July, August, and September were months of light rainfall and much frost. At the beginning of October the outlook for the wheat crop was anything but bright. Happily, excellent rains fell then and at intervals throughout the month, and since 1st October it is questionable whether more favourable weather for the development of bright, plump grain has been experienced for many years.

Rust was noted in a minor degree on some of the competing crops, but the majority were too far advanced to anticipate that it would have any appreciable effect on the yield or quality of the grain.

Summary.

The opinion was formed that very few growers made any special preparation beforehand for the competition. With the initiation and finalisation of this State's first attempt of the kind, there is reason, in the event of the combined Agricultural Societies holding further competitions, to make an early pronouncement respecting same.

Estimates formed of the "apparent yield" of the competing crops indicate a very high rate of production, a fact eloquent of Queensland's redundant potentialities, as a wheatgrowing State.

It is fitting on this occasion to place on record the fact that many crops not entered in the competition were seen which were estimated to yield from 40 to 45 bushels per acre. One of these was growing on land known to have been cropped continuously for forty-five years, and that no fertiliser or manure of any kind had been used. So much for the inherent richness of the Darling Downs soils!

Soil moisture appears to be the dominant factor in production at the present time, and the importance of its conservation for crop production, in districts with a somewhat uncertain rainfall, cannot very well be over-estimated. Primarily for this reason, the suggestion is made that, when consideration is being given to extending the scope of wheat competitions, prizes be offered for crops grown on land fallowed under specified conditions.

Such a competition would tend to check the spread of wild oats, wild turnip, variegated thistle, hexham, and other weeds which levy their toll on the wheatgrower, who, if once they are introduced, has little or no chance of checking such foreign growths where modern harvesting machinery is used on land which is cropped continuously for wheat. Another equally important aspect of the question of assisting to build up the wheat industry is the nature of the supply of graded seed to growers, pure to varietal type, and free from spore-borne diseases, barley, and foreign seeds.

In reviewing the crops entered in this year's competition it is only fitting to remark that a closer examination showed that many lost valuable points owing to infestation with wild oats and barley; an undue mixture of other varieties of wheat; the presence of bunt (striking smut); also flying smut; and the prevalence of weeds. Deductions had accordingly to be made in the scale of points. Apart from such preventible causes, the competition brought forward some highly creditable crops. A very narrow margin of points separated the prize winner from other competitors, who, one and all, have at least the satisfaction of knowing they are the pioneers of a scheme designed to advance an important Queensland industry.

In conclusion, I wish to draw attention to an anomaly in the scale of points. "Apparent yield" in the case of high-yielding crops carries a greater number of points than is provided for under any of the several individual headings; and although prolificacy is obviously very important, a slight mistake on the part of the judge in underestimating yield might deprive a competitor of a substantial prize. The points provided for under Trueness to type and purity (20); Freedom from disease (30); Evenness of crop (20); Condition (10); and Cleanliness (20) can be adjudicated upon with a greater accuracy. As many factors exercise an influence on "apparent yield," even within a few weeks of harvesting a crop, it is suggested that the scale of points be reconsidered with a view to its modification on the lines suggested.

[A table of points awarded is being prepared for publication in the February Journal.—Ed.]

PLATE 36.—"CLARENDON" WHEAT.

Grown by Mr. S. J. Cutmore, Swan Creek. First in Warwick District Crop Competition and winner of the Royal National Association's Grand Champion Prize.

PLATE 37.—"CLARENDON" WHEAT.

Grown by Mr. P. O'Mara, Tannymorel. Second in Warwick District Crop Competition.

PLATE 38.—"WARATAH" WHEAT.

Grown by Mr. J. E. Tucker, Freestone. Third in Warwick District Crop Competition.

PLATE 39.—"CURRAWA" WHEAT.

Grown by Messrs Ziesemer Bros., Bongeen. First in Toowoomba District Crop Competition and Second in the Royal National Association's Grand Champion.

Plate 40.—"Warrior" Wheat.

Grown by Mr. H. C. M. Sharpe, Milmerran. Second in Toowoomba District Crop Competition and Third in the Royal National Association's Grand Champion.

Plate 41.—"Warren" Wheat.

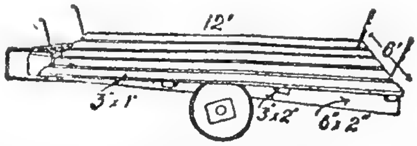
Grown by Messrs J. Ritson and Sons, Clifton. Third in Toowoomba District Crop Competition.

PLATE 42.—"CEDRIC" WHEAT.

Estimated to yield 40 bushels per acre and grown by Mr. H. G. Stower, of Southbrook, on land cropped for 45 years without fertilisers of any kind.

A LOW TROLLEY.

When green crops are cut for silage there is a great deal of heavy handling, if ordinary drays or wagons are employed for carting. The "Agricultural Gazette" of New South Wales gives an illustration of a low two-wheeled trolley. It consists of wheels of solid wood, from 20 inches to 24 inches high and 5 inches to 6 inches thick, are tired with old tiring iron, and provided with an axle of 1½-inch iron. On the axle, and fastened to it by iron clips, rest two pieces of 6-inch by 2-inch timber, so placed that they are 6 feet apart at the rear end and close together at the front, forming thus a broad V with the sharp end, in front, and the axle about half way along the sides. These two heavy timbers, however, do not come quite together at the front. Working between them, on a strong swivel bolt, is a large iron-shod block of wood which rides on the ground as a sort of slide. To this front block are attached the chains by which the trolley is drawn. Resting on the



6 by 2 bed pieces is the platform, an which is loaded the fodder. This platform is usually about 12 feet long by 6 feet broad, and it generally consists of a framework of 2 by 2 timber, covered with flooring or 3 by 1 battens. Four corner posts, of 3 by 2, are sometimes bolted, sometimes socketed into the frame to keep the material on the trolley while it is being moved. Sometimes these corner posts are simply four iron uprights, as in the illustration; sometimes they are missing altogether. The trolley is so constructed that when it is loaded, it practically balances on the wheels, with not too much weight forward, so that, as the horses move forward, the front of the swivel block is slightly lifted, though its middle and rear still travel on the ground. If the load is placed too far forward, the swivel block will not lift at all, and may carry into ploughed or heavy ground.

VALEDICTORY.

RETIREMENT OF WELL-KNOWN DEPARTMENTAL OFFICERS.

Mr. James Henderson, Assistant Instructor in Fruit Culture; Mr. John Liverseed, the Manager of the State Farm at Hermitage, near Warwick; and Mr. W. G. Brown, Instructor in Sheep and Wool, have retired from the Public Service on account of their having reached the age limit.

Mr. J. B. HENDERSON.

Mr. Henderson joined the service in 1897 as Manager of the Experimental Orchard, operated by the Department, then at Redland Bay. He was subsequently transferred to Cairns, and was for a time in New Guinea. He was transferred from the North to Stanthorpe in 1909, where he has since remained. When he commenced duty in the Granite Belt, fruitgrowing there was practically in its infancy, and Mr. Henderson has had the satisfaction during his term of office of seeing the industry around Stanthorpe grow steadily into its present position of importance in the rural life of Queensland. In this progress Mr. Henderson was a strong, personally influencing factor. His knowledge of temperate fruits and of the various soils of the granite country has always been of material benefit to both established and new settlers, and he carries with him into unofficial life the goodwill and esteem of all those in the industry which he served so well.

Mr. JOHN LIVERSEED.

Mr. John Liverseed, who retired in October last, joined the Department in 1894, and took over the management of the Hermitage Farm in 1907. He gained his first farming experience in the county of Durham, in England, and prior to going to Hermitage travelled extensively in the service of the Department. His travels included a visit to India, when he took over a large consignment of dairy cattle from Queensland to one of the Indian native princes. Mr. Liverseed accompanied Mr. Henry Tryon, formerly Chief Entomologist and Plant Pathologist, to New Guinea. One of the important results of this expedition was the introduction to Queensland of Badila cane, which has proved one of the most valuable factors in the progress of the Queensland sugar industry.

On Hermitage Mr. Liverseed proved a sound agriculturist and did valuable work, in collaboration with other officers of the Department, in grain propagation and field trials, besides demonstrational work in animal husbandry, particularly in respect to crossbred sheep.

Mr. W. G. BROWN.

Mr. Brown is a native of Hobart, Tasmania. In the island State he was reared among the merinos. Concentrating on the technical side he became widely known as a classer of both sheep and wool, and his services were sought by leading pastoralists in all the eastern States. In 1883 he came to Queensland to class the stock on Coongoola, returning later to handle New South Wales and Victorian flocks. As with many Southerners, Queensland as a young country of immense promise had for him an irresistible appeal, and he came back to remain and win a high reputation among Northern graziers as a classer of flocks and fleeces, and also as a shearing contractor and woolscourer.

Seventeen years ago Mr. Brown entered the service of the Department, and the appreciation of his work may be judged from a valedictory note in the ''Graziers' Journal'' (Brisbane), which is typical of similar notices in the pastoral Press, and which is quoted hereunder.

''Mr. W. G. Brown, State Sheep and Wool Expert, has reached the age limit, and retired from the Department of Agriculture and Stock last week. We feel sure that graziers throughout the State will regret to hear of his retirement. During the seventeen years he has been in the Department he has carried out his duties faithfully, capably, and courteously. He was always approachable, and was ever ready to give advice to sheepmen. The 'Journal' has no hesitation in saying that the Department has lost one of its most popular and capable officers. Mr. Brown was essentially a sheep man, consequently he carried out his duties most enthusiastically, indeed. The man who makes a success of his job nowadays is he who puts his heart and soul into it. 'Bill' did that. Mr. Brown's interesting book, 'The Farmer's Sheep in Queensland,' has gone into several editions, and is still being asked for. It is easily the best of its kind ever published in this State, and will undoubtedly serve to perpetuate his memory in sheepland long after the final muster.''

Mr. Brown had the misfortune to lose his two sons—Frank and William—in the Great War. They were of the 26th and 25th Battalions of the A.I.F., respectively, and both were killed within an hour on the same day—4th August, 1916.

Mr. Brown is a foundation councillor of the New Settlers' League and of the Queensland Authors and Artists' Association. Possessing an able and facile pen, he has made a name in agricultural and stock journalism, and his pen-name "Tar Boy" is well known to old readers of the Sydney "Bulletin." He is also the author of a novel, "Helen Paley," a Western romance, "Farmers' Sheep in Queensland," and numerous pamphlets on pastoral practice, besides sketches on Australian inland life and industry in a section of the American periodical Press. He is also a member of the Johnsonian Club.

At a Departmental farewell on 23rd December he was the recipient of the good wishes of the entire Head Office staff, accompanied by a substantially filled wallet. The Under Secretary, Mr. E. Graham, made the presentation, and in doing so referred

PLATE 43.—MR. W. G. BROWN.

to the success of Mr. Brown's work in the interests of pastoral industry, particularly in respect to the farmers' wool scheme, sheep-farming on coastal country, and experiments in the blow-fly and other scientific investigations for which Mr. Brown had been largely responsible. He added that departmentally they were all sorry that Mr. Brown was retiring, as he was a most popular and conscientious officer. He felt sure that not only his fellow officers, but sheepmen throughout the State, wished him the best of good fortune in his unofficial life. In the course of an appropriate response, Mr. Brown counselled the younger officers present to maintain the reputation of the Department, which all over Australia was known as "easy of access, staffed with capable and courteous officers, having always something useful to impart."

In his well-earned leisure Mr. Brown proposes to travel further along the Inky Way, having accepted a retainer on the metropolitan Press.

Answers to Correspondents.

PIG RAISING.

The following replies have been selected from the outward mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Pig Management.

A.H.J. (Perriman)—

It is quite apparent that the young pigs have suffered from exposure. We think also that they have become overfat through not taking sufficient exercise. They have, also, no doubt, suffered from bowel troubles, constipation in particular, and from feverishness. We recommend reducing the amount of grain and increasing the quantity of green feed, also the keeping of your sows and litters in good-sized pig paddocks, where they would not only have the benefit of succulent green food, but also abundant exercise. It is necessary also to see that they have sufficient drinking water, and the provision of mineral mixtures in the form of charcoal, bone meal, &c., is advised. It is an advantage, too, to add lime water to the food given to pigs. There is no cure for the ailments referred to, but they may be prevented by a proper system of management and by keeping the pigs under an open-air paddock system in preference to their being constantly housed, even in well constructed sties. The lucerne chaff is quite a valuable supplement to the food supply, although you will note that the young pigs do not consume as much of this, in comparison, as the older stock. Young pigs much prefer succulent green food to any form of hay or chaff, even if the latter is soaked in water over night. Of course, when no green food is available, it is a decided advantage to place the soaked chaff before the stock, particularly at the morning feed.

Pig Breeding.

M.R. (Gayndah)—

We are of opinion that there is something wrong with the breeding of the pigs to which you refer. It is probably a case of in-breeding or, at any rate, of the mating of stock that are too closely related. There is no reason, under normal conditions, why young pigs shortly after birth should suffer from the trouble which you state was similar to St. Vitus Dance. Even during very cold weather this condition should not exist, though, of course, if the pigs were housed in dry, dusty pens or quarters where fleas, flies, lice, and mosquitoes were numerous, young pigs would become very worried, and in endeavouring to free themselves from parasites, might move about in the manner indicated. The fact that seven of the young pigs died also indicates that they were not constitutionally sound. Evidently, those that survived were the strongest of the batch. The fact that the litter was uneven in size and development also indicates inferior breeding, although in most litters of pigs there are usually one or two somewhat smaller than the balance, and sometimes one or more particularly well-developed animals. It is pleasing to note that the pigs you now have are doing so well. We recommend your considering the introduction of some more reliable breeding sows, and possibly a better boar. The conditions under which your pigs are kept might be still further improved.

Overheated Bacon Pigs.

A.O.H. (Brooloo)—

There is little or no treatment than can be relied upon to relieve and save very fat bacon pigs that have become overheated as a result of being forced to travel during the heat of the day. It does not pay to attempt to drive fat pigs over long distances during very hot weather, though it is fairly safe if they are moved along quietly during the late afternoon or early in the morning. It is better to cart them to the station than to drive them, and in any case they should have ample water and be protected from the sun. The loss of bacon pigs such as those to which you refer would more than pay a good deposit on a suitable pig wagon; in fact, it would go a long way towards paying the total cost. Bleeding by slitting the ear or the tail is attempted as a last resort in some cases and with success, but in many cases these pigs do not live through the night, and are dead in the trucks on arrival at the factory. It is better to see that the pigs are not too fat, and that they have plenty of exercise in a good roomy yard during the topping-up stages than to pen them up in a cool protected pen, force them into an over-fat condition, and then, after all the trouble and expense associated with their preparation for market, expose them to the sun and to the risk of heat apoplexy by driving them during a hot summer morning. Bacon pigs are too valuable nowadays to risk their loss through neglect and mismanagement. At any rate, it is quite useless depending upon any form of treatment to restore to normal condition a pig—whether fat or otherwise—that has become overheated and that is down and out to it before treatment is commenced. Bacon pigs worth between £3 10s. and £4 each are deserving of better attention than this.

BOTANY.

The following replies have been selected from the outward mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Zamia Palm.

R.W.H. (Cairns)—

The "Zamia Palm" (*Cycas media*) has been declared a noxious weed for the Shire of Tinaroo. The word "Zamia," as applied in Australia, is simply a local name applied to any plant of the Cycas family (*Cycadaceæ*). In South-eastern Queensland it is most commonly applied to *Macrozamia spiralis* (also known as Wild Pineapple); about Springsure it is applied to *Macrozamia Moorei*, and so on. We do not remember ever seeing a species of *Macrozamia* in or about Cairns, except a very tall one that grows here and there in the scrubs about Babinda. Species of *Macrozamia* are easily told from Cycas, in that the leaflet has no midrib. The male cones are somewhat alike, but the females very different.

SHEEP AND WOOL.

The following replies have been selected from the outgoing mail of Mr. W. G. Brown, Instructor in Sheep and Wool:—

Blindness in Hoggets.

H.W.P. (Brookstead)—

There is no doubt that the cause of the blindness is dietetic. The young sheep have been eating some herb which has the effect described. Paddymelon vine which grows on light soils in Queensland is a cause of temporary blindness. In South Australia sheep farmers give an arsenical drench to the sheep as a cure. If it be "pink-eye" the eyes will be bloodshot, and a kind of pimple is seen in the eye over the pupil. If the blindness is due to anything the sheep have eaten they will appear quite normal, excepting that the pupil is dilated. Try the drench, and report results.

Sheep Lick.

H. and L. (Hughenden)—

The Agricultural Chemist, Mr. J. C. Brünnich, F.I.C., F.A.C.I., advises that the report on the success of the use of lick is very gratifying, although not unexpected. We had some analyses of Mitchall grass from the Hughenden district some years back, and although very nutritious with regard to protein contents, the amount of ash is about normal, the lime contents fairly high, but phosphoric acid more deficient than that found in other samples from other districts. You can, therefore, do no wrong by using a similar lick, as recommended for Meteor Downs, using a bag of coarse salt, one bag of crushed Nauru phosphate, adding about 20 lb. of Epsom salts; the latter amount can be increased if sheep are found to eat constipating foods like shrubs, &c. If your water used by the stock is at all saline, the amount of salt used in the lick must be reduced, using only one bag of salt to two or three bags of Nauru phosphate.

General Notes.

Staff Changes and Appointments.

Mr. F. Hayles, of Arcadia, Magnetic Island, has been appointed officer under and for the purposes of the Animals and Birds Acts.

Mr. W. D. Cameron, of Bolton, has been reappointed Government Representative on the St. George Dingo Board.

Mr. C. J. Smith, of the Forestry Department and stationed in the Inglewood district, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

Messrs. A. R. Charles (Inglewood), C. J. F. Miller (Land Commissioner, Cairns), and R. C. Lethbridge (Mitchell), have been appointed Government Representatives on the Western Downs, Cook, and Booringa Dingo Boards respectively. Messrs. N. V. Collins, G. J. McIver, W. Atherton, and F. Lawrence have been elected Members of the Cook Dingo Board, and Messrs. R. F. Douglas, G. E. Ferrier, C. A. Peters, and G. A. White have been elected Members of the Booringa Dingo Board.

The member of the Police Force stationed at Camooweal has been appointed an Acting Inspector of Stock.

The resignation of Mr. B. A. Webb, of Darr Creek, as Acting Inspector of Stock, has been accepted as from 5th December, 1927, as tendered.

Mr. O. H. Webb, of Darr Creek, viâ Jandowae, has been appointed Acting Inspector of Stock, and Mr. J. S. Avey, of Habnarey, New Angledool, N.S.W., an Honorary Inspector of Stock.

Mr. R. Dillaway and Mr. D. A. C. Macpherson, of Redcliffe, have been appointed Officers under and for the purposes of the Animals and Birds Acts.

Mr. W. M. Nash, of Columboola, has been appointed Government Representative on the Condamine Dingo Board, Messrs. E. J. Ryan, J. W. Newbery, and D. H. Butler have been appointed Members of that Board, and Mr. G. Mundell has been elected a Member.

Messrs. A. M. Deutscher, J. W. S. Gildea, W. W. B. Hogarth, and M. L. Williams have been elected Members of the Warrego Dingo Board, and Messrs. G. Foote C. G. Gall, G. S. Martin, and C. T. Mills have been elected Members of the Tambo Dingo Board.

Mr. G. H. E. Heers, Grading Inspector, has been appointed Senior Grading Inspector, Department of Agriculture and Stock.

Mr. J. C. Pryde has been appointed Temporary Inspector of Stock, at Boonah, as from 21st December, 1927, to 6th February, 1928.

Messrs. G. R. I. Anderson, of Townsville, and H. J. Campbell, of Brisbane, have been appointed Inspectors of Slaughterhouses, on probation, as from 5th December, 1927.

Obituary.

The untimely death of Mr. F. L. Nott, M.L.A., H.D.A., in the course of the month is generally regretted. The late Mr. Nott represented the State electorate of Stanley in the Legislative Assembly, in which he won the respect and esteem of members on both sides of the House. After graduation from Hawkesbury Agricultural College he pursued his scientific studies in Germany. Returning to Queensland he entered the service of the Department of Agriculture as science lecturer at the Queensland Agricultural College at Gatton. He later became a sugar-grower in the Bundaberg district, and met with much success, becoming a recognised leader in the industry. He possessed a wide knowledge of Queensland and its rural enterprises, and was always a close student of agricultural science. For the State he performed good service both as a farmer and as a legislator. Sympathy with his family is widespread, and his passing hence while still in life's prime is regarded generally as a distinct community loss.

A Stanthorpe Sanctuary.

Vacant Crown land known as Mount Pleasant, Fletcher, near Stanthorpe, has been declared a sanctuary for animals and birds.

A New Sugar-cane Harvester.

"The Planter and Sugar Manufacturer," of New Orleans, U.S.A., reports that the Fisher cane harvester, the result of eight years' investigations and trials, made its first demonstration on 12th May last. The cane harvested was some left standing from last year's crop and very difficult to handle. Nevertheless the harvester straightened, topped, cut, and delivered the cane in form to be loaded into wagons direct from the machine. The machine operated for over forty days in the canefields and was tested severely in every way. As a result certain perfections are to be introduced tending to reduce the weight, strengthen the structure, and add to its mobility and general working.

In conclusion, the report states that the completed machine, which will be delivered to planters next season, will be operated by three men and should handle 300-500 tons of cane a day at an estimated cost of 5 cents per ton of topped, cut, stripped, and loaded cane.

In the Middle West—A Glimpse of Beautiful Taroom and its Bird Life.

A reader, just west o' sunset, writes:—"I am grateful for the publication sent, 'Notes on Insects Damaging Sugar-cane,' by Mr. Jarvis. I was for some years going to school on the Clarence River (N.S.W.) and hence was brought up in the heart of cane country. I can follow the book well, and have used it with the children here in connection with local and nature study knowledge.

"The Prickly-pear Commission have sent along a great instalment of caterpillar eggs—or rather the moth's eggs—*Cactoblastus cactarum*. All the eggs I secured have hatched out on the pear leaves. There is no mistake about their activity and voracious appetites. The children now understand and can rear them themselves, thus helping to spread them.

"Two inches of rain here on 7th November and more to-day; a green carpet everywhere. The trees are out in new clothes, the bauhinia is gay with red flowers, and is visited by leatherheads and honeyeaters by day and flying foxes by night—all after the honey in the flowers. In between times the ubiquitous small boy gets his cut at the flowers. They love this bauhinia flower nectar. The solidwood is out in flower—rusty red blossoms—and it's wood is as hard as the name implies. Further west they call the solidwood the 'Ooline.' The sandalwood—properly 'Budha' tree and not the sandalwood of joss house fame, is also out in flower. Bushmen have a great regard for this wood as a fine wood to burn in wet weather. The 'wild pomegranate' or Taroom Tree is in full bloom, and full of the nests of the wild canary.

"Flocks of snipe are fairly plentiful on the river flats. A large plain turkey was killed close to town on 7th November—weight dressed was 20 lb.

"I have a collection of aboriginal stone axes—over a hundred—have specialised in the collecting of them for years. One I have received lately came from Duaringa, and is a perfect specimen of the native craftsmen's art. Some of the axes are very large and others very small. I have only one mounted with handle complete. The axes used to break up the bunya pine cones are of different composition to the others. My Stanley River specimens are all in good condition, and were found at the feet of the pine trees themselves. The New Guinea natives were fond of serpentine to make axes from; there is an outcrop of this at Pine Mountain, near Ipswich, and one of my stone axes is made from it. It was obviously used on Pine Mountain itself, being found not far from there. The advance from the primitive stone axe is, of course, an interesting subject to ethnologists. I am proud of my collection and consider it as the most representative private collection in Queensland. By interesting the children I have increased the number. The children out here find old stone axes in primitive kitchen middens of the early Dawson blacks and also in flood water deposits; they bring them all along to me. I have Solomon Island, Fijian, and New Zealand (greenstone) axes, also the rare clam shell axe blades of Matty Island. The New Caledonian serpentine blades are the best I have seen so far. There is one perfect specimen in my collection. . . .

"The Koel is busy these days with its monotonous chant. The bush birds give it a rough time, and its ragged appearance shows it—it is always the odd man out. The little Field Lark, Ground Lark, and Rufous Song Lark are busy nesting; Leatherheads have also got a move on with housebuilding. Nearly every tea-tree on the river bank seems to have a wagtail's nest. The white-winged triller, or Dobbyn magpie as they call the little chap here, is busy with its tiny home, too."

Corn in Egypt—from Australia.

In 1926 the total imports of wheat flour into Egypt amounted to 195,624 metric tons as compared with 198,575 tons during 1925. Of these quantities Australia supplied by far the largest, viz.—112,779 tons in 1926 and 116,742 tons in 1925. So people of the oldest land are now fed by farmers in the newest.

The Leasing of State Farms.

In referring to the call for tenders for the lease of Hermitage and Warren State Farms, the Minister for Agriculture, Mr. W. Forgan Smith, informed the Press recently that the operations of the State Farm, Warren, 17 miles west of Rockhampton, commenced in 1907. At that period, agriculture was not practised extensively in the Central district. There was available at that time little information as to the kind of crops that could be grown satisfactorily in that neighbourhood, and there were few settlers who had a knowledge of agricultural science. By demonstrating methods of cultivation of the soil, the nature and range and varieties of crops that could be grown, the work at the Warren State Farm has been of considerable assistance to farmers. It can now be claimed, however, that agricultural matters in the Central district have assumed a somewhat changed form; farmers generally are much better informed in agricultural matters. Cotton-growing has come into greater prominence, and promises to be one of the principal crops that will be raised in the Central district. To meet this situation, a Cotton Experimental Station has been established at Biloela in the Callide Valley, and the activities there have been designed to meet the requirements of the cotton-growers. The swing towards cotton-growing leaves the Warren State Farm shorn of a good deal of its former importance in the agricultural development of the Central district.

Under these circumstances, it has been arranged that this State Farm at Warren should be closed down as a Government institution and leased. Under existing conditions, it is thought that the requirements of farmers will be fully met by the assistance afforded from the Biloela Station, and, in addition, by the appointment of another Assistant Instructor in Agriculture in the Central district. When farmers in the neighbourhood of a State farm have acquired a generally sound insight into farm practices, there no longer remains any useful purpose for performance by the State farm.

For some years past the State Farm at Hermitage has been used principally for the purpose of wheat-growing. A number of varieties of wheat coming forward through the Roma State Farm have been planted out at Hermitage, and a series of field tests have been conducted there. It has also been the practice to allocate to prominent wheat-growers quantities of seed wheat for planting under field conditions. The system of distributing these wheats for trial purposes to individual growers has, in practice, many advantages over the system of growing them at a State farm. The principal disadvantage in the case of a State farm is that the character of the soil and climatic conditions are essentially local, but by distributing the seed to individual growers upon farms, and where the soil is typical of the district, a much more accurate and reliable indication of the behaviour of the wheat is obtained. Because of this happening, combined with the fact that the Hermitage State Farm is in a comparatively old agricultural district and has more or less exhausted its usefulness as a State farm, it has been decided to close the institution down, and that the work done there in the growing of wheat under field conditions be carried out by arrangement with individual growers. This is not an experimental step, as this arrangement has been in practice for a number of years and has proved satisfactory.

The decision to close these farms was not arrived at until a full investigation had been made into both of them by a committee consisting of Professor J. K. Murray, the Principal of the Queensland Agricultural High School and College, Mr. J. Irwin of the Public Service Commissioner's Department, and Mr. E. Graham, the Under Secretary for Agriculture.

Increased attention will be given in the future to the propagation of wheats at the State Farm, Roma. This work will be continued under the direct control of the present manager, Mr. R. Soutter, and arrangements have been made to allow of his devoting increased time to this very important phase of agriculture, including the evolution of new types of wheat suited to the requirements of the various wheat-growing areas of Queensland. Among the wheats that are doing well this year on the Darling Downs may be mentioned Fusa, an Indian wheat introduced by the Department and tested out and distributed from the Roma State Farm, and Cedric, War Chief, and Watchman, three wheats which were evolved by Mr. Soutter at the Roma State Farm.

Plant Diseases.

By Proclamation, the following diseases have been declared to be diseases under "*The Diseases in Plants Acts,* 1916 *to* 1924:—

Name.	Commonly Known As
Bacterium vascularum	Gumming
Mosaic (Virus)	Mosaic or Yellow Stripe
Leaf Scald (Bacterium sp.)	Leaf Scald
Sclerospora sacchari	Leaf Stripe
Colletotrichum falcatum	Red Rot

Farmers and Co-operative Service.

The benefits from membership in co-operative marketing or purchasing organisations have been so evident, says the "California Citrograph," that 46 per cent. of the producers participating in such organisations in the Northern and Western States are members of more than one co-operative enterprise. In those States in which the merits of the co-operative method of doing business have long been recognised, the farmers seem to be members of more different enterprises than in those States in which co-operation has become of importance only in recent years.

In California 36 per cent. of the co-operators are members of two associations; 15 per cent. members of three; 3 per cent. members of four; and 1 per cent members of five or more.

Continuing, the report points out that once the advantages of the co-operative method are demonstrated to him, the agricultural producer does not hesitate to join more than one group for a more economical distribution of his various products and purchase of supplies.

Farming on the Film—Educational Enterprise.

The Office of Motion Pictures, Department of Agriculture, U.S.A., is concerned with the production and distribution of educational films dealing with the problems of agriculture and farm and home economics.

For fifteen years its activities have been part of the educational programme of the Department for the dissemination of agricultural information in co-operation with the State colleges and other agencies.

The field of the distribution of the films includes, first of all, the widespread organisation of the agricultural extension service, made up of country agricultural, home demonstration, and boys' and girls' club agents and subject-matter specialists. employed co-operatively by the State and Federal Governments and working in practically every agricultural county in the United States. The majority of the county agents now use the films regularly in their work. Other active users of the films are the field staffs of the various bureaus of the Department of Agriculture.

Although preference is given to requests for films from these agents and specialists, they have been sent whenever available to other applicants, including farm and community organisations, schools and colleges, women's clubs, garden clubs, sportsmen's and breeders' associations, churches, business organisations, museums, theatres, fairs, hotels, summer resorts, and railroad development trains.

A wide variety of the important activities of the U.S.A. Department of Agriculture has been covered by the films. Those now in circulation include the following:—

Beef cattle, dairy cattle, dairy products, diseases of cattle, parasites of cattle, horses, sheep industry, swine husbandry, diseases and parasites of swine, poultry production, poultry pests, wild game and bird protection, destructive rodents, cereal crop production, cereal crop handling and diseases and insects, cotton production, cotton insect control, fruit production, fruit insects and diseases, truck crop production, plant diseases, home gardening, miscellaneous crops, farm engineering, types of road construction, food inspection, forest fire prevention, forest insects, pests and tree diseases, lumbering, scenic and recreational resources of the forests, reforestation, miscellaneous forest uses, bees, the marketing of farm products, co-operative marketing, rural organisation, agricultural extension work, boys' and girls' club work, rural sociology, and weather forecasting.

In Queensland the Department of Agriculture and Stock has also brought the cinema into the service of agriculture. Some excellent pictures of Queensland rural industry—wool-producing, dairying, banana-growing, and other phases—have already been made and circulated. A picture of pig raising in Queensland and other films are now in course of preparation.

Mosquito-infested Swamp Land Sprayed from Aeroplanes.

According to Naval and Health Departments of U.S.A., a very successful demonstration of spraying mosquito-infested land with paris green from Naval aeroplanes was carried out at Bambury, S.C. It is stated that the test has shown that it will now be possible to reclaim areas of similar land with less expense than heretofore by means of commercial aeroplanes.

Experimental Oversea Consignment of Australian Oranges.

Interest attaches to an experiment made with a cargo of 235 cases of South Australian oranges, shipped to Great Britain by the "Bendigo." Excluding six cases in various wrappers, which were sent for special investigation to Dr. Barker, of Cambridge University, half of the cargo was carried in cold chambers, and the balance under ordinary cargo conditions between decks, without even a through draft. In appearance and condition there was no difference between the two lots, but, on being tasted, those carried in cold store showed a fuller and finer flavour. The wastage was 1½ per cent. on large fruit, and none on the smaller fruit. The results are considered excellent, and were unexpected, says the "Imperial Food Journal."

Standardisation of Perishable Products.

The discussion of "Trade Mark Standardisation in the Marketing of Perishable Food Products," by well-known members of the trade and authorities on marketing at a recent meeting of the Merchants' Association of New York, brought out several interesting statements.

One of the principal speakers emphasised the fact that organisation of growers must precede organisation of product, and that the present successes have come about gradually as an economic trend, rather than as an industrial revolution.

Volume is absolutely essential to the success of a trade mark or brand, and then only when the brand is carried through to the consumer was the experience of the speakers. While farmers are not making the same progress as manufacturers in accomplishing standardisation, it was pointed out that there are conspicuous successes in agriculture, among which the California Fruit Growers' Exchange was ranked as a leading example.

Apples were cited as an instance of a product lacking in standardisation and with innumerable brands, no single one of which has enough force behind it to carry through to the consumer.

The proper appeal to the consumer was judged to consist of telling him something that will make him buy rather than in simply trying to tell him what to do.

Helping the Pig Industry—£30,000 Subsidy.

Recent reports from New Zealand indicate that the Dominion Government is seized with the importance of helping the pig industry. On Thursday, 22nd December, the Prime Minister (Mr. J. G. Coates) of the Dominion of New Zealand announced the Government's decision to subsidise the pork industry for three years. "The amount for the present season," Mr. Coates said, "will be approximately £30,000, reducible in the following years. He explained that pig-raising is a necessary adjunct to dairying and has been so rapidly increased that the production of pigs suitable for both pork and bacon exceeds the local consumption. The recent fall in export values has been a severe blow to the industry in the Dominions. The Government is reluctant to adopt a policy of subsidies, but considers that an exception should be made in the case of the pig industry to enable the industry to overcome the present difficulties."

New Zealand's experiment will be watched with considerable interest by pig raisers in every part of the world, particularly in Australia, though as yet the Commonwealth has not seriously taken up the export of frozen pork to overseas ports. The matter is one that might to advantage be taken up by the Australian Pig Industry Council at its next meeting.

If New Zealand, by adopting a Government subsidy, can finance the export trade and make the industry a more profitable one to the farmer, then the Commonwealth should be able to follow suit, for it would appear from figures available that the demand in Great Britain alone would comfortably absorb all the pork and bacon both Australia and New Zealand can produce. Whether the price obtainable will prove a profitable one to Australian and Dominion producers is, of course, a question that would have to receive due consideration in taking up the matter. It is, at any rate, of interest to note that the Dominion Government is awake to the possibilities of the trade.—E. J. SHELTON, Instructor in Pig Raising.

Disease-resisting Bananas for Panama.

According to an American Consular report, experiments are being conducted by Professor J. Edgar Higgins, Agronomist, of the Panama Canal, with disease-resisting varieties of bananas brought from the Philippine Islands. The "Bungulan," also known as the "Lacatan," one of the varieties introduced, is stated to have been found to be highly resistant to the "Panama Disease," which has proved so destructive to plantations of the east coast of the Republic of Panama, notably the Bocas del Toro district.

Butter Board.

Notice has been given of the intention to create a board to deal with butter produced at factories in Queensland for the period from 1st March, 1928, to 30th June, 1931. The board to deal with the commodity will consist of six elected representatives of growers and the Director of Marketing, and will hold office for the period of existence of the board. For the purpose of electing growers' representatives, the State has been divided into six divisions. Persons eligible to vote on any matters in connection with the proposed board shall be cream suppliers to the butter factories in the divisions concerned. The butter factories will also be eligible to vote. The board, if constituted, will have somewhat similar powers to the present board which expires next month. Any petition for a poll to decide whether the board shall be constituted must be signed by at least fifty cream suppliers and must reach the Minister not later than 5 p.m. on the 23rd January, 1928. Persons eligible to vote are asked to send their names and addresses to the Under Secretary, Department of Agriculture and Stock, Brisbane. Nominations will also be received by the Under Secretary until 5 p.m. on the 23rd January, 1928, for election as growers' representatives on the proposed board. Each nomination must be signed by at least ten cream suppliers in the division concerned.

Special Classes in Pig Section, Brisbane Show, 1928.

The secretary (Mr. J. Bain) of the Royal National Agricultural and Industrial Association, Brisbane, advises that special provision has been made in the Schedule of Classes for competition at the 1928 Royal National Show, Brisbane, in the Pig Section for Classes for Bacon Pig Carcass Competition and Litter Weight Contest, details of which are as hereunder:—

As the Association are anxious to cater for every section of the community, and as it is necessary in classes of this description to issue a Preliminary Schedule as early as possible, these details have been made available for the information of all interested.

As usual, provision will be made in the Schedule for all the Breed classes and for other special classes, details of which will be made available as soon as the Schedule of Classes is complete.

Meantime, any breeder requiring further information may obtain same on application to the Association's Offices, Courier Building, Queen street, Brisbane, or at the office of the secretary, Australian Stud Pig Breeders' Society, Inns of Court, Adelaide street, Brisbane, or to the Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane.

A New Cotton Harvester.

According to "La Hacienda," New York, a new cotton fibre-gathering machine will shortly be put on the market in U.S.A., capable of doing the work of 100 hand-workers.

The report states that the machine possesses working parts provided with steel "fingers," which automatically remove the cotton fibres from the ripe or open individual bolls. It has two vertical drums, each fitted with 500 fingers, which rotate at a high speed as the machine moves forward, each of them gathering the fibres from one side only. As the machine proceeds the gathered fibres are wound round a reel and when the reel is full, a special mechanism based on air suction comes into action, releasing the reel which holds the fibre and depositing the latter in sacks placed ready in the rear.

Working continuously for twenty-four hours the machine can do the work of 100 men working the same number of hours and needs only two men to look after it, one to drive and the other to put the sacks in position and remove when full.

Such quick work obviates the serious difficulty, which exists in districts where labour is scarce, of the impossibility of immediately harvesting the ripe cotton which thus remains for some time on the plant and deteriorates.

A Cool Food Safe.

The Queensland Pastoral Supplies, Limited, are now sole Queensland agents for the Trafalgar Cold Safes, which are a boon to those who do not use ice. This safe will keep food cool in the hottest weather. Meat and fruit are preserved by its action. Milk and cream retain their freshness. Jellies and other hot weather delicacies, so difficult to prepare when no ice is available, become, it is claimed, enticing and palatable when placed in the safe. It is absolutely fly and ant proof. Further particulars may be obtained from the Queensland Pastoral Supplies Limited, Bowen street, Brisbane.

Canary Seed Board.

An Order in Council has been approved constituting a Canary Seed Board to deal with canary seed harvested in Queensland during the seasons 1927-28, 1928-29, and 1929-30. The Board to deal with the seed has been appointed to consist of Messrs. T. P. Grimes, Leyburn road, via Clifton; T. Muir, Allora; and L. R. Macgregor, Director of Marketing.

The question of the reconstitution of the Canary Seed Board for a period of three years, and the election of two board members, was submitted recently to the growers for their decision, and the result of the voting, which was conducted by the Department of Agriculture and Stock, was as follows:—

For a Canary Seed Board	66 votes.
Against a Canary Seed Board	33 votes.

As the necessary two-thirds majority was obtained the proposal was therefore carried.

The voting for membership to the board resulted as follows:—

Thomas Perse Grimes (Clifton)	82 votes.
Thomas Muir (Allora)	64 votes.
Michael Coleman (Nobby)	50 votes.

The two first mentioned will therefore be appointed for a period of one year.

Oil from Coal.

According to the "Export and Import Review," Berlin, Germany, the agreement recently entered into between I.G. Farbenindustrie, I.G. Dye Industry, and the Standard Oil Company will have a very important bearing on the world oil supply. The full text of the report is as follows:—

The agreement deals with the mutual utilisation of the patents of both companies, the references made to experiences in crude oil production being interpreted to mean that the manufacture of oil synthetically from coal has passed the experimental stage and is now ready for commercial use.

In the opinion of German scientists, the new process will enormously increase the world's supply of oil, will reduce by half the cost of gasoline, and will have important political consequences by lessening the rivalry of nations for sources of natural oil supply. If the new process were not a success, it is thought most unlikely, that so practical an organisation as the Standard Oil would be anxious to conclude a bargain with the I.G. for the right to use the process in America.

The general opinion is that the I.G. did not sell to the American organisation its patents based on the Bergius process for the liquefaction of coal. The concessions the Standard Oil made to the I.G. in return is not known, but it is thought that they must have been heavy because of the exhaustion of the American oilfields in a comparatively short time would make the American firm eager to win the right to manufacture oil synthetically.

Germany has banked heavily on this process of "making oil from coal" invented by Dr. Bergius, of Heidelberg, since it is believed that it will cut the market price of natural petroleum by half. Early in April of this year the I.G., which had acquired the Bergius patent, started manufacturing the synthetic oil in a factory at Merseburg, employing 500 men. It was recently reported that the manufacture was progressing favourably, with constantly improving results, and that the synthetic product is expected to be ready for sale to the public some time in the first part of next year. A corporation called the Deutsche Gasolin Company has been created to sell the synthetic gasoline; in this company the I.G. will hold half the shares and the Standard Oil and Shell Companies each a quarter.

Apart from getting the right to use the Bergius process, the Standard Oil also acquires a valuable oil refining process, whereby the oil that has hitherto been of little use commercially will, under high pressure, be made available for industrial purposes. Furthermore, the I.G. has a process for manufacturing from brown coal a synthetic benzine, which is claimed to be fully as good as natural benzine.

Australia's Trade with India.

Exports of Australian wheat to India during 1926-27 amounted to 40,400 tons as compared with 35,400 tons in 1925-26. There was also an increase in shipments of horses and wooden railway sleepers, whilst raw wool decreased from 632,000 lb. in 1925-26 to 365,000 lb. in 1926-27.

The principal imports from India to Australia in 1926-27 were:—

Gunny bags	86,000,000
Gunny cloth	26,500,000 yards.
Tea	8,000,000 lb.

Imports of goat skins, carpets and rugs showed an increase, but rice, linseed, paraffin, wax and shellac were less than the previous year.

Egg Board Election.

The annual election to the Queensland Egg Board resulted as follows:—

District No. 1 (Caboolture to Bundaberg)—
R. B. Corbett, Woombye, returned unopposed.

District No. 2 (Brisbane North to Caboolture)—
M. H. Campbell, Albany Creek, returned unopposed.

District No. 3 (Brisbane South to Cleveland)—
William Wakefield, Mount Gravatt, returned unopposed.

District No. 4 (Moreton District)—	Votes.
Alexander McLauchlan, Boonah	115
H. M. Stevens, Lanefield	104

District No. 5 (Darling Downs)—	
William Dearling, Oakey	121
George Burton, Cambooya	99
Patrick McNee, Kingsthorpe	40

One member is required for each district.

Mr. Arthur Jones of the Department of Agriculture acted as Returning Officer.

Spoilt Hay Turned to Good Use.

Recently a Bulga (N.S.W.) farmer related an interesting experiment in fodder conservation. Last January he had a large crop of lucerne, but rain drenched a considerable quantity of the hay. He therefore dug a pit of about 100 cubic yards capacity with the assistance of one man and the aid of a scoop, the work taking one day to perform, and into this pit he turned about 60 tons of green lucerne and hay starting with a layer of green lucerne and alternating it with the spoilt hay. Water was added when filling and the weight of a draught horse was utilised to press the material down, while the covering consisted of fence rails and earth heaped on top of them. The silage was in perfect condition when opened in August and was fed to milking and dry cows, which did well on it and ate it greedily. The crop wauld have been wasted but for the pit. It was estimated that he had conserved sufficient feed for forty head of cattle for three months.

Spare that Tree—Valuable Kurrajongs.

The "Spare-that-tree" policy has an ardent advocate in Mr. W. Giles, of Highbury, Beetric, in the Temora district, New South Wales.

On his property of 3,000 acres he has preserved over 500 kurrajong trees, which are generally regarded as the most valuable indigenous fodder trees. In a recent dry spell branches were lopped prudently from a number of trees and fed satisfactorily to sheep.

In the wheat cultivation paddocks on Highbury, the kurrajongs add greatly to the appearance of the undulating land. In a normal season wheat can be grown almost up to the trunks of the kurrajongs without ill-effects to the crop. The trees provide valuable shade during the hot summers for sheep and other live stock, and are a splendid fodder standby in periods of drought.

The kurrajong is a shapely tree, often of ornamental beauty to the landscape. Although these trees do not, any more than do other trees, increase the rainfall or actually cause precipitations, they prevent excessive evaporation by breaking the force of the winds.

Kurrajong trees are also valuable for preventing erosion of soil on steep hillsides.

"Spare that tree" is more than a motto; it is a national obligation on every land occupier.

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

The excellent rains recently experienced should have a heartening effect on all farming operations, as a good season may now be reasonably expected.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River), wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production. Weather conditions, particularly the recent heavy and continuous rains, have interfered a great deal with farming operations. Although abundant supplies of grasses are in evidence, provision should be made for the inevitable period, at maturity, when these lose their succulence.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth, which in itself is sufficient to coounteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of one pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyanidings, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early-ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums, and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months, with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

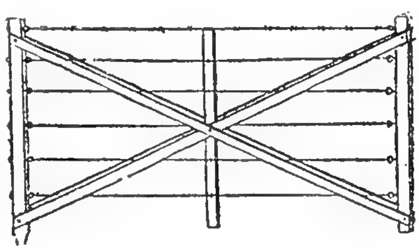
Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

A USEFUL GATE.

This serviceable gate, designed by the instructor in building construction at Dookie Agricultural College, may be easily made by any handy man. Planed timber should be used, hardwood for preference. The ends are 3 inches by 3 inches, the centre, 3 inches by 2 inches, the length over all being 10 feet and height 4 feet. The four diagonal braces are 3 inches by 1½ inches, and are notched ⅝ inch deep to make a snug fit over the stiles or ends, but are simply sprung over the centre upright without notching or checking the timber. A 6½-inch bolt at each corner, and a 9½-inch bolt in the centre holds the frame securely. All joints should be coated with good lead paint to keep out the wet. The first wire is 4 inches from the bottom, the spacing of the others being 5½ inches, 5½ inches, 5½ inches, 7 inches, 7½ inches, and a barb wire 2 inches from the top. Eye-bolts of ¼ inch iron are used for holding the wires, and by leaving a long tread on one end the wire can be drawn up as tightly as necessary, and the projecting ends cut off. The cost



of the timber in this gate is approximately 4s. The familiar strap hinge on top and pivot at the bottom are used for hanging the gate. A block is set in the ground and a 3-inch auger hole bored into solid wood to receive the rounded end of the stile. A ½-inch hole is bored from the outside to meet the bottom of the socket, providing for drainage. The gate should be hung so that both stiles will rest firmly against the gate posts to prevent undue swaying. A chain encircling both posts and stile is the best fastener for this gate.

This design also offers the alternative that the six wires may be replaced with five battens of wood of 3 inches by 1 inch or ¾ inch material. The pivot at the bottom of the end stile may be done away with and a short strap take its place.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1928.		February. 1928.		MOONRISE. Jan. 1928.	MOONRISE. Feb. 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.1	6.49	5.26	6.46	p.m. 12.32	p.m. 2.40
2	5.2	6.49	5.26	6.45	1.35	3.45
3	5.3	6 49	5.27	6.45	2.40	4.46
4	5.3	6.50	5.28	6.44	3.47	5.42
5	5.4	6.50	5.28	6 44	4.54	6.34
6	5.5	6.50	5.29	6.43	5.57	7.18
7	5.6	6.51	5.30	6 42	7.0	7.56
8	5.6	6.51	5.31	6.42	7.54	8.30
9	5.7	6.51	5.31	6.41	8 45	9 8
10	5.8	6.51	5.32	6.40	9.25	9 31
11	5.9	6.51	5 33	6.40	10.2	10.1
12	5 9	6.51	5.34	6.39	10.31	10.30
13	5.10	6.51	5.34	6.38	11.3	11.3
14	5.11	6.51	5.35	6.37	11.33	11.37
15	5.12	6.51	5.36	6.37	...	...
16	5.13	6.51	5.36	6.36	a.m. 12.3	a.m. 12.20
17	5.13	6.51	5.37	6.35	12.34	1.7
18	5.14	6.51	5.38	6.34	1.9	2.0
19	5.15	6.51	5.38	6.34	1.46	2.57
20	5.16	6.50	5.39	6.33	2.30	3 56
21	5.16	6.50	5.40	6.32	3.20	5.1
22	5.17	6.50	5.40	6.31	4.15	6.6
23	5.18	6.49	5.41	6.30	5.13	7.10
24	5.19	6.49	5.42	6.29	6.15	8.14
25	5.19	6.49	5.42	6.28	7.19	9.19
26	5.20	6.48	5.43	6.27	8.22	10.23
27	5.21	6.48	5.44	6.26	9.25	11.28
28	5.22	6.48	5.44	6·25	10.26	p.m. 12.35
29	5.23	6.47	5.45	6.25	11.29	1.40
30	5 24	6.47			p.m. 12.32	
31	5.25	6.47			1.37	

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

7 Jan.	○	Full Moon	4 7 p.m.
15 ,,	☽	Last Quarter	7 13 a.m.
23 ,,	●	New Moon	6 18 a.m.
30 ,,	☾	First Quarter	5 25 a.m.

Perigee 4th January, at 8 36 a.m.
Apogee 16th January, at 4 48 a.m.
Perigee 29th January, 9 30 p.m.

Venus will be apparently near Saturn (5 degrees North) in the early morning of the 16th when passing to the eastward of the much larger and more remote planet.

On the 19th at 4 p.m. the Moon will be apparently very near Saturn (1 degree South). This will form an interesting daylight spectacle for observers possessing telescopes.

The occultation of Mars by the Moon on the 20th and of Jupiter on the 27th will take place when they are far below the horizon.

6 Feb.	○	Full Moon	6 11 a.m.
14 ,,	☽	Last Quarter	5 5 a.m.
21 ,,	●	New Moon	7 40 p.m.
28 ,,	☾	First Quarter	1 20 p.m.

Apogee 13th February, at 2 6 a.m.
Perigee 24th February, at 9 30 p.m.

An occultation of Eta Leonis (magnitude 3·6) by the full moon will take place on the 7th at about 2·15 a.m. at Townsville and about 2·25 a.m. at Warwick. At the latter place its reappearance will occur about 10 minutes later; both disappearance and reappearance being on the upper edge of the Moon, somewhat to the right.

The elusive planet Mercury will be at its greatest distance east of the Sun (18 degrees) on the 9th.

An occulation of Nu Scorpii (magnitude 3·9) should occur at Warwick at about 12·45 a.m. on the 15th while the Moon is rather low down in the east.

Venus and Mars will be in proximity to one another, especially on the 14th and 15th, when seen about one and a-half hours before daybreak, above the eastern horizon.

Saturn will be two degrees north of the Moon at 5 a.m. on the 15th. An interesting spectacle will be formed by these bright objects an hour or two earlier in the east, before the sunlight dims the effect.

There will be an occultation of a small star in Sagittarius (Magnitude 4·8) in Southern Queensland, where it will be only just covered by the northern edge of the Moon, at about 2·45 a.m. on the 17th at Warwick.

Early risers on the 19th will find a pretty sight awaiting them; the crescent-shaped Moon and the beautiful star Venus will be displayed in juxtaposition well above the eastern horizon, about 24 degrees, or four times the length of the Southern Cross, south of east.

The conjunction of Mercury and the Moon on the 21st will be invisible on account of their nearness to the Sun.

Mercury, instead of passing directly between the Earth and the Sun on the 24th, will be three and a half degrees below it, well avoiding a transit.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

A New Vision of Agriculture.

THE recent announcement of the Minister for Agriculture and Stock (Mr. W. Forgan Smith) on the constitution of the Board of Agriculture was received very favourably by the Press, and the setting up of the new co-ordinating agency was commended strongly in able editorials. In the course of this comment it was recognised that there is an enormous field for such a Board, that it could do a tremendous amount of useful work by collecting the results of scientific investigation, and by helping to solve for the farmers many of the intricate problems ordinarily beyond their own resources. It was realised that each phase of agriculture has its own specific difficulties, and the value of a Board of Agriculture would be that it would so correlate the efforts of its constituent departments as to obviate overlapping and yield the best results.

Entomological and plant pathological problems are of immense economic importance. Each year enormous waste is caused by animal and vegetable pests, and their eradication or control are matters that must continue to receive the close attention of our scientific investigators and field workers, and through the new Board of Agriculture it will be possible to institute a thoroughly sound collaborative scheme which will be of great value to the whole industry. One leader-writer reminds us that the new vision of agriculture was very vividly described by Sir Alfred Mond at a luncheon he gave to delegates to the Imperial Agricultural Research Conference in London a few months ago. "The position of agriculture in the world," he said, "is slowly being recognised. Curiously enough, although it is the most vast industry and the most fundamental industry in the world, it has, on the whole, been carried on without much regard to a scientific basis. It has, on the whole, been carried on by people who have worked hard, and who have reaped on the whole very small, if any, reward. But throughout the history of the world it has been looked down upon as a thing which could be carried on by relatively uneducated people, and as being of relatively small importance.'' The commentator continues:—''But all that is now rapidly changing, and Queensland can claim that it saw, many years ago, the change approaching. Agriculture and animal husbandry are coming to be highly-skilled professions, and in this State abundant opportunities are being provided for those now engaged on the land to extend their knowledge and improve their methods, and for the younger generation to qualify themselves thoroughly for all branches of primary production. . . . . In the last session of Parliament a Bill was passed authorising the setting up of primary produce research stations. One of the immediate aims of this measure is to assist the banana-growing industry. Whatever is done under the Bill will require to be co-ordinated with the work of the University and the Agricultural College, and here a use for the new Board of Agriculture is indicated. Similarly, the employment of the most efficient methods for the transport of fruit is of vital concern to the Committee of Direction of Fruit Marketing, and calls for research in one quarter, instruction in another, and the dissemination of information from another. The new Board of Agriculture can be of very valuable service in these and other matters as an agency of liaison and co-ordination among all bodies concerned in the development of agriculture.''

"Ploughing Lonely Furrows"—The Call for Co-ordinated Effort.

THE new Board of Agriculture is evidently one of the first fruits of the seed sown by the Public Service Commissioner (Mr. J. D. Story, I.S.O.) on the occasion of the opening of the new biological laboratory at the Queensland University in November last, when he emphasised the desirability of co-ordination in State Departments. In his address he pointed out that to-day we had the Press and public men stressing the necessity for closer relationship in many ways between Britain and the Dominions for the sake of the wellbeing of the Empire as a whole. Missioners had toured the Dominions with that end in view. In a minor way he pleaded for closer relationship at home—namely, in many of the State Departments. He feared that if we were not wise in time there would be much overlapping, much misdirection of effort, and much unnecessary waste in the various State and semi-State scientific, technical, and educational departments. There was the University with certain scientific departments, the Department of Biology being one of them; the Department of Agriculture with its botanical, entomological, pathological, and chemical sections; its bacteriological stations at Yeerongpilly and Townsville; its Sugar Experiment Stations and its State Farms. There was the Education Department with Gatton College. Now what relationship existed as amongst all these departments and sections? To what extent did officers confer with each other on matters which were of common interest? To what extent did they co-ordinate their work and general activities? Was there not far too much ploughing of lonely furrows and too little concerted effort? And this although the State paid. The Commonwealth, too, was now entering the field of research. He suggested that the time had come when a comprehensive review of the present situation should be made, steps taken to ascertain with some degree of definiteness the most pressing problems relating to primary production, or to the secondary industries closely allied to primary production, which were at present awaiting solution, and concerning which research was essential to their elucidation. He thought that if the scientists would confer and take stock of the situation they would be able to evolve a scheme of useful co-ordinated work which would be helpful not only to production but to themselves. By judicious allocation of work amongst the several sections, results might be expedited and the scope of investigations widened without material increase in expenditure. Where there was a will there was a way. He fully realised that each section might have to a degree separate functions to perform, and that administrative control must be safeguarded. He felt, however, that more would be accomplished by the sections keeping in touch with each other and working in a kind of elastic unison than by working as alien detached units. But if effective unison were to be secured there must be mutual trust and goodwill. Mere passive acquiescence was worthless; indeed, it was worse than direct hostility. Hostility could be met and overcome, but the very subtle elusiveness of passive acquiescence made it difficult to grasp and strangle. He, therefore, made an earnest plea for closer relationship amongst the cognate sections and scientists.

Fits and Misfits.

ARCHBISHOP DUHIG, whose public addresses always command attention, and whose ideas of sound citizenship so expressed always receive the commendation of thinking people, had some important things to say to a Brisbane lunch-hour audience recently. Speaking on the subject "Obstacles and Aids in Road of Progress," he opened with a reference to misdirected energies—obvious incongruities that might pass unobserved by the superficial mind and the indifferent eye, but must forcibly obtrude themselves on any one who has acquired the habit of serious thinking. These misdirected energies were observable in individuals, whole communities, and in Governments of countries. There was in every community a tremendous waste brought about by misfits in life, and by energies which, if directed in the right channels, would be fruitful and productive, but, misdirected, were worse than lost, for they were not only wasted themselves, but caused waste in the matters in which they were employed.

In every community, he said, there was a tremendous waste brought about by misfits in life. Communities, he remarked, rarely classified their energies. A large percentage of men fell into life's activities at haphazard and in the wrong place. Many having thus got in brought themselves to believe that they were specially created for the positions they filled, and ignored the fact that their lack of adaptability or knowledge was going to be a big obstacle to the success of the undertakings they would be called upon to handle. There was in life a place for every man, but many men were in the wrong places in life. They were there through circumstances which were absent in the cases of others really fitted for the work to be done. Many great men had been "discovered," and the world had benefited by their discovery. Artists, musicians, engineers, men of business genius had simply been "discovered." Through circumstances they had taken up positions where their energies were being misdirected, but a discerning eye, through some outward indication, had peered into their latent powers and led them into spheres in which they were able to render splendid service to society.

Elimination of Economic Waste.

IT was particularly necessary in a young country like Australia, Archbishop Duhig continued, that energies should be properly directed and economic waste eliminated. Queensland particularly needed every help that any one of her citizens could contribute towards her development. The point was to have the contribution rightly timed and rightly placed. Progress there was to-day, and they were all proud of it, but it was not well balanced. For instance, young men admirably adapted for country pursuits had come into the cities to fill spheres of usefulness of much less importance. They would tell you that they had been brought in by economic pressure. The drudgery of the farm repelled them, while the high wages of the city attracted them. Yet it would be a thousand times better for Queensland, and much better for the majority of those young men themselves and their families if they could have been advantageously kept in the sphere of primary industries. Australia, and Queensland particularly, possessed what was fundamental to prosperity—abundant natural wealth. Two main factors were necessary to bring about permanent prosperity—namely, capital and men, and the right kind of men was quite as essential as capital. To choose the wrong stamp of man or turn capital into wrong channels must obviously be detrimental to progress. Here they came face to face with the necessity for good government, because a young country like this, with immense undeveloped resources and millions of acres of Crown lands, must depend largely for its development on a sane government policy, and a sane policy could come only from a Government that had at heart and above all party considerations the good of the whole community; from a Government that would be careful to direct national funds into channels of the highest usefulness, particularly in the development of primary industries. As it was possible for the individual to waste his energy and his means by directing both into wrong channels, so was it possible for municipalities and Parliaments to do the same. The making of laws was one thing, their administration was another. Without good administration, legislation, no matter how good, was largely nullified. If misplaced persons and misdirected energies were a bar and a hindrance in the smaller affairs of life, they were a calamity in the greater ones. Conscientious public men would regard their trust as a sacred one from the people, and remember that God and the people would hold them responsible for it.

Bureau of Sugar Experiment Stations.

FERTILISER TRIALS.

The following fertiliser trials as carried out on the Sugar Experiment Stations should be of considerable interest to cane farmers. The results show that careful fertilising, combined with the best cultivation, will give payable results, and in many cases a handsome profit per acre.

As a rule, mixed fertilisers containing sulphate of ammonia, nitrate of soda, sulphate or muriate of potash and phosphates give the best results.

The Experiment Stations, in fertilising trials, do not manure the land, but manure the cane. By this is meant that in the application of fertilisers consideration is given as to what should suffice the crop for the season; the manures are applied at the right time, and the cultivation of the cane is good.

BUNDABERG.

Results from experiments with and without manures, Sugar Experiment Station, Bundaberg. Standover crop of first ratoons. Cane value, 30s. per ton:—

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertiliser in Tons Cane per Acre.	Cost of Manure and Application. £ s. d.	Increase in Value of Crop due to Fertilisers. £ s. d.
Mixed Manure— Sulphate of Ammonia, 1 cwt. Nitrate of Soda, 1 cwt. Sulphate of Potash, 1 cwt. Meatworks Manure, 1 cwt.	80·75	20·21	3 15 0	26 11 3
No Manure	60·54	..	..	..

Results from experiments at Bundaberg with single and mixed fertilisers. Plant crop. Cane value, £2 per ton:—

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers. Tons per Acre.	Cost of Manure and Application. £ s. d.	Increase in Value of Crop due to Fertilisers. £ s. d.
300 lb. Sulphate of Potash ..	22·17	6·79	2 10 0	11 1 7
200 lb. Sulphate of Ammonia ..	18·09	2·71	2 0 0	3 8 4
265 lb. Nitrate of Soda. ..	19·36	3·98	2 11 0	5 8 2
300 lb. Superphosphate ..	13·48	1·90 (loss)	1 10 0	5 6 0 (loss)
600 lb. Mixed Manure containing— 100 lb. Sulphate of Ammonia 100 lb. Nitrate of Soda 100 lb. Muriate of Potash 300 lb. Superphosphate	23·40	8·02	4 5 0	11 15 0
No Manure	15·38	..	..	..

Results from manuring at Sugar Experiment Station, Bundaberg. Cane value, 35s. per ton:—

Manure Applied.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	Cost of Manure and Application.	Increased Value of Crop per Acre for use of Manure.
			£ s. d.	£ s. d.
Mixed Manure— Sulphate of Ammonia, 1 cwt. Nitrate of Soda, 1 cwt. Sulphate of Potash, 1 cwt. Meatworks Manure, 1 cwt.	37·29	22·67	3 15 0	35 18 4
No Manure	14·62	..	..	..

SOUTH JOHNSTONE.

Results of experiments at South Johnstone with fertilisers. Cane value, £2 per ton. First ratoons—eleven months old:—

Manure Applied.	Tons of Cane per Acre.	Increased Yield due to Manure in Tons Cane per Acre.	Cost of Manure and Application.	Increased Value of Crops per Acre for use of Fertilisers.
			£ s. d.	£ s. d.
Mixed Manure— Sulphate of Ammonia, 100 lb. Nitrate of Soda, 150 lb. Sulphate of Potash, 100 lb. Superphosphate, 250 lb.	36·08	7·65	4 5 0	11 1 0
No Manure	28·43	..	..	..

POTASH FERTILISER TRIALS AT BUNDABERG.

Remarkable results have been achieved by the use of potash on the red soils of the Sugar Experiment Station in the Woongarra district of Bundaberg. When these soils were analysed some years ago they showed a very low percentage of available potash, in places as low as 13 lb. per acre. The use of potash was thus indicated from the chemical results, and experiments were undertaken to confirm this finding by field practice.

The vital necessity for potash upon the red soils of Childers and Bundaberg has been advocated for a long time, and these experiments prove that such advocacy is warranted.

It is not contended that dressings of potash alone will always give higher results than mixed fertilisers upon the red soils, but we believe they will do so at first where the potash content is low as it is in the two districts mentioned.

On the Northern alluvial soils, where the available potash is higher, potash alone would not give such an increase in yields.

We have also found that potash manures applied at the rate of 300 lb. per acre have a great effect in preventing the yellowing of the cane leaves and accompanying stunting of the sticks, which is often prevalent in the Bundaberg district.

The financial results of these experiments are shown in the following tables:—

Experiments using potash manures only upon the red soils of the Woongarra, near Bundaberg. Plant crop. Cane value, £2 per ton:—

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertiliser in Tons Cane per Acre.	Cost of Manures and Application.	Increased Value of Cro due to Fertiliser.
			£ s. d.	£ s. d.
No Manure	26·29	..	..	..
300 lb. of Potash	44·21	17·92	2 10 0	33 6 9

Experiment using potash manures only upon the red soils of the Woongarra district, near Bundaberg. Cane value, £2 2s. per ton. Average result of plant and ratoon crops:—

Potash Fertiliser Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons of Cane per Acre.	Cost of Manure and Distribution.	Increase in Value of Crop due to Fertiliser.
			£ s. d.	£ s. d.
No Manure	12·49	..	..	..
300 lb. of Potash	22·62	10·13	2 10 0	18 15 5

Results of experiment with manures containing a heavy dressing of potash on poor red scrub soil at Bundaberg Sugar Experiment Station. First ratoons. Cane value, £2 per ton:—

Manures Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
No Manure	16·18	..	..	..
Mixed Manure Containing— Nitrate of Soda, 100 lb. Sulphate of Ammonia, 100 lb. Potash, 200 lb. Meatworks Manure, 200 lb.	26·60	10·42	4 10 0	16 6 9

PARADICHLOROBENZENE FOR COMBATING CANE GRUBS.

INTRODUCTION AND PAST HISTORY.

By EDMUND JARVIS, Entomologist.

BUREAU OF SUGAR EXPERIMENT STATIONS.

In the following article will be found a brief review of our past experiments carried out in the Cairns district with paradichlorobenzene, and the results obtained with it against *Lepidoderma albohirtum* Waterh. ("greyback cane beetle"), together with a detailed description of this soil fumigant, its methods of application, when and how to apply it, and the cost per acre for such treatment.

Initial experiments against the grubs of this notorious cane pest were commenced by the Bureau at Gordonvale during February to April, 1915. At that time no attempts to combat the ravages of root-eating scarabæid grubs by fumigating cane land with paradichlorobenzene had been recorded in other sugar-growing countries; although during the same year (1915) its use as a commercial insecticide was demonstrated in America, where it was shown to be an excellent fumigant for destroying insects attacking stored products, &c.

Strangely enough at the very time when such conclusive results were being obtained in the States, our laboratory experiments at Gordonvale with paradichlor. against cane grubs were also proving highly satisfactory (see Bulletin No. 17, pp. 16 and 17).

Some years later (1923) our first field plots were laid down at Meringa and elsewhere, and in spite of encountering drought conditions and other disadvantages, successful results were again obtained (see Bulletin No. 18, pp. 49-58).

In the following year (1924) data yielded by several experiment plots established by our Sugar Bureau in various portions of the Cairns district served to further demonstrate beyond doubt the value of paradichlor. as a grub destroyer (Bulletin No. 19, pp. 37-47). Taking, for example, our experiment plots at Woree (see accompanying plate) it should interest growers to learn that according to figures supplied by the Colonial Sugar Refining Company, who weighed and crushed the cane harvested from these two plots at their Hambledon mill, the area treated with dry nodules of paradichlor. yielded cane at the rate of 27.208 tons per acre, whereas the grub-affected cane cut from the adjoining untreated check plot of similar size gave a yield of 14.032 tons per acre, representing the gain of an additional 13.428 tons of cane per acre as a direct result of such fumigation (see Bulletin No. 19, p. 57).

During 1921 experimentation was commenced by the Bureau of Entomology at Washington, U.S.A., in hopes of discovering some means of successfully combating the "Peach Tree Borer" (*Ægeria exitiosa* Say., the larvæ of which tunnel in and destroy the roots of peach and other fruit trees, causing injury amounting at that time to about 6,000,000 dollars a year. As a result of these experiments carried out during several seasons, Mr. E. B. Blakeslee, the entomologist in charge, clearly demonstrated that paradichlorobenzene when properly used was uniformly effective against this fruit pest, and in a recent Farmers' Bulletin No. 1246 states:—"There has now been accumulated a sufficient body of experience based on large scale commercial use, and further experiments by the bureau and others, principally the New Jersey Agricultural Experiment Station, to show that a practical economic method of control has been found for this heretofore almost invulnerable pest."

Finally, it is interesting to note in this connection that E. O. Essig (Professor of Entomology at the Californian Agricultural Experiment Station), in a bulletin published by him last October (1926), remarks:—"The wide use being made of this fumigant is well illustrated from the fact that during the year 1924, 39,695 lb., and in 1925, 59,469 lb., or a total of 99,164 lb. for the two years, were used in California, according to figures forwarded by one of the leading wholesale distributors."

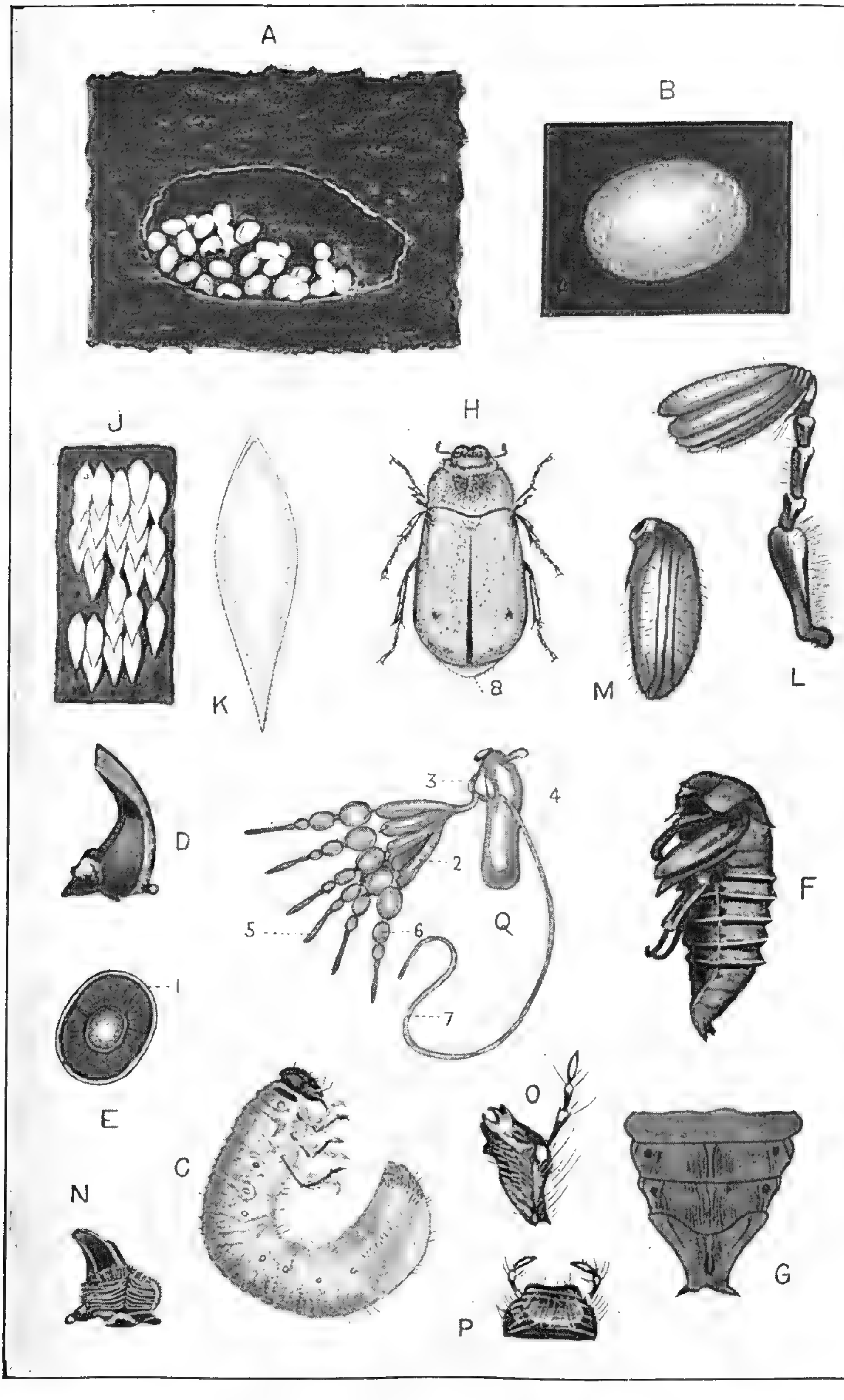

PLATE 44.
(For description of plate, see page 99.)

DESCRIPTION OF PLATE 44.

Fig. A.—Eggs of "greyback" cane beetle, *in situ* (nat. size).

Fig. B.—Egg of same (magnified).

Fig. C.—Grub of same, third instar (nat. size).

Fig. D.—Mandible of grub (enlarged).

Fig. E.—Stigma of grub of same (enlarged); 1, peritreme.

Fig. F.—Pupa of "greyback" cane beetle (nat. size).

Fig. G.—Dorsal view of abdominal segments 7 to 9 of same, showing arrangement of striæ.

Fig. H.—*Lepidoderma albohirtum* Waterh., male (nat. size).

Fig. J.—Portion of wing-case of same, showing arrangement of scales (enlarged).

Fig. K.—A single scale (highly magnified).

Fig. L.—Antenna of same, showing 5-lamellate club of male.

Fig. M.—Antennal club of female, with four lamellæ (enlarged).

Fig. N.—Mandible of same (enlarged).

Fig. O.—Maxilla of same (enlarged).

Fig. P.—Labrum of same (lower lip) (enlarged).

Fig. Q.—An ovary of same, eight days after copulation; 2, ovarian tubes; 3, oviduct; 4, copulatory pouch; 5, terminal chamber; 6, immature egg; 7, spermatheca.

PLATE 45.

One end of the plot injected with paradichlor. (E. C. Earl's estate at Woree), showing cane over the head of manager on left of photo. The man on right hand of photo., who did the injecting, is standing among the cane on the check plot, which has fallen over on the ground owing to grub injury. Photographed about six months after fumigation.

Description of Paradichlorobenzene.

Paradichlor., as it is commonly called here, is sold in the form of irregular crystalline, semi-opaque nodules, granules, or lumps of variable size, somewhat resembling coarse salt or washing soda, and of a colour ranging according to quality or price, from whitish-grey, through pale greens and yellows, to deep brown.

The vapour arising from it is harmless to human beings and domestic animals, and being about five times heavier than air diffuses downwards through the soil from points of injection, permeating also in a lateral direction, and upwards through the surface soil during brisk evaporation of moisture from the ground.

When acted upon by the air the nodules do not deliquesce, but very gradually volatilise; thus allowing ample time for the gas to do its deadly work. Paradichlor. possesses an odour resembling that of ether or benzine; is non-poisonous, cleanly to handle, and not inflammable. Although practically insoluble in water, the crystals will dissolve readily in chloroform, ether, carbon bisulphide, &c.

Plate 46.—Three Different Qualities of Crystalline Nodules of Paradichlorobenzene

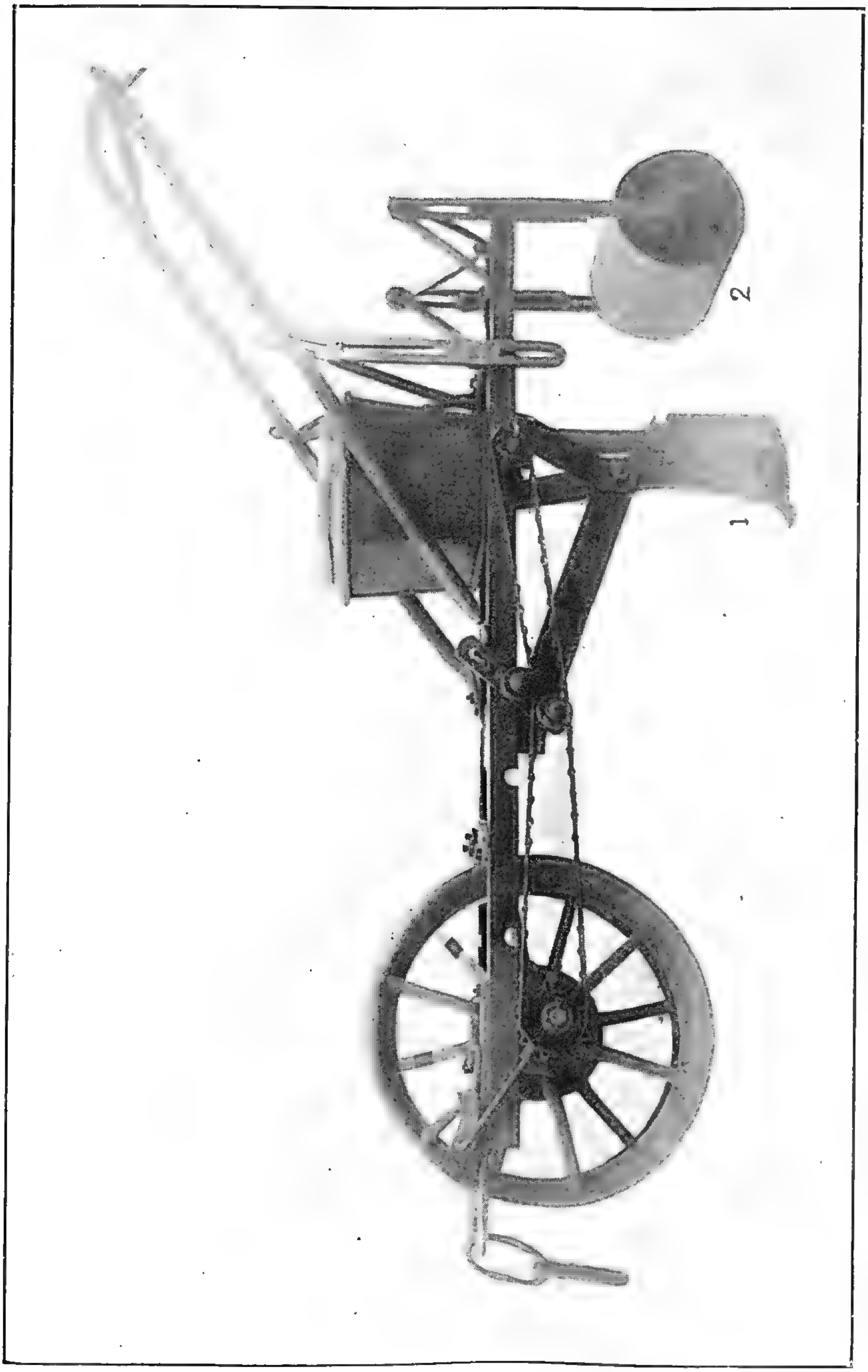

PLATE 47.—MACHINE FOR FUMIGATING GRUB-INFESTED CANE LAND WITH PARADICHLOROBENZENE IN DRY NODULAR FORM, DEPOSITING UNIFORM DOSES AT REGULAR DEPTHS AND DISTANCES APART, COVERING AND ROLLING SURFACE OF SOIL ABOVE SAME

(1) Swing-jointed coulter, protecting delivery tube. (2) Roller, having vertical movement, determining depth of injections.

Rate of Evaporation.

In the Cairns district during dry summer weather ¼-oz. doses of paradichlor.—when buried 7 inches deep in cultivated soil—were found by the writer to maintain effective fumigation throughout a period of about six weeks. Exposed to direct air and daylight, however, a similar dose of the crushed crystals (¼ oz.) evaporated completely in fifteen days under an average shade temperature of 84 degrees Fahr. As the rate of diffusion depends on degrees of soil temperature at the time of application, it is important to remember that the best results from the use of paradichlor. are likely to be obtained during November to January, when our average shade temperature varies from about 70 to 80 degrees Fahr.

Injections of ¼ oz. made in friable volcanic soil near Meringa on 25th January, 1923, lost only one scruple in two weeks (one-sixth of the original dose), while during this fortnight the fumes of paradichlor. had penetrated to a depth of 2 inches in unbroken subsoil, 10 inches in a lateral direction, and had permeated throughout the upper surface soil.

Methods of Application.

With regard to the various methods of applying this fumigant, the following have been tried at Meringa Experiment Station, viz.:—(1) Machine application, (2) injecting, (3) dropping dose in an open furrow by hand.

By the first method a man and one horse could fumigate about three acres of cane per day. The appliance used is a corn-planter adapted by us for such work, by means of which uniform doses of dry nodules of paradichlor. can be buried close alongside rows of cane at regular depths and distances apart; the soil above them being at the same time levelled and slightly consolidated by means of a special roller attached to the machine (see illustration on page 102).

The second method of applying this fumigant was made possible by an injector invented by the writer in 1921 for conducting initial field experiments (see illustration, page 104). This appliance met our need at the time, and answered admirably for treating experiment plots. Without some such simple injector, indeed, it would have been impossible to place in hard ground—except by hand with trowel or dibble—doses of the dry crystals at uniform depths and distances from each other and from the cane rows. Not having been designed for general work in canefields, a novice using this injector would not at first do much more than one-quarter to one-third of an acre of cane per day of eight hours; which would mean the making of from 4,000 or 5,000 separate injections. It may be well to mention here that our best results were obtained on plots where the paradichlor. had been applied in this manner.

Dropping the dose by hand at regular distances in the bottom of an open furrow ploughed close alongside cane rows, and then covering same by returning the soil, is a method which should be given a good trial, and will be further studied by us with a view to securing quicker and more uniform application by use of some simple mechanical dropper.

Note.—It would be well to state in this connection that another method of applying paradichlor.—viz., by dissolving it in bisulphide of carbon—has been tried at Goondi and elsewhere, and its use recommended by officers of the Colonial Sugar Refining Company employed to investigate diseases and insect pests of cane.

On account of the fact, however, that when dissolved in this way the most desirable quality of paradichlor. as a soil fumigant—viz., its long sustained toxic action—is practically destroyed, while at the same time additional cost is incurred for labour and material by employing two insecticides when either of them if used alone would do the work required, such method of fumigation has never been advocated by the present writer.

It is this undoubted advantage of sustained action possessed by paradichlor. in dry form over other soil fumigants which has led to its extensive use in America and other countries as a controlling agent against some of the most formidable insect pests known to economic entomologists.

One is forced to admit that when the fumes from injections of dry nodules of paradichlor. continue active day after day for a fortnight or longer in infested cane land, the toxic vapour can hardly fail to ultimately reach grubs chancing to be ensconced in compacted lumps of soil not easily entered by such vapours; or those grubs that so often lie directly under the stools in earth more or less consolidated by increasing pressure due to expansion during growth of the basal portions of the cane sticks and main roots, where the soil is a little moister as a rule than that disturbed by cultivation and proportionately difficult to permeate.

Further, with regard to the matter of dissolving paradichlor. in liquid mediums, it was shown by experiments conducted in America during 1923 in connection with the fumigation of insects, that when paradichlor. is dissolved in carbon tetrachloride (a fumigant often used in the place of carbon bisulphide for combating subterranean larvæ, &c.) that about 1 per cent. only of the paradichlor. is given off during evaporation of the carbon tetrachloride, and that this small proportion of 1 per cent. is obtained regardless whether the amount of paradichlor. used be large or small, thus indicating that the toxicity or killing-power of the former insecticide is not greatly changed by such addition of paradichlorobenzene. Similarly, when

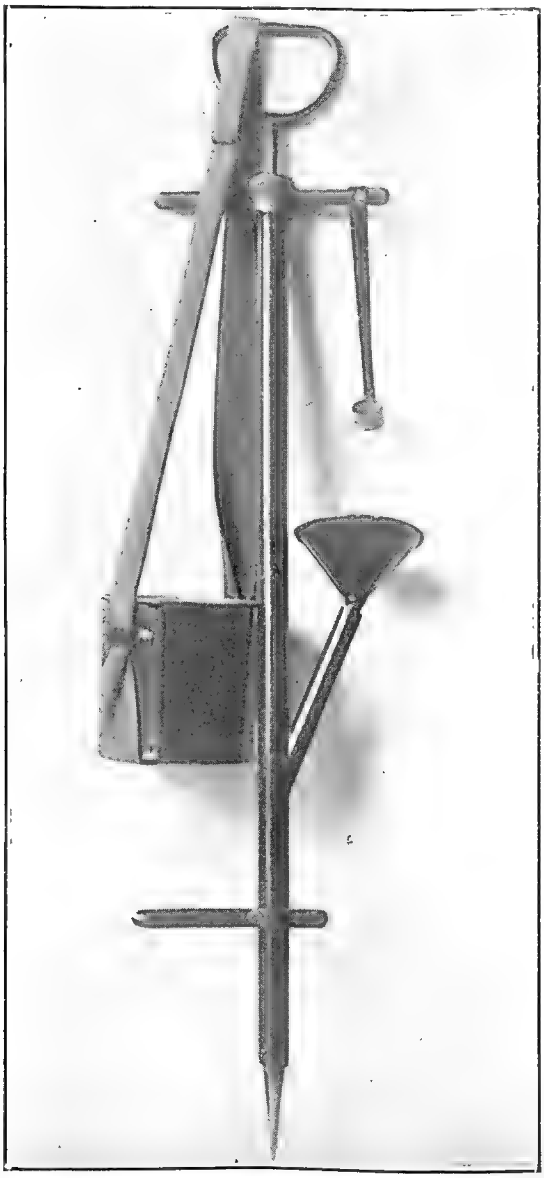

PLATE 48.—JARVIS' HAND-INJECTOR FOR FUMIGATING GRUB-INFESTED CANE-FIELDS WITH PARADICHLOROBENZENE (ABOUT ONE-EIGHTH FULL SIZE).

dissolved in carbon bisulphide the toxic action of paradichlor. lasts no longer practically than that resulting from fumigation of soil by carbon bisulphide when used alone.

Before applying paradichlor. (either by machine or hand injection) all large lumps or nodules should be crushed up and the whole passed through a sieve with ¼-inch meshes.

Quantity and Cost per Acre.

This would necessarily vary somewhat according to weight of the dose and distances allowed between injections.

When treating ratoon crops 3 to 4 feet in height by machine application, a dose of 1¾ drachms (Apoth.) could be used on badly infested cane land; although in most cases ⅛ oz. will be found sufficient. For plant cane from 1 to 2 feet high the dose should be about 1 drachm; and for still smaller cane 2 scruples (Apoth.) would prove effective. In each case these doses are to be administered from 5 to 6 inches from the nearest cane shoots, 15 to 18 inches apart, about 4½ inches deep, and on both sides of the rows.

Approximately, the quantities required per acre work out as follows:—

Dose of 1 drachm—

Placed 15 inches apart	= 113 lb.
Placed 18 inches apart	= 98 lb.

Dose of 4½ scrup.—

Placed 15 inches apart	= 169 lb.
Placed 18 inches apart	= 147 lb.

The probable cost per acre, including labour for treating such ratoon and plant crops by machine application, would depend largely, of course, upon the market price of paradichlor. At the present time (November, 1927) the cost works out at about £6 15s. for maximum doses—applied in exceptional cases to advanced ratoons—and £4 10s. for the majority of crops requiring fumigation.

Future experimentation, however, with smaller doses of paradichlor. is likely to effect a reduction in the costs mentioned above, seeing that field experiments already alluded to, undertaken during 1923, demonstrated that the vapour arising from a dose of only 1 scruple (1/24th of an oz. Apoth.) injected 6 inches deep in volcanic land, are sufficient to permeate and sustain effective fumigation during a period of two weeks. In well-drained friable soils this would permit ample time for the toxic vapours to reach about 95 per cent. of the grubs; so that in such situations it would not be necessary to extend fumigation over a longer period.

Price of Paradichlorobenzene.

This chemical can be obtained from Messrs. Buzacott and Company, Limited, of 7-11 Market street, Sydney, at the following prices:—32-lb. tins, 10d. per lb.; 8-lb. tins, 1s. per lb.

The quality supplied by the above firm, which is sold in the form of large rock-like brownish-black lumps of variable size, appears to possess good toxic properties; the vapour, when closely confined in a glass jar, tending to soon form large oblong crystals, which are thin, plate-like, and nearly transparent, and may be seen adhering in great numbers to the glass inside.

When to apply Paradichlorobenzene.

The best months for treating late-planted cane and ratoon crops is during a period dating from the middle of December to end of January, while the soil is not too wet, and grubs still in their first and second stages of growth. In the event of emergence of the beetles being delayed until the beginning of December, as often happens, fumigation may be carried out about the middle of January.

The soil at time of treatment should be nicely moist, neither too wet or very dry, in a condition to work freely without sticking. A capital test is to examine with a pocket lens of good magnification a small piece of soil between the rows of cane, taken without compression from a depth of about 6 inches. The individual tiny soil particles can then be clearly seen, and in ground not sufficiently aerated for fumigating, water will be distinctly observed filling the interstices between these particles. Treatment must never be delayed until after commencement of the wet season, when grubs have started to noticeably damage the crop, or the chances are that on low-lying situations, or on areas supporting cane of a size to completely overshadow the ground between the rows, such land may remain closed for several weeks against passage of the fumes.

An instance of such late treatment happened during 1923 on a piece of land at Woree, which was injected on 19th March, when grubs were fully grown and external injury to the cane apparent.

Treatment in this case was followed almost at once by a fall of 14 inches of rain spread over a period of eleven days.

The crop being higher than one's head naturally prevented the ground from drying, and when examined about three weeks later we found—upon digging up and weighing some of the doses—that no appreciable evaporation of the paradichlor. had taken place, owing, doubtless, to the soil having remained waterlogged; and that nearly all the grubs were alive and quite normal.

When this water had mostly drained away, which occurred about a couple of months after injection of the paradichlor., another examination of these plots revealed a mortality of about 50 per cent. of the grubs.

The following instructions regarding the best time to commence fumigation work on different classes of soil will be found useful to canegrowers:—

Light, friable volcanic soils—From four to five days after a fall of about 3 inches of rain.

Sandy soils—Two or three days after heavy rain.

Clay loams or sandy loams—About six days in well-worked and well-drained land.

Fumigation of heavy clay ground is seldom advisable, unless such land be very well cultivated and treated with organic manures and thoroughly drained; but, fortunately, this class of soil rarely becomes seriously grub-infested.

In the event of wet weather occurring a few days after an application of paradichlor., the very slight solubility of this chemical in water is, of course, greatly in its favour, since during wet conditions evaporation of the crystals simply remains in abeyance, as it were, becoming operative again as soon as excess of moisture has drained away.

Does not Injure Cane Plants.

During November of 1922 a field experiment was carried out at Meringa, in which forty-eight stools of young plant cane about 14 inches high, growing on volcanic soil, were treated with ¼ and ½ oz. injections placed along one side of a row of D. 1135, and from 4 to 6 inches from the stools. An adjoining row of similar cane on each side of the treated row served as check plants.

Some of these injections were placed immediately opposite stools, and others diagonally, in intermediate positions, all being 6 inches deep. When examined a few months later none of the treated stools were materially injured by this fumigant, while some months later still, growth of both the treated and check rows was found to be quite normal, not a single stool having been stunted in any way (see Bulletin No. 18, pp. 25, 26).

On experiment plots established at Sawmill Pocket, Woree, Highleigh, Meringa, and elsewhere during 1923-24, on which the varieties Badila, Clark's Seedling, and D. 1135 were fumigated with injections varying from 1/16th to ¼ oz. of paradichlor. to test its action upon the growth of young ratoon and plant cane, the results in all cases showed that this fumigant when properly applied does not in any way injure the plants.

On one of these experiment plots (D. 1135) the owner, indeed, noticed that, although no evidence of grubs could be found in the treated or check areas, the cane on the fumigated plot appeared slightly higher than that on the adjoining check plot.

Upon comparing the length of the sticks from these two plots while lying in the field after cutting, this difference in tonnage was quite marked.

Another grower who fumigated some of his cane last season (1926-7) discovered when getting his returns and figures from the mill that the cane he had treated with paradichlor. showed a higher percentage of sugar than that cut from the check plot.

In this case also, no apparent grub-infestation chanced to occur in either of these two plots. The quality of paradichlor. used was that sold in the form of black, rock-like masses at 10d. to 1s. per lb., and was applied with a cane fertiliser machine.

Used against other Insect Pests.

Growers should not lose sight of the fact that paradichlorobenzene holds first place among the various insecticides employed both in Europe and America for controlling not only soil-frequenting larvæ of some of the most serious insect pests, but also for combating numerous world-wide species of great economic importance affecting stored foods and other products.

When first employed in California against the "Pacific Peach Tree Borer" (*Ægeria opalescens* H. Edw.), "preliminary tests," states E. O. Essig, "demonstrated at once the efficacy of the paradichlorobenzene treatment, and immediately presented an unexplored field in the control of agricultural pests, and particularly those difficult and hitherto almost uncontrollable forms which inhabit the soil."

The following list of a few of the more serious insect pests against which paradichlor. is at present being used may interest some of our farmers:—

Ægeria exitiosa Say.—"Peach Tree Borer"; for larvæ boring the main roots.
Ægeria opalescens H. Edw.—"Pacific Peach Borer"; for larvæ boring roots of peach, cherry, prunes, apricot, and other trees.
Eriosoma lanigera Haus.—"Woolly Blight" or "Apple Root Aphis."
Eriosoma languinosa Hartz.—"Pear Root Aphis."
Gortyna immanis Gn.—"Hop Borer"; for aphides on roots.
Diatræa saccharalis F.—"Moth Borer"; to destroy caterpillars in cane sticks before planting.
Rhizoglyphus sp.—"Bulb Mite."
Capnodis tenebrionis L.—"Root Borer" attacking plum and cherry trees.
Wireworms in dahlia roots.—*Note:* Splendid results have been recorded in California against this pest infesting planted dahlia roots.
Miscellaneous insects attacking furs, carpets, &c.
Caterpillars infesting stored fruits.
Insects attacking stored products, grain, nuts, &c., &c.
Termites in houses (for fumigating confined spaces).
Beetles damaging stored timber.
Flies, ants, cockroaches (these are readily killed by using 1 lb. to 100 cubic feet of air space).

Points to be Remembered.

(1) The correct time for administering paradichlor., modes of fumigating, cost per acre, &c., described in this pamphlet, apply only to the "greyback cockchafer," our chief pest of sugar-cane, which has a life-cycle of one year.

(2) Do not use excessive doses. From 1½ to 3 scruples weight (Apoth.) is sufficient in most cases for plant cane 1 to 3 feet high; and 5 scruples for older plant or ratoon crops.

(3) When treating very young plant cane avoid placing the crystals closer than about 5 inches from the nearest shoots.

(4) Do not fumigant when the soil is very dry, or while it is excessively wet.

(5) Only one treatment is needed each year—to be given when possible during December or early in January before commencement of the wet season.

(6) Store this insecticide in airtight tins when not in use, or in closely-fitting wooden boxes, to prevent waste from needless evaporation of the crystals.

(7) Order supplies in good time (about end of July or early in August).

DESTROYING CANE GRUBS WITH CARBON BISULPHIDE.

PREFATORY NOTE.

The reputation of this fumigant for combating the activities of numerous species of insects attacking miscellaneous stored products, such as dried fruits, leather goods, tobacco, flour, &c., or damaging the roots of many trees or plants of great economic value may be said to be world-wide, its suitability for such control work having been amply demonstrated during the last forty years or more.

It was used in Australia as far back as the year 1891, when Mr. C. French, senr., who at that time had just been appointed Government Entomologist in Victoria, recommended it for controlling the ravages of the "Apple Root Borer" (*Leptops hopei*).

More recently, carbon bisulphide has been employed in our canefields against grubs of root-eating scarabæid beetles; and when applied intelligently appears to have given general satisfaction.

It should be mentioned here that during 1905 experiments on a large scale were carried out in canefields at Mossman under the supervision of Mr. W. E. Seymour-Howe, who subsequently published a pamphlet on the destruction of cane grubs by the carbon bisulphide treatment for the benefit of our Northern canegrowers.

This publication has proved very serviceable, as it describes how to manipulate a hand injector, and enumerates various important points worth memorising in connection with the use of carbon bisulphide.

I may state that its use against caterpillar borers or grubs tunnelling the roots of fruit trees, &c., has of late years been largely superseded by paradichlorobenzene; as although under proper conditions of soil moisture and porosity carbon bisulphide has proved an effective fumigant, its extreme volatility during ordinary temperatures renders it difficult at times to secure uniformity of evaporation under subterranean conditions.

Such troubles, due to variation in soil porosity, would naturally be liable to occur when fumigating the ground around the trunk of a fairly large fruit tree, which may have lain uncultivated for years, while subjected at the same time to uneven compression in different spots owing to growth and expansion of its main roots.

Soil conditions of the above nature, however, should very seldom be experienced in well-worked canefields.

Description of Carbon Bisulphide.

Most farmers are familiar with the appearance of this fumigant, which may be described as a colourless liquid with a very offensive odour, about one-fourth heavier than water, and considerably more than twice as heavy as air. Although not dangerous to handle as a fluid, its vapour explodes readily and violently if exposed to a flame or any incandescent object, which accordingly necessitates great caution on the part of the operator handling it. This should be carried out whenever possible in the open air, and away from any source of heat, even that arising from a lighted cigar or tobacco pipe. On this account carbon bisulphide is usually put up in iron drums, which ought always to be stored some distance away from any dwelling, and in a cool, well-ventilated spot. Upon exposure to the air this liquid evaporates with great rapidity, so that in order to be effective against such insects as cane grubs, the toxic fumes need to be confined in sufficient proportions to render the air occupying the tiny interstices between soil particles fatal to animal life.

Action of Carbon Bisulphide on Cane Grubs.

When injected into the soil close to a stool of cane, the volatile fumes, on account of being so much heavier than the air, tend to spread mostly in a lateral and downward direction.

Though gradually working upwards, the greatest density of the vapour is found to usually occur at the lower levels.

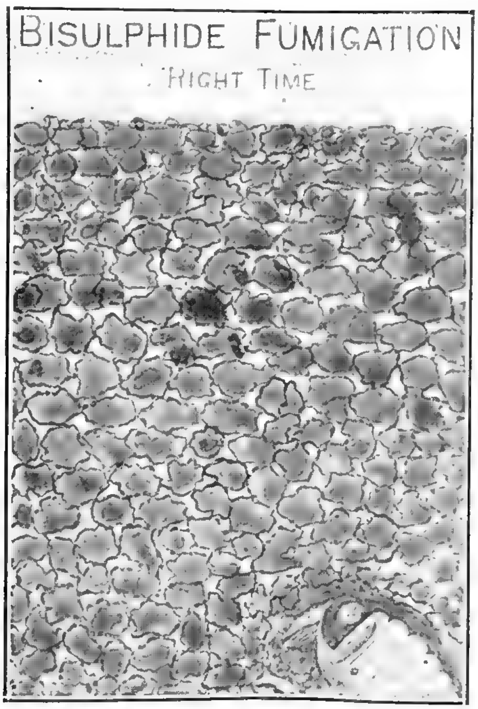

Photo.: E. Jarvis.]

PLATE 49.

DIAGRAMMATIC DRAWING OF VERTICAL SECTION THROUGH SOIL ABOVE A CANE GRUB.

(A) Interstices between soil particles filled with air, open for fumigation.

This fact was remarked by us when experimenting in the year 1923 with carbon bisulphide in a canefield against greyback cockchafers lying in pupa cells, when beetles situated at depths of 15 to 18 inches below the surface in unbroken subsoil were killed by ½-oz. doses injected 7 to 13 inches above them. It is important, therefore, to make sure that such doses are always made at least a couple of inches above the general level at which grubs happen to be feeding during the treatment of cane land.

The fumes upon reaching a grub act very rapidly on its vitality, producing paralysis and suffocation, as well as exercising other injurious effects on fats and proteins contained in the body.

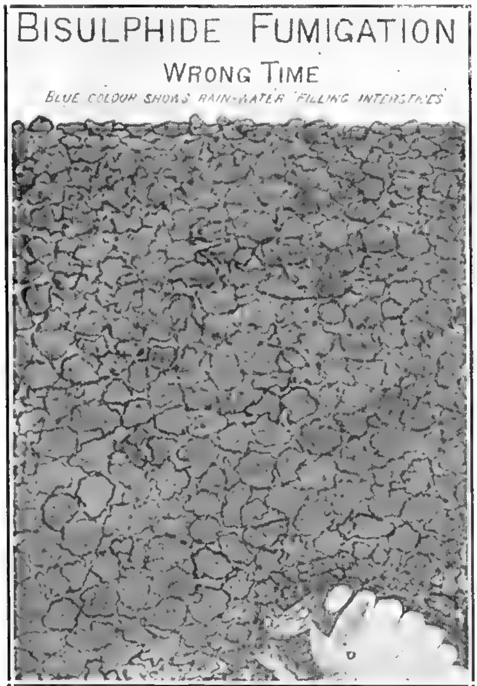

Photo.: E. Jarvis.]

PLATE 50.

(B) Interstices clogged with water, closed against fumigation.

How and When to apply Carbon Bisulphide.

This fumigant is usually injected into the soil by means of an appliance specially designed for the purpose, with which uniform doses can be administered at any depths or distances required. Familiar examples of reliable hand injectors are those known as the "Danks' Injector" and the "Vermorel Excelsior," both of these being forms of the old "Pal Injector" originally invented by Vermorel for fumigating the "Grape-vine Aphis" (*Phylloxera vastatrix* Planch.) in the vineyards of France.

The former appliance, which may be obtained from John Danks and Son, Bourke street, Melbourne, costs £10 10s., or £9 9s. if six or more be ordered at the one time. The freight on up to three injectors would be 18s. 6d. The "Vermorel Excelsior" is supplied by Cooper, Pegler, and Co., Ltd., of 24-26 Christopher street, Finsbury Square, London, E.C. 2, at a cost (including duty, wharfage, packing, &c.) of under £5. Full directions as to how to use same and regulate the various doses obtainable are sent with each appliance (see illustration on page 110).

Before applying carbon bisulphide to ground thought likely to prove infested, it should first be examined at a time when grubs are in their early stages of growth, in order to discover the extent and degree of infestation and the depth at which they happen to be feeding. The best time to inject is when the first inch or two of the surface is firm or slightly caked, while the main body of soil below is in a moist, well-drained, and open condition. It should be remembered that land is not fit for such fumigation unless it has lain undisturbed by cultivation for at least a fortnight.

A good way to find out whether it be in a fit state for treatment is to take a handful of soil from a depth of about 6 inches and squeeze it firmly between the palm and fingers.

If this compressed lump readily breaks into particles when dropped about 6 feet upon hard ground it shows that excess of moisture has drained away. Another method is to examine with a pocket lens a small portion of uncompressed soil taken from a similar depth, and look for the glint of water filling air-spaces between the minute soil particles.

PLATE 51.—"VERMOREL EXCELSIOR" HAND-INJECTOR, FOR FUMIGATING CANE LAND WITH BISULPHIDE OF CARBON (LENGTH 44 IN., WEIGHT ABOUT 14 LB.)

The following guide as to the best time for fumigating various classes of soil will be serviceable to canegrowers:—

Highland volcanic soil or coarse sandy loams—From four to five days after a fall of 2 or 3 inches of rain.

Clay loams or fine sandy loams—About six days on land that has been well worked and drained.

Sandy soils—Two or three days after heavy rain.

Fumigation of stiff clay land is never advisable, unless in cases where the drainage and cultivation happen to be exceptionally good, and organic manures have been freely used.

Failure to secure good results from the use of carbon bisulphide is generally due to lack of essential knowledge on the part of the operator. When a farmer who has neglected to fumigate at the right time suddenly notices external evidence of grub damage amongst his cane he generally hastens to inject at once, without waiting to find out if the soil be in a fit state for such treatment. The most propitious time for using this insecticide is during a period dating from about the middle of December to the end of January (see further directions on page 105 under heading "When to Apply Paradichlorobenzene").

Cost of Fumigation per Acre.

According to a late quotation (September, 1927) received by the writer, carbon bisulphide is supplied by Cumming, Smith, and Company at the rate of 38s. 6d. per drum of 60 lb., f.o.b. Melbourne.

The freight for this works out at £6 1s. per ton measurement of ten cases—that is, twenty drums to the ton measurement, or slightly over 6s. per drum. Allowing for this additional freight, the price asked for by their Brisbane agents (Messrs. Taylor and Elliott) would be £2 4s. 6d. per drum—practically about 9d. per lb.

The amount of carbon bisulphide required per acre would necessarily vary somewhat, according to the age, &c., of the stools treated. One drum per acre has been recommended by some authorities as being sufficient in most cases. For young plant or ratoon cane growing on friable classes of light soils, doses of about 1 drachm, injected 3 to 4½ inches deep, 18 inches apart, and on both sides of rows planted 5 feet apart should destroy 70 to 95 per cent. of the grubs. This would take about one and a-quarter drums (77 lb.) of carbon bisulphide per acre—equal to £2 15s. for material.

A similar treatment would be suitable for older plant cane or ratoon crops, either on clay loams or light soils, but in such cases it will often be found advisable to inject every 12 inches instead of 18 inches apart, which works out at about two drums per acre—equal to £4 10s. for material.

Unfortunately, the only way at present of applying carbon bisulphide in canefields is by hand injection, which, in addition to being expensive, is liable occasionally to be more or less uncertain as regards results obtained, owing to the difficulty of procuring men who will faithfully perform work of a disagreeable nature. Assuming, however, that a labourer can fumigate one-third of an acre in a day of ten hours—which is about as much as could be done when treating both sides of rows of cane planted 4 feet 6 inches apart, necessitating the making of about 6,100 separate injections—the total cost per acre for treating ordinary crops 2 to 4 feet high would amount to about £6 15s.

After making each injection the operator should close the hole left when withdrawing the spear of the injector by pressing loose earth into it with his heel to consolidate the ground above the dose.

During fumigation work in the field, instead of filling an injector by pouring into it the bisulphide from an ordinary drum, the entire contents of the latter are usually emptied at once into special drums fitted with taps, and placed on headlands or convenient roadways, from which the injectors in use can be easily replenished without incurring unnecessary waste of material.

Very favourable conditions for applying this fumigant are when the soil is firm, yet nicely moist, and with good porosity, while the surface is compacted owing to recent wet weather.

If very dry or too porous even large doses injected at such times may have little or no effect on soil-frequenting grubs or insects.

When fumigating orchards that have been indifferently cultivated, it is sometimes advisable to use a water emulsion of carbon bisulphide, which applied in this form has been found to standardise soil conditions, and prove uniformly effective without causing injury to the plants or young trees.

Manurial Value of Carbon Bisulphide.

We should not lose sight of the well-established scientific fact that carbon bisulphide, even when applied in strong doses, exerts a favourable influence on the soil, producing beneficial effects, and greatly improving the fertility of exhausted lands.

Its action, whilst resembling that of the bare fallow, is said to be more effective, as it gives immediate results by at once disinfecting soils so treated, and rendering them fit for new crops.

When using soil fumigants such as paradichlorobenzene or carbon bisulphide, it should always be remembered that in addition to the extra tonnage of cane obtained as an immediate outcome of such fumigation, beneficial results are also derived as a matter of course by the ratoon crops of the following season, owing to the absence of root-eating grubs and injurious soil bacteria, &c.

SUMMARY.

Carbon bisulphide is a volatile liquid, heavier than air or water, the vapours from which will explode if brought near fire, and when confined underground prove quickly fatal to animal life.

In well-aerated soils the fumes spread laterally and downwards, paralysing and suffocating all grubs or insects occurring within a radius of about 9 inches from points of injection.

Application is made by means of a hand injector, costing from £5 to £10, at a time when the ground is moist and permeable to the toxic fumes, and the surface even and slightly compacted by recent rains.

Doses of about ⅛ oz., injected from 12 to 18 inches apart, are placed just above the level at which grubs are feeding.

The best months to use this fumigant embrace a period dating from about the middle of December to end of January, while the cane shows no signs of being grub-affected.

Avoid working the soil for at least a fortnight, both before and after fumigating same with carbon bisulphide.

Cost of treatment per acre for labour and material varies from about £5 to £6 15s.

Carbon bisulphide possesses valuable manurial properties, and greatly improves the fertility of poor land or exhausted soils.

Do not apply carbon bisulphide to very young cane just beginning to make roots, but wait until the stools are established and the cane about 2 feet high.

Calcium Cyanide as a Soil Fumigant.

Laboratory experiments with calcium cyanide were commenced at Meringa Experiment Station during February, 1924, to determine the effect of hydrocyanic acid gas on the grubs of root-eating scarabæidæ. Data obtained at that time showed that a dose of 8 grains was sufficient to kill first-stage grubs of *Lepidoderma albohirtum* Waterh. (greyback cockchafer), and third-stage grubs of *Lepidiota frenchi* Blkb. in less than twelve hours.

This was sprinkled about 2 inches above the level at which they were feeding, in cages containing 36 cubic inches of soil, the dose being at once covered by moist earth to a depth of a couple of inches. Having proved that it would kill grubs located just under injections, a series of experiments were made to determine how far hydrocyanic acid gas would travel laterally underground with fatal results. The cages used for this work contained about 144 cubic inches of soil, the poison being placed in the centre of each cage, and about 1½ inches below the surface. In the first experiment three of these cages were used, and a first-stage *albohirtum* grub placed at opposite ends of each, 2 inches below and 2 inches to one side of the dose.

One of the grubs in each of these cages was prevented from moving farther away from the injection by a vertical screen of wire gauze. When examined twenty-four hours later, results were as follows:—

Cage A.—Dose 15 grains of calcium cyanide; both grubs dead in the position placed.

Cage B.—Dose 15 grains; grub imprisoned by wire gauze dead; other grub had moved to one side and was dead.

Cage C.—Dose 8 grains; both grubs dead in original position.

In another experiment in which 15 grains of this poison were buried 1½ to 2 inches below the surface, second-stage grubs were placed 4½ inches from the injection, laterally, and a couple of inches below same. When examined about twenty hours later results were as follows:—

Cage D.—Both grubs dead, but had worked about ½ inch nearer to the surface.

Cage E.—Both grubs dead.

Cage F.—One grub had travelled into corner of cage and was dead; the other sick, but able to move its legs.

In a third experiment conducted later second-stage grubs of *albohirtum* were placed 2 inches under, and 4½ to 5 inches away from, injections of 15 grains, and when examined twenty-four hours later results were as follows:—

Cage G.—Both grubs dead; one had moved 1 inch nearer the poison; the other was in original position.

Cage H.—Both grubs dead in original position.

Cage J.—Both grubs dead and soft; one had moved ½ inch nearer the poison.

Two months later (April, 1924) thirty-six third-stage grubs of *albohirtum*, each in a cage containing moist soil, were treated with 8 to 12 grains per cage of calcium cyanide flakes, placed 3 inches above the grubs, and after a lapse of twenty-four hours all grubs were found dead, and a strong odour of cyanide still pervaded the soil.

Experiments made to determine the effect of such fumigation on growing cane roots yielded highly encouraging results.

In the first tests doses of 40 to 60 grains were injected about 6 inches from shoots of young plant cane, without any injurious effect on growth of the stools. These field tests were followed up later on by application of 80 to 200 grains of calcium cyanide per plant, without any harmful effects resulting.

When examining these plots forty-seven days after treatment with maximum doses, plants that had received 120 and 200 grains were found quite normal, and appeared to have made better growth, if anything, than the check plants alongside.

Field Experiments with Calcium Cyanide.

Early in February of 1925 preliminary field experiments at Meringa resulted in our securing a mortality of about 48 per cent. of first and second stage grubs of *L. albohirtum* on light volcanic soil, with doses of 1 scruple, injected 1 foot apart on both sides of cane rows. During 1926 experiment plots were laid down at Meringa to determine the effect on cane grubs of calcium cyanide flakes, but owing to the occurrence of drought conditions and other adverse influences these plots showed a difference of only 36.7 per cent. in grub infestation between the treated and check areas in favour of the former. The cane in both plots had also suffered the previous season from grub damage, and consequently the "strike" in many places was uneven and numbers of the ratoons were stunted.

Judging by the results of laboratory experiments outlined above, calcium cyanide may prove an effective fumigant against cane grubs in North Queensland. At the present time, however, insufficiency of data in connection with field work renders it inadvisable to publish definite recommendations with regard to the use of this insecticide in our canefields.

SEASONAL PROSPECTS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has returned from a brief visit to the Bundaberg, Isis, Maryborough, and Nambour sugar districts. All the Southern mills finished crushing prior to the New Year, and the crop was much better than in the previous year, 1926.

So far the season, as far as rainfall is concerned, has opened up well, but there has been very little hot weather, and the cane though of good colour has in many instances not made the anticipated growth. Weeds are also giving much trouble. It is hoped, however, that a warmer spell of dry weather may eventuate and so enable cane farmers to clean up their lands and bring about a more rapid growth of cane. The present season has been remarkable for its absence of hot, humid weather so far, and many farmers are unable to recollect so cool a summer before.

Some fine Badila and Q. 813 were seen on the Maroochy River. Wet conditions here have prevented many farmers from getting on with cultural operations, though they are working early and late to take advantage of every opportunity offering. This land, while of excellent quality, is moist naturally, and farmers have to go to much trouble and expense to provide suitable drainage. This has been done by a large number of the growers who have spent large sums of money in getting rid of the surplus water, and by so doing have considerably improved their holdings.

All the mills are providing for large crops this year, and it is hoped that the remainder of the season will be satisfactory.

CANE PESTS AND DISEASES.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has received from the Entomologist at Meringa, near Cairns, the following report (22nd December, 1927) from Mr. J. H. Buzacott, Assistant to the Entomologist at that place:—

INNISFAIL.

The second week in December was spent in the Innisfail district examining farms for beetle borer and other pests. As the Goondi mill had finished crushing, opportunity for examining borer infestation was poor, as there was little standing cane left on plantations served by this mill.

Beetle Borer.

The beetle borer has been very bad everywhere this year, probably owing to the cyclone and floods during February. Many farmers seem to consider that, in attacking the cane sticks about the middle and top as well as at the base, the borer has formed a new habit; but this is not the case. It only means that there is a heavier attack than usually experienced on the farm in question, as, only in comparatively light infestations does the beetle confine its attentions to the butts of the cane.

Rats have been very bad this season, and borer damage was frequently noticed in rat-eaten canes, the removal of the rind by the rat having formed an easy ingress for the ovipositor of the egg-laying beetle.

Tachinid flies were found parasitising grubs of the beetle borer on several farms in the South Johnstone district, upon some of which no liberations had been made, thus proving that the flies are gradually spreading, although they have met with serious reverses this year. The practice of burning so much cane as has been burnt at South Johnstone this year is ruinous to the efficient spread of flies.

It would not be surprising to find the borer worse than ever next year owing to the dumping of many thousand tons of cane; for although this cane may be burnt before cutting, burning only kills the borers close to the surface, whilst those near the centre of the stick escape, thus releasing hordes of the beetles which normally would have been exterminated during milling operations.

On the whole the beetle borer was far more plentiful (1) near creeks, swamps, or the river bank, (2) in dirty cane, and (3) along headlands and outside borders of blocks rather than nearer the centre. No borers were seen on red volcanic soils.

Grubs.

In the sections visited grub damage was negligible, and grubs of French's cane beetle (*L. frenchi*) do not appear to have created the same havoc down there that they have farther north. A few odd grubs of the Christmas beetle (*Anoplognathus boisduvali*) were turned up by the plough in sandy soils.

Beetle Flight.

The only beetles seen in flight were the Greyback (*Lepidoderma albohirtum*), the Christmas beetle (*A. boisduvali*), and the small green beetle (*Anomala australasiæ*). The flight of greybacks was small and followed an inch and a-half of rain about a fortnight before. It is probable that there will be a larger flight as soon as there are any heavy rains.

Army Worms.

One of the army worms (*Cirphis unipuncta*) was responsible for a fair amount of damage on one or two farms. If the cane affected be sprayed with a mixture of 2 lb. of lead arsenate in 50 gallons of water, the greater part of them will be killed.

Moth Borer.

The large moth borer (*Phragmatiphila truncata*) was observed in small numbers on nearly all farms, but nowhere was it causing appreciable damage.

General.

The districts visited comprised Mundoo, Wangan, Goondi, South Johnstone, and Mourilyan, and the cane in all these areas should greatly benefit by heavy showers which fell during the week. Ratoons of borer cane were very backward in dry places owing to the borers having removed a great deal of the food matter in the stool; however, with rain a great many of these backward stools may improve.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report from the Assistant Entomologist at Bundaberg, Mr. R. W. Mungomery, for the period November-December, 1927:—

Activities of Army Worms (*Cirphis loreyi* Dup.).

During the past month large numbers of army worms have been in evidence, and in many parts of the Bundaberg district they have completely stripped the leaves of young ratoon cane, leaving only the bare midrib and the small stalks exposed to view. In severer cases they have even eaten the young tender shoots, and in this way were responsible for a marked check on the growth of the cane stools.

These pests occurred mostly in small patches in widely separated fields of cane, and when first noticed they were distributed uniformly throughout the affected areas. Growers soon became apprehensive of the safety of their crops and sought advice from this station, and we advised the use of the following poison bait, scattering the mixture throughout the infested area:—Bran 50 lb., sodium arsenite 2 lb., the juice of six lemons, and molasses.

The sodium arsenite is first dissolved in a small quantity of water, and this together with the lemon juice is thoroughly mixed in with the bran, and enough molasses is then added to bring the mass to a stiff dough. By using sodium arsenite in this manner instead of white arsenic as is sometimes used, we found this mixture to be far more effective and that it gave a quicker kill, for dead caterpillars could frequently be found under pieces of trash at the base of the stools on the day following its application. Caterpillars that were taken to the laboratory for experimental purposes seemed to be attracted by this mixture, and were eager to eat it even during the daytime, although it is customary for them to feed after nightfall. Therefore it is best to distribute the bait late in the afternoon, when the sun's rays are no longer powerful enough to dry up the mixture, and it will then be in a moist and attractive condition when the caterpillars commence their feeding. By sprinkling the mixture lightly along the cane rows, 20 lb. will be found sufficient to treat an acre.

Some growers sought relief by spraying the foliage with lead arsenate (5 lb. in 100 gallons of water) and obtained good results with this method.

Of many hundreds that were kept under observation, only a few caterpillars assumed the imaginal condition and emerged as perfect moths, the remainder suffering a heavy parasitism. The moths proved to be *Cirphis loreyi* Dup. The parasites, though not yet identified, represent two species of flies (*Tachinidæ*) and a wasp (*Ichneumonidæ*).

Much the same state of affairs prevailed in the Isis district, where parasites were also found to be active. In view of the small percentage of moths emerging and the large number of parasites, as well as the increased vigour of the cane, it is not expected that succeeding generations of army worms during the early part of the coming year will be large enough in numerical strength to cause any appreciable damage to cane crops.

Notes on Cane Beetle Pupæ (*P. furfuracea* Burm.).

Part of the months of October and November were occupied by Mr. G. Bates, Assistant to Entomologist, in carrying out investigations in the Isis district concerning the pupal stage of the cane beetle (*P. furfuracea* Burm.). This was a most important subject for investigation, in view of last year's observations when an overwhelming preponderance of male beetles were found to be attracted by the light traps. Some maintained that probably the beetles emerged in these proportions, and although the writer was of the opinion that such an occurrence would be quite unusual amongst insects of this class, we sought to gain definite data on the subject. The primary object, therefore, was to determine the relative proportions of the sexes of these insects as they occurred naturally in the soil, and in consequence as they would emerge from the soil, after the advent of suitable rains.

Now sex in "furfuracea" beetles may readily be determined by an examination of the antennæ, the clubs of which are much larger in the male than in the female sex, being longer and composed of a greater number of plates. The pupæ also exhibit the same characteristics in this respect as the beetles, though, of course, it is not possible to distinguish the actual number of plates which go to make up the club. Therefore, to determine sex amongst pupæ of this beetle, one has merely to examine those parts which will subsequently develop into the antennæ of the perfect beetle.

By digging trenches in several different fields of cane previously infested with grubs, pupæ and some newly changed beetles were found in their cells in the soil, at depths varying from 9 to 22 inches, the average being 16.8 inches, and it was interesting to note that females had, on the average, pupated from 1½ to 2 inches deeper than the males.

Of the total number dug up in this manner, 248 should have assumed the beetle stage this year, and of these 133 were males, 93 were females, and 22 were of undetermined sex owing to being either grubs in the prepupal condition, or pupæ so badly damaged by digging operations that it was impossible to distinguish their sex.

Additional data was obtained from several grubs that were collected from canefields in the early part of this year. These were taken from the furrows as they were exposed by the plough, and were bred through to the adult stage at the laboratory, where the ultimate figures showed 21 males and 16 females. This, however, was not considered so accurate as the field test, for it was thought possible that while living under unnatural conditions the larvæ of one sex might be more susceptible to the attacks of fungus and bacterial diseases than the larvæ of the other, and again, some died of mechanical injuries. Nevertheless, in the main, these results agree with our findings in the field, which work was carried out as a check on the laboratory rearing.

Another digging previous to the flight of the beetles resulted in a find of 17 males and 17 females, and another farmer submitted to me for examination beetles which he had dug from the ground, and of these 49 were females and 44 were males. Though there appears to be a slightly greater ratio of males to females recorded from our diggings, we can say that for all practical purposes the proportion of the sexes of the cane beetles is approximately equal.

Warning to Farmers.

At this time of the year, when beetles are emerging in countless thousands, and later will deposit their eggs in canefields, it will not be inopportune to warn farmers of the dangers to which their crops are exposed when the young grubs begin to hatch out and commence feeding. Particularly do I wish to draw the attention of some of the Mackay growers who are troubled with "greyback" cockchafer grubs to the importance of combating these pests. Seasons of late have been especially suitable for the development of pests of this kind, and apparently very little natural control has taken place. Accordingly the year 1928 is likely to show increased grub damage in many parts, and it behoves those whose holdings are more or less grub affected each year to have a supply of fumigant ready to wage war on the young grubs towards the end of January and so prevent them from exacting their usual toll, which means tons of cane lost to the grower.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (10th January, 1928) on the Diseases of Gumming, Mosaic, and Fiji, in the Bundaberg district, from Mr. E. J. F. Wood, B.Sc.:—

GUMMING DISEASE.

In view of the serious outbreak of gumming disease that was reported on the Woongarra this year, Mr. George Wilson, B.Sc., and I went up to investigate the damage caused by the disease and its extent, and to report on any available means of control. We found that, although the season was finished, the amount of damage could be easily observed, and we had the additional advantage of seeing the effect of the epidemic on the young plant crop. It is a very difficult matter to put into figures the losses due to such a disease as Gumming, but it is hoped that we will be able to give some idea of these caused by this factor this season.

A scheme of control has been worked out and will be detailed later in this report, but it must be clearly understood that the control of any disease rests as much on the farmer himself as on the Pathological Staff. It is a matter for the co-operation of all concerned, and it is hoped that the farmers in their various associations will discuss the disease question, and that they will refer to the Bureau any matters on which they desire information. It will be noted, too, that Gumming has been gazetted, along with other diseases, under the Diseases in Plants Act, and that this gazettal gives inspectors under that Act wide powers. That has been a necessary measure in order that, when control measures are undertaken by all parties working in co-operation, a refractory individual will not be able to spoil the whole result of efficient control work. The suggestions that have been adopted are those that will fall most lightly on the farmers, will benefit them most, and at the same time will, if carried out, gradually improve the situation, and will tend to prevent a similar epidemic from affecting the community as this one has done.

For the benefit of those farmers who do not know the symptoms of gumming disease, and are consequently unable to detect it in its earlier stages, the following description is given:—

Symptoms.

1. A series of yellow leaf streaks with the edges dotted with dark crimson red occur on the older leaves of the cane from comparatively early stages in plant and ratoon crops until the time for cutting. They run obliquely towards the edge of the leaf, and are usually upwards of 12 inches long and of a varying width which averages about one-quarter of an inch. The central part of the streak often darkens and dies, so that a mature streak has an elongated dead patch in the centre. At times they run from the midrib, but often occur in the middle of the blade of the leaf and gradually extend to the edge and midrib. They appear, as they really are, at places wherein the leaf has been infected by some external agent, and whence the organism is naturally extending his operations. Several of these streaks usually appear in the same leaf, and the youngest leaves are not usually affected. Mr. D. S. North, of the C.S.R. Company, has shown that the gum oozes from the pores of the infected leaves, and if it be transferred to an injured portion of the blade of another leaf the streak may appear. There are periods of the year when these streaks cannot be observed, but when they can be seen they form a very safe characteristic of the disease. These streaks show that a cane is infected, though very often no gum can be made to ooze from the stem when they are present. They give, however, no idea of the relative resistance of canes, for Q. 813 shows the streaks (though perhaps not to the same extent) as often as M. 1900 Seedling, and M. 55—which Childers reports seem to indicate has powers of resistance—is showing the streaks in Bundaberg to an even greater extent than the M. 1900 S. on the same farm. They show, however, that the streaked cane is infected, and that clean seed is needed if that can be obtained.

2. A more severe stage of the disease is shown by the fact that the leaves are white, or white streaked with green, and gradually merging into green. This stage is seen very often just now in the young plant, and often, too, in ratoons, even occasionally in the older cane. In the young cane which has just emerged from the ground the leaves are inclined to be twisted, and the young shoot has a deformed appearance, besides the fact that it is white in colour. It is well known that D. 1135 and M. 1900 S. have sports in which the leaves are striped with white, but in this case the stripes are regular, and there is little chance of confusion with the true gumming chlorosis.

3. On cutting the stick lengthwise it will be seen that the fibres are scarlet in colour, and that in bad cases where sticks are dying or dead there are cavities in the stem which are full of yellow slime and are often of an unpleasant odour.

4. At times the growing point of the young plant or ratoons decays and gives off a bad smell. This is somewhat similar to injury by the Pink Moth Borers, but the top is slimy and rotten and does not appear to have been chewed.

5. The best known symptom is the oozing of gum from the cut ends of the stick, and the yellow gum need not be described. In the case of plants which are lightly infected, the gum may only ooze after the cut plants have been left under a moist bag overnight, and this process of sweating should be carried out always before planting, so that some, at any rate, of the gummed plants can be rejected.

Cause.

The disease is caused by a bacterium known to science as *Bacterium vascularum* (Cobb) Greig Smith. This bacterium, however, seems to live a very balanced parasitism within the host plant, and to require certain conditions for development. The weather, therefore, has a very great bearing on the severity of this disease in any season. The account of transmission as given by Mr. North points to the fact that the disease requires wet weather in order that it may spread rapidly, and this seems actually to be the case. Wet weather seems also to be necessary for a severe attack, and the effect of the disease on the plant is much governed by rainfall. It would appear that the effect is due to the fact that in very wet weather the soil is waterlogged, and therefore improperly aerated. The disease gets a good hold on the plant tissues, and a dry spell, such as that experienced last year, has the effect of weakening the plant and further aiding the parasite. During my visit early in the year I predicted to several farmers who were planting badly gummed plants that the weather conditions were such as to cause a serious outbreak of the disease, but my advice was disregarded. The farmers at Bundaberg have been repeatedly warned that the droughts of the past years have been saving them from gumming, but have taken no notice of any warnings. That is where Field Officers are so helpless, for unless they undertake the actual farming they cannot impress on farmers when a disease is not causing much damage that by continued neglect it will become so severe that very strenuous, continued, and expensive efforts will have to be made to save the situation.

Many farmers realise that a cane grown on the one class of soil for thirty or forty years will be bound to lose its vitality, but in spite of this fact the cane grown on the Woongarra is very old stock, and whatever resistance it ever had to disease has long since been lost. In any case, the varieties which are grown (M. 1900 S., D. 1135, Badila, and N.G. 16) are known elsewhere as susceptible varieties.

Transmission.

1. Plant cuttings. This is the means by which the disease has been fostered throughout the Bundaberg district, for in the majority of cases the stock which was grown in 1895 and later (when the previous gumming epidemics occurred) and which must have become infected, is still grown on every farm. New strains may have been introduced at rare intervals, but they have long since become contaminated by the older canes.

2. Knife infection.—The wise farmer, when selecting for plants, chooses his cleanest field and his freest variety and places his cut plants under a bag overnight so as to sweat out the gum, and then he rejects the plants which have oozed. Many do not realise, however, that plants which do not show the infection may be infected by cutting them with a gummy knife after cutting a plant which has oozed gum on to it. The gum bacteria are very small and live in the fibres; so that, when a fibre is cut, many millions may ooze in a thin film on to the knife. On cutting another stick, some of these are bound to be wiped on to the end of a fibre and will very probably move with the juice into the cane and set up infection. The bacteria multiply in moist atmosphere, and the hot, moist atmosphere of the soil, which is best for young plants, is also ideal for the bacteria, so that the stick is easily infected. The obvious remedy is to place the knife in a tin of disinfectant as often as possible while cutting plants, so as to kill the bacteria.

3. Secondary infection after the plants have struck.—Mr. North has given us a theory that in wet weather the bacteria multiply rapidly and the gum containing them oozes from the leaf pores. It is easily miscible with water, and can drip from the leaves, or be borne from plant to plant by wind-blown rain. Thus it will travel in the direction of the prevailing wind, in Bundaberg, from the south-east to the north-west, with modifications due to the elevation. There is also the possibility of insect infection, which will also take place in the direction of the wind.

A study of the nature of the disease will show that the only measure that will promise success is that of growing resistant varieties and subsequent selection of canes.

Distribution

Infection occurs over the whole of the Bundaberg district, and Childers is also badly affected. However, the disease has only assumed epidemic proportions on the Woongarra, but there is no reason to suppose that if the conditions were right it would not spread over the Bingera and river areas and Gin Gin. The farmers in these parts must take an example from those of the Woongarra, and realise that the disease is at all times imminent, for traces of the disease are not wanting in any area. The serious nature of the Mosaic problem on the river farms would make the losses particularly heavy in this area. The fact of the general prevalence of the disease makes the problem of control a difficult one, and it would be no use for farmers to get cane from the Bingera area in order to free themselves of the disease. It is probable, and almost certain, that the cane when planted in the Woongarra soils would develop gumming to the same extent as the plants from the Woongarra itself. The reason for this is that the plants are infected, and that the Woongarra soils are in the right physical and chemical condition for the development of the disease. I might predict that if the weather continues to keep the ground in the sodden state that it is in at present, gumming will be quite as bad next season as it was this. It has been noticed by me on the Woongarra and independently by Mr. Richardson, of the C.S.R. Company, at Childers, that gumming is worse in the heavy scrub red soil areas than on the light forest red soils such as those at Elliott. The Bingera soil, too, is lighter than the Woongarra red soil. Gumming has not shown up to the same extent on the Rubyana area, on the sandy loams there, and this is probably due to the nature of the soil and its better drainage. In dry weather the red soils are very porous and well drained, and this is true in moderate rains. When, however, the rainfall is heavy and the soils become waterlogged, the drainage becomes bad, as there seems to be a fair percentage of clay in these soils.

It seems a general rule in the Woongarra that the infection is worst in the lower-lying areas and basins, wherever the water is likely to lie, even though the hollow be almost imperceptible to the naked eye. There are (as are bound to be) exceptions, but history of the seed cane planted and other factors concerned would no doubt account for this. In one noticeable case a crop of H.Q. 426 was no doubt responsible for the extreme virulence of the disease on this and the adjoining farm. It has been shown in other gum infested areas that drainage was of inestimable benefit, but most of the farmers in the Woongarra will aver that the land is well drained. I should like, however, to see the effect of drainage on the disease, and I think that some drainage experiments would not be out of place.

Gumming is serious in the region stretching from Elliott Heads, which has long been seriously affected, through Pemberton, Windermere, the Hummock Plantation, South Coast road, and the Sandhills road along the Burnett Heads road on the red soil, and west to Kalkie. Farms on the alluvial soil at Burnett Heads, and along Rubyana, on the river bank, show serious infection only in isolated places, and a light infection was noted in the Barolin and South Kalkie sections south of the Windermere road, and roughly west of the Hummock. On the lower ground beyond the Barolin section the disease was epidemic again. This comparatively clean region was confined to the higher, well-drained, red soils.

The cleanest section of the Bundaberg and Childers districts, as regards gumming and also as regards Mosaic, is that comprised in the Elliott River section, along the Maryborough road, around Clayton and Elliott. Hapsburg, also at Childers, is very free of gumming, which is due to the fact that the most susceptible cane in this section (D. 1135) has been discarded by the manager of that plantation.

Fairymead had trouble with gum in the Badila grown on that plantation, but had little or none in that from Avondale to Hapsburg.

Control Measures.

The control of gumming in the Bundaberg district rests at present on the general planting of canes which are recommended as being resistant to the disease and on their subsequent selection. It is hoped that we will be able continuously to introduce new stock of these canes for plants to the Woongarra, and thus to give a continuous supply of healthy seed, which will gradually reduce gumming to a negligible factor. The resistant varieties recommended (and these are at present in the district) are Q. 813 and H. 227.

Q. 813.—This cane was tried by many of the farmers some years ago without much success, and was abandoned without having a fair trial. In the meantime it has become acclimatised, for it has been shown by experience to require acclimatisation, and is now a much better cane than when it was introduced. It is admitted that it will not give as heavy a crop as a healthy crop of M. 1900 S. or D. 1135, but it is asserted without hesitation that with the present diseased state of D. 1135 and M. 1900 S. it will give a higher yield of sugar per acre than either of these canes. In a normal time it is lighter in crop than D. 1135, but it has the advantage of giving about two units higher in density. Like M. 1900 S. it is a late maturer in the south, and if not cut at the right time will not ratoon, but when cut in September and when the trash is burnt off or rolled soon after cutting, it proves a good and heavy ratooner. It is a perfect striker, but should be planted in September, as it germinates best in that month, and at the same time the ratoons are not impaired. Qunaba cut this year a crop of first ratoons at 28 tons per acre in the midst of badly-gummed canes of other varieties. That the cane is a shallow rooter and is not at its best in red volcanic soils is conceded, and the variety is of little use in the Childers district, except in isolated cases. On the Woongarra, however, the situation is different, and we know from the results that Qunaba has achieved and from our own experiments with the cane at the Sugar Experiment Station that it is a profitable crop.

The Experiment Station has badly infected farms on all sides of it, and efforts have been made in the past to keep it clean by selecting plants and retaining D. 1135, Badila, and M. 1900 Seedling. This year practically the whole area has been planted with Q. 813, and in a detailed inspection we could not find much trace of gum. In some varieties gum was found, and these were immediately dug out. It will not be long before the station will be very free from gum, and as it now stands it is far less affected by the disease than any other farm in the Bundaberg district, except, perhaps, some of the Elliott farms, and that is in the midst of a seriously affected area, on a place that was itself badly affected last year. It serves as a standing example of the rapidity of control measures when the farmer is working in collaboration with the Pathological Staff, and to effect this the expenses have been no greater than they would normally have been for the replanting of the blocks cleaned up. We are convinced of the fact that Q. 813 is resistant to gumming, though it does at times show the leaf streaks, for rarely has the stick been seen to ooze gum in comparison with the other varieties. It will do so at times, but so will Uba or any of the other canes which have been used successfully to overcome the disease in other districts. At Qunaba, the c.c.s. jumped up immediately the other varieties stopped coming to the mill, and Q. 813 was the main cane crushed. Moreover, its density was still holding out at the close of the season, when the other canes had fallen off. It is urged, then, that the farmers plant as large an amount as possible of Q. 813, for the trouble due to gum is worse in the mill when the density reaches its peak and most of the delay occurs then; so that the season is protracted and less cane can be crushed just at the period when the returns to both farmer and miller are at their maximum. If the mill could be kept running on Q. 813 from September to the end of the season, the mill could work at full capacity till the end and the farmers would get their crops off without difficulty and with the best results.

H. 227.—This cane has been grown for some years at the Experiment Station and also at Nambour, and on a few farms on the Woongarra, and in all cases it has shown signs of marked resistance to gumming. It is, however, highly susceptible to Mosaic, and must be carefully selected and looked after. Experiments with this cane show that it matures early, and those who have grown it state that it will also ratoon strongly when cut early. It is a cane very like D. 1135 in growth and habit, but has a higher c.c.s. and is a very good striker and ratooner. There is not much of this variety available for seed, but farmers are recommended to get a small patch of it if possible as a seed plot. Mr. A. Christensen has some of this variety, which is standing and ready for immediate use. He is willing to sell it to farmers for plant at any time between now and March. This cane appeared at the time of our visit to be free from gumming, but it is hoped that fresh stocks will be made available to the farmers by the end of next year.

These are the only promising canes which are at present in the district in sufficient quantities to be of any use, and are therefore recommended to the farmers, and should be used to replace M. 1900 Seedling and D. 1135, which should be rejected.

Another cane which shows resistance is Black Innis (M. 189), and our observations on this variety have been confirmed by Mr. Richardson, at Childers, working independently. It is, however, so susceptible to Mosaic that I do not recommend it to farmers. The whole stock in the Bundaberg district is contaminated with this disease, and general use of this variety would mean reintroduction of fresh stock. The presence of Shahjahanpur 10 on the Woongarra would be fatal to any results which might be expected of this cane from its resistance to gum. It is not immune, however, to this disease, and at times shows marked symptoms—far more marked than those in Q. 813 under the same conditions.

B. 147 is another cane which shows strong evidence of resistance to gum in the North, but is so susceptible to Mosaic and Leaf Stripe that it could only be recommended to farmers whose places are practically free from Mosaic. It is hoped, however, to introduce this cane into a nursery to obtain plants.

M. 55, according to reports of farmers at Childers, resists gum to some extent, but as the only field seen on the Woongarra showed marked leaf streaks in the young cane, it must be subjected to further trials. This cane is being introduced in large quantities into Bundaberg from Childers, but it will not do for farmers to assume without further trials that it is resistant to gumming. It is possible, even probable, that it may be, but this must be proved. A nursery of this variety has been started in a very free area. It is, however, highly susceptible to Mosaic, and the remarks which apply to H. 227, M. 189, and B. 147 apply here also. For that reason I have made a separate report on Mosaic Disease in Bundaberg, and have pointed out the necessity for control, especially of Shahjahanpur 10. For the sake of the control of gumming this cane must be eradicated, as it will not do to substitute one disease for another, as we should do if we planted canes susceptible to Mosaic near this variety.

One of the objects of the Experiment Stations during the next few years will be to try out varieties for resistance to gumming, and to test the resistant canes for their productiveness. There are a number of varieties at the Bundaberg Station, many of which show promise as resisters, but require further trials before they can be recommended. With the Woongarra in its present state of infection, the station cannot be used for the distribution of varieties; so that the canes tested there will have to be grown in a more isolated situation and sent to the farmers on the Woongarra. The varieties grown include Korpi, Oramboo, and Nanemo, which are known resisters of good density, but which have never been tried out on the Bundaberg soils for early maturing or cropping capacities. It is hoped that the Bureau will shortly be able to get supplies of these canes in isolation, so that some distribution may be made in the course of the next few years.

While examining the district for gumming, we kept our eyes open for some isolated farm or farms which were reasonably free from gumming, and were rewarded by finding that on the red forest soils around Clayton and the Elliott River the farms seem to be practically clean and are well isolated. There is in these places a fairly clean stock of Q. 813, and farmers on the Woongarra are advised to buy plants from there if they are planting up with the variety. The existence of this area is a godsend, and will probably save a very serious position. If farmers wish to procure seed cane for next spring planting, they will do well to get in touch with the Bureau, so that arrangements may be made to select for them the cleanest cane. The Elliott area will be thoroughly examined at intervals through the year, and a careful watch will be kept for disease.

It may now be said that the machinery for the control of gumming has been made ready, and it remains for the farmers to combine so that everything may work smoothly. It will be realised that it is more economical to grow a resistant variety than to grow a susceptible cane which may, but probably will not, give a return for the money expended in planting it. Many farmers are loth to give up D. 1135, although they are forced to admit the fact that there are other canes which give a much better return, and are quite hurt when they are told that they are not efficient farmers. The strikes of plant M. 1900 Seedling are very bad over the Woongarra, much of the cane not having grown at all, and more having struck, turned white, and died off. All this is solely due to gumming. Several farmers have planted up three times and still have not more than a 30 per cent. strike, and it has taken a set-back such as this which will cost them some hundreds of pounds to make them realise that it would have been cheaper to plant Q. 813 and risk not getting a fourth crop from this variety.

Recommendations such as these are not made without careful consideration of the financial situation, and the farmers may be sure that the recommendations made in this report are those which appeal to the officers of this Bureau as giving the greatest gain to the farmers who adopt them. They are not theoretical suggestions, but suggestions based on purely practical considerations.

It was further noted on the Woongarra that on the whole the soil is in a very poor condition. It is a general rule in Queensland that red volcanic soils are low in potash and also in phosphate, and in many cases little fertiliser is added to keep the soils up to standard. Still more urgent is the need for humus. Green manuring is in very little use on most farms, and is of the greatest importance to restore the humus to the soils. Without humus a soil does not retain the water in drought and becomes puggy when wet, while the application thereof makes the soil porous and better drained, and at the same time keeps small amounts of moisture in the soil in drought. It will be long before the soils of this district will be restored to their original humus content, even if a beginning is made now.

The other control measures, such as seed selection, the methods of which have been given above, will naturally follow the introduction of canes like Q. 813 and H. 227, and knife disinfection will also have to be practised by the farmer who wishes to clean his place and render it free from gum.

In conclusion, I should like to thank Mr. Wilson, of the Bureau, for his help in making the field observations, and Messrs. Richardson, Crabtree, and McBryde for their information and opinions, which have done much to give me the true idea of the situation.

Mosaic Disease in the Bundaberg District.

My observations on this disease were only incidental to the main ones on gumming, but it was noticed that the disease was very bad along the Burnett and Kolan Rivers, on the low-lying alluvial soils. Given the same conditions in other respects, the disease seems worse in Queensland in low-lying areas than on hills.

The prevalence of the disease is due to the fact that Shahjahanpur 10 is still grown on many farms, despite many warnings and its obvious disadvantages. Even Q. 813 will be diseased under such conditions, and it is hopeless to try and clean up other varieties while this cane is grown. This cane is prohibited in some mills, but not at Bingera, and here the growth is widespread.

Farmers have read in the paper that Mosaic has been gazetted as a disease under the Diseases in Plants Act, and this gives the inspectors wide powers under the Act. While the Bureau has no present intention of applying these regulations with regard to Shahjahanpur 10, farmers who are still growing this variety are advised to plough it out after next harvesting, as it will be the first variety to be attacked. This is of great importance owing to the fact that so many of the canes which are showing some resistance to gumming are very susceptible to Mosaic, and unless there is reason to hope that the Mosaic position can be improved, these varieties cannot with safety be recommended. Such canes are H. 227, which, besides showing evidence of gum resistance, is an early maturer, B. 147, M. 189 (Black Innis), and M. 55. None of these canes can be profitably grown where they would be near Shahjahanpur 10, and this fact will considerably hinder the control of gumming owing to the fact that fields which are infested with Mosaic cannot be recommended for seed. It is to the interest, both of the farmers and the millers, that Shahjahanpur 10 be placed on the disapproved list, and a penalty be imposed and enforced that will prevent this cane being grown profitably. Failing that, it is likely that the regulations will be enforced in the future to control Mosaic disease.

On the Woongarra, where gum is rife, every effort should be made to keep Mosaic under control by plant selection and roguing of both plant and ratoon cane. Not till this is done will we feel safe in introducing stocks of canes such as H. 227, B. 147, and M. 55 for fear of a severe Mosaic epidemic. The gumming situation is a serious one, but it is made much more so by the lack of attention which the farmers pay to Mosaic disease.

That Q. 813 is resistant to the disease is well known to all who have studied the question. Another cane—P.O.J. 2714—is also resistant, as shown in a trial in Bundaberg, where this variety is growing alongside badly Mosaic infected B. 208 and corn and grasses, and is 100 per cent. free from Mosaic. It is thought that this cane is susceptible to gumming, but it could be grown to advantage on the river soils at Sharon, Gooburrum, and South Bingera, where Mosaic is so bad. It is a heavy cropper, but its density is not the best. It grows well on Bundaberg alluvial soils.

These are the only two canes which are recommended as resistant to Mosaic for the Bundaberg district. Farmers are urged to do their utmost to clean up the district of Mosaic so that we may be able to attack the gum problem unhampered by any side issues.

Fiji Disease in the Bundaberg District.

The Bundaberg district has now been discovered to be infected with Fiji disease, though the infection appears to be slight and confined to the Bingera district as far as can at present be ascertained. Three varieties are infected—Garvan's Black, N.G. 16, and H.Q. 274—and farmers are warned to be very careful in planting these canes and to reject anything suspicious when selecting their plants. Many fields of these varieties were inspected in many areas in the Bundaberg and Childers districts, but no trace of the disease was found. For this purpose detailed surveys were made, and it is intended to repeat them at an early date in case the disease was latent.

The fields found were lightly infected, and are being rogued, so that the disease may be brought under control immediately. It is considered, owing to the lightness of the infection and its present apparent restricted character, that it is unnecessary to quarantine the district, and this is undesirable from other points of view. The owners of farms infected have been requested to adopt quarantine methods, but should they fail to do so rigid quarantine will, of course, be instituted and strict control measures brought into force. Farmers in the Bundaberg district are advised for their own protection to report anything of a suspicious nature which they may observe to the Bureau as soon as possible. There is no need for panic, as the outbreak is slight and the control in efficient hands.

CANE PEST COMBAT AND CONTROL.

The Entomologist at Meringa, near Cairns (Mr. E. Jarvis) has made the following report for the period November to December, 1927, to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—

Aphides Attacking Cane Roots.

In the last monthly report issued by Mr. R. W. Mungomery (Assistant Entomologist at the Southern Sugar Experiment Station, Bundaberg), some interesting observations were recorded respecting the habits of a species of aphis, found by him feeding on the roots of cane and "nut grass" (*Cyperus rotundus* Linn.).

As often happens in such cases, these aphides occurred in association with ants, the species in the present instance being *Aphænogaster longiceps* Sm.

Judging by Mr. Mungomery's remarks, this cane-root aphis appears to be very similar to, or identical with, that discovered by me in 1916 affecting young plant cane at Meringa, illustrations of which were published at the time in the first edition of Bulletin No. 3 (Division of Entomology).

This large, dull, yellow aphis was noticed on several occasions during winter and early spring clustered in small colonies at the bases of the shoots or on swelling buds of "sets" planted about 4 inches deep. It was invariably attended by ants, and sometimes associated with mealy bugs (*pseudococcus* sp.).

Winged forms were not present, and no specimens were noticed on the stems or leaves above ground level.

Description of Larva.—Elongate, hairy, pale orange-yellow, slightly darker on dorsal margins of body. Rostrum reaching nearly to end of abdomen. Antennæ, short, stoutish, 4-jointed; 4th joint longer than remainder taken together. Extremity of rostrum, tarsi, and antennæ, blackish. Legs short, stout. Length of body, 0.65 mm.

Description of Viviparous Female.—Rotund, nearly spherical viewed from above, hairy, dull orange colour, dusted with white powdery secretion. Abdomen much wider than thorax, with dorsal marginal edges depressed, tail conspicuous and obtusely conical. Head small, eyes nearly obsolete, consisting of about four dark red ocelli. Rostrum not reaching beyond posterior coxæ. Antennæ and legs short, stout; the former not reaching to metathorax 4-jointed, 4th joint slightly longer than 2nd and 3rd taken together, 3rd joint clavate. Length of body, 1.40 mm.

This aphis appears to be of very minor importance in our Northern canefields, as although searched for at intervals during the last ten years or more, no additional specimens have been found.

Cane-Root Mealy Bug.

Another very interesting insect affecting cane roots is a species of Coccididæ belonging to the genus *Ripersia*, specimens of which were first noticed near Gordonvale, and at the laboratory there during 1916 on the roots and underground buds of cane "sets." The adult female varies much in shape, being often observed packed tightly in irregular crevices between expanding buds, &c. Like the well-known coccid *Antonina australis*, which it closely resembles in general appearance, it is more or less enveloped by a crust composed of a yellowish white felted secretion, but differs from that insect in being dark purplish-brown instead of black, and in the absence of conspicuous tubercles and hairs on the anal segment. The young larva, which is elongate-oval in form, and dark-brown above, margined with yellow, is covered with minute excrescences, and possesses a very long hair-like rostrum and 6-jointed antennæ. Length of body, 0.60 mm.

When touched, these curious mealy bugs emit a tiny globule of clear sugary fluid that is greedily devoured by a small golden-coloured ant which is usually in attendance; and in return for such sweet morsels probably protects them from the attacks of various insect enemies.

A species of *Ripersia* is known to damage the roots of sugar-cane in Cuba; while *Ripersia terrestris* Newt. frequently proves troublesome in England, where it injures the roots of greenhouse plants throughout the year. A 1 per cent. solution of potassium sulphocarbonate has been found to kill these root-eating coccids without injuring the plants.

Enlisting the Services of Grub Parasites.

It may interest farmers to learn that in the Cairns district three weeds belonging to the genus *Sida* occur very plentifully, at least two of which happen to be of more or less economic importance in connection with the natural control of our cane grubs. By far the commonest of these plants is *Sida acuta*, which apparently takes first place in this northern portion of the State, where it is often referred to erroneously as *Sida retusa*.

This latter species, however, which in the year 1908 was proclaimed a weed pest under the Quarantine Act, and is a common species around Brisbane, is frequently met with also in the Cairns district, growing alongside *S. acuta*.

The third of the weeds alluded to is *Sida cordifolia*, which happens to be quite different in general appearance from either of the foregoing species, and may at once be recognised by its flowers being larger, more open, and lighter in colour, and by its rather thick, soft leaves, which are broadly heart-shaped, seldom oval or narrow, and have long stalks. This plant is taller than the others; somewhat coarse, erect, and branching; its leaves and twigs being more or less clothed with soft hairs.

Our commonest species, *Sida acuta*, differs from *retusa* in having the leaves narrower, of a lighter green shade, with edges noticeably serrated, the extremity more pointed, and the veins strongly marked. In *retusa* the leaf surface is smoother, and the colour darker, but never of a yellowish-green. The flowers in both these species are of similar size and shade of yellow.

Isolated plants of *acuta* often develop a symmetrical cup-like form of growth, growing from a single short stem, the middle of such plants appearing at times regularly concave owing to the scarcity of central leaves and shoots. Plants of *retusa*, on the other hand, never assume such shape, the usual growth of this species being irregular, more erect, and slightly taller.

Attention is drawn to these common weeds on account of the fact that two of our principal digger-wasp parasites of cane grubs, *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr. are fond of visiting the honey-bearing flowers of the above-mentioned species of *Sida* during sunny mornings throughout the year.

Growers should, therefore, leave small patches of such food-plants here and there when noticed growing near headlands of canefields, in order to encourage these useful parasites to remain and breed in the vicinity of grub-infested areas.

FIELD REPORTS.

The Northern Field Officer, Mr. A. P. Gibson, reports, 3rd January, 1928:—

TULLY.

Seasonal.

This is the time when the mercury is expected to climb near or over the century mark. The weather from a field man's point of view has been distinctly suitable for proper cultivation, the rapid advancement of the new crop growth, and the uninterrupted removal of the district's greatest crop.

Rainfall.

Rain and sunshine alternated for the greater part, followed by cool nights. Tully was leader in the field last year so far as rain and cane are concerned. The official record is interesting, and is as follows:—January, 34.58; February, 65.65; March, 14.40; April, 22.67; May, 4.12; June, 11.48; July, 3.54; August, .14; September, 6.61; October, 3.33; November, 4.59. Total rain for eleven months, 171.11 inches.

Thirty inches of this total have fallen since the factory commenced its operations. One inch of rain represents 101.5 tons of water broadcasted over an acre. This enormous precipitation is naturally responsible for great soil washing and plant food leaching, hence the great need of growing cover crops during the wetter periods.

The 1927 Crop.

The big and excellent crop of Badila continued to grow throughout the season, therefore the early forecast of 180,000 tons had been exceeded by some 20,000 tons. Some heavy and reclining crops were harvested on the more fruitful lands of the Lower Tully. These heavy crops are invariably low in quality and sometimes are not desired by the harvesters. The recent rain, combined with the decidedly warmer conditions, had promoted new and rapid growth of the remaining uncut cane, reducing its sugar content.

The New Crop.

Though weedy in parts, it generally is splendid in appearance and well advanced; in consequence, at the moment it promises well for another prolific yield. Some unpermitted cane will not be harvested. There does not appear to be so much advanced plant cane as last year. This cannot be expected, for most growers have the area assigned to them about fully planted to cane. It is more than likely the factory will start crushing 8,000 tons of cane weekly instead of 6,000 as last year. This would, of course, favour a later starting on the same crop tonnage.

The local people are proud of their ever-growing town and big modern new mill. The cane put through in one week—viz., 9,020 tons—appears to have been the greatest quantity of cane milled during any one week in Queensland. This amount may be easily eclipsed in future; the present difficulty obviously is to obtain cane enough for the mill's big daily requirements. It is better that a mill be idle a little time daily in preference to operating continuously on a big quantity of stale cane. The mill's average quality has been good. As time goes on the crop growth will be less rapid, when a higher c.c.s. cane may be expected.

Cultivation.

Endeavour should be made to maintain or improve the fertility of the soil from the beginning by leguminous crops and judicious manuring (soil samples should aid the grower in determining what is required). Comparatively little land is yet under the plough, therefore much tedious and costly hoe work is required to keep the field clean. It is highly desirable that weeds be controlled in fields and headlands from the outset. Less scrub is being felled. The total cost of this work from brushing and including cane planting may be put down from £28 to £30 per acre. November weather was favourable for this class of work.

Pests.

Rats are responsible for much crop damage in parts. Weevil borers were observed on several farms. Army worms had temporarily checked the crop growth in many fields. This pest is spreading too rapidly, due, maybe, to its natural enemies (our insectivorous birds) being unwisely destroyed by the action of man; it is urgently desired that our feathery friends be protected. Mound-building ants are located generally in coarse-grained poor soils; frequent light tillings before the crop is well established will in a large measure have a controlling effect.

Diseases.

Leaf Scald is the chief disease. Disease-free cane from the outset should have been introduced and early grown, and the area's supply of seed compulsorily taken from it. Had this been done the area probably would have been clean, whereas it is now far from it. Badila is becoming highly susceptible to Leaf Scald; many canes after stem-shooting from the disease had perished. Parts of fields held over for seed were found to be too highly diseased for seed use. We can only point out such diseases and urge the growers to discontinue planting same, also recommend that the farmer go over his plant field at intervals, especially that intended for seed use, and remove anything diseased or not quite up to type. Badila, which is North Queensland's greatest field and milling cane, soon will be on the scrap heap unless our farmers devote more attention to the seed-selecting part of the business; it is slowly weakening, and in consequence becoming more susceptible to disease. Top Rot streaks widespread throughout the area.

HERBERT RIVER.

Rainfall.

Some 97 inches had fallen to the 16th December. This registration, though overshadowing the annual average, had not been well distributed, nearly half falling during February. The December fall to the 20th was far below the average. Storms are threatening; but there is, however, plenty of time for the month's average to be reached or even eclipsed. Surface water is becoming scarce. A good precipitation is urgently required to replenish the depleted supplies and to maintain the continuous crop growth. The area planted to cane has increased greatly during the last few years. Plenty of good land—enough for another mill it is said—is to be found some miles back from Long Pocket.

The 1927 Crop.

The early crop prospects speedily changed from one of gloom to that of brightness and prosperity, despite the memorable and disastrous flood. Freedom from disputes, mechanical troubles, and adverse conditions has permitted the two factories working continuously and well, therefore the unexpectedly great crop (probably the district's largest with one exception) of some 355,000 tons was expected to be milled by the end of the year. The lighter and more severely damaged crops are being fired prior to harvesting. Some Badila flood remnants were being cut on the river lowlands; they were very soiled and appeared poor in quality. The crop averaged some 3 feet of cane when inundated; the tops quickly perished and subsequently dropped off; side shooting followed; each at time of cutting showed about 18 inches of cane; such shoots depend on the parent cane for their existence, therefore rob it of sweetness. The writer has sometimes found that flood or frost damaged canes low in sugar, whilst the newly formed cane on its shoots is generally quite satisfactory in quality. The new crop has been well cared for. There is a great area of plant cane, most of which had germinated very favourably. Less gumming disease is in evidence. The cane is forward in growth. The crop, however, may yet be regarded as a very speculative one, despite its present most favourable qualifications. It is quite clear that the two local mills will be called upon to start very early so as to fully cope with the 1928 now apparent record crop, but, even so, there is a great probability that they will not be able to fully treat the whole crop. Victoria's upper rich alluvial deposits specially look well. Most of the 1927 stubble on such lowlands was destroyed by water; this was ploughed out and replanted with Badila. The curling of the leaf is just one of Nature's little economising ways; by so doing the leaf area exposed to sun and drying winds is minimised, thereby reducing plant evaporation.

Varieties.

Many varieties are grown; the principal are as follows:—Badila on the better lands; H.Q. 426, confined now to the Upper Stone River. H.Q. 409, a popular kind—it arrows freely and rather early—is a good weigher and germinator. Oramboo, Korpi, and Nanemo generally are liked; that planted early had germinated well; later plants, however, were less favourable. The growing of Q. 813 I think could be extended with profit in selected soils. Some healthy and most promising crops of this variety were noted.

Cultivation.

Generally this has been satisfactory and the fields on the whole were then reasonably clean. Farmers realise the enormous value to be gained by the frequent mulching of the soil interspaces, especially during the early stages of the crop growth and when the soil is bared of crop covering. The prevailing dry conditions have advanced this work considerably. It is important that the farm's drainage system be in the best of order now that the wet season is fast approaching. Not many rotary cultivators are in use. The soil for the greater part is cohesive. These implements do excellent work in the more friable soils free of encumbrances. Volunteer crops (trash left as cut) cannot be said to be a good practice on level country; though controlling weeds, conserving moisture, and perhaps retarding plant food leaching during times of heavy wetness, it harbours pests and fungi, is always a source of danger from fire, and reduces considerably the stooling of cane. Such fields are better relieved—that is, the blanket of trash should be removed off the cane stool.

Manuring.

The local farmers are big users of manures; different kinds at different rates per acre are applied at intervals to plant and ratoon crops with apparent good results.

Leguminous Crops.

We cannot get our farmers to realise the enormous value of the growing and ploughing in of cover crops, also the cane trash. Different sorts of cowpeas are sometimes grown. A kind of giant cowpea is becoming popular; this variety flowers some eight weeks after sowing and does not perish, as does the ordinary kind, after seeding, but continues to grow and seed for about five months before it finally dies. A sample of this was obtained and forwarded to the Government Botanist for identification. Small areas of maize are grown for feed; it serves the purpose well, but must be looked upon as dangerous from a disease-spreading point of view.

Pests.

Pest destruction is not great. Rats at the moment are occasioning the greatest amount of damage to what is left of the old crop; they are being driven from the harvested fields and are concentrating in the yet uncut ones, hence the increased damage. They appear hungry and are devouring unpicked up harvested heaps of cane that happen to be lying in the trash-covered fields, also completely severing innumerable ratoon shoots in the same class of fields. Aphis Sacchari are very common at present; their presence may easily be detected by the shiny and sticky nature of the lower leaves.

Leaf Hoppers.—Three different kinds may be found here. A few greyback cane beetles were on the wing.

Noxious Weeds.—The real Johnson grass and Star of Bethleham noted; the former is a dreaded pest, a quick spreader, a deep rooter, is very stubborn to eliminate, and may speedily take possession of a cane field.

Diseases.

The Herbert River cane still appears the most disease-free of the whole of what is known as the No. 1 Division. Three years back the gumming disease was serious, but the area affected has been wonderfully reduced by the almost total elimination of H.Q. 426, a highly susceptible kind, together with a logical system of plant selection, helped perhaps by less favourable weather conditions. What has been achieved here may be performed elsewhere by greater co-operation between farmers and mill field men.

The following information is interesting and shows the progress made in reducing the affected acreage in the Victoria Mill area alone:—

Year 1925—Area known to be gum affected	3,240 acres
Year 1926—Area known to be gum affected	2,137 acres
Year 1927—Area known to be gum affected	580 acres

The chief parts diseased are Victoria Estates, Gairloch, and Fairford.

Top Rot.—Red streaks widespread and found in patches of Badila plant and ratoons alike. Generally the most advanced stool shoots are affected; the number of shoots affected in stools varies from one to sometimes the lot. Many shoots were dying or had perished from the disease. (This disease truly wants investigating.)

Leaf Scald, Leaf Stripe, and Mosaic are here, but not yet in a dangerous way, and when noticed are immediately removed. The writer found four stools of Leaf Stripe in Korpi ratoons and one stool of Mosaic in Korpi plant at Fairford.

Yellow-striped leaves, not unlike Leap Stripe yet different, are sometimes found in H.G. 426 and Badila throughout No. 1 Division.

Nearly 1,000 tons of cane were transported by Victoria for plants, the greater part of which had been used to supplant known unclean areas.

NOTES ON THE BLUE OAT MITE

(*Notophallus bicolor* Froggatt).

BY J. HAROLD SMITH, M.Sc., Entomological Branch.

A pest reputed to have caused the failure of a crop of wheat in the Back Plains section of the Nobby district in 1925 showed signs of further attack in September, 1926. A brief investigation in that year yielded some interesting information, and the following notes contain the gist of a memorandum supplied to the Chief Entomologist (Mr. Veitch).

General Considerations.

The soil is a rich black basalt, easily worked if well soaked with rain. In dry weather, the soil sets into a hard pan at a depth of a few inches and becomes increasingly difficult to work. At the time of my visit sufficient rain to permit satisfactory drilling had not materialised, and the seed sown was planted under conditions far from favourable to the crop.

Continuous cropping of wheat is the normal practice of the average farmer, though some have a knowledge of its attendant evils in the spread of insect pests and disease organisms. When necessity compels a change, a volunteer fodder crop of oats may be allowed to grow or occasionally lucerne is sown. Conditions of cultivation generally are such that a continuous growth of those host plants required by cereal pests exists in the form of crops actually cultivated, or allied grasses to be found as weeds.

The affected paddocks had a south-east aspect with sufficient fall to occasion a surface wash in times of heavy rainfall.

Identity of the Pest.

The pest proved to be a mite of the family Eupodidæ. In appearance and habit it agreed with *Notophallus bicolor* Frogg., and further study confirmed that identification. About 1 mm. in length, the adult mite has a dull blue body colour, with mouth parts and limbs red.

This record appears new to Queensland, at all events as a pest of cereal crops.

Injury.

No standing crop of wheat was present on the farm from which the inquiry originated and, though observed feeding on young wheat elsewhere, advanced symptoms of attack by the Blue Oat Mite could not be examined. In the previous year—i.e., in 1925—the wheat crop had been practically ruined on the farm referred to, and, according to local wheat growers, the apparent cause was an excessive infestation of the mite. The incidence of the pest has extended during a period of two years from a small patch in the uppermost paddock throughout the whole length of two, each some 18 acres in area. In both cases, the wheat grew healthily until 8 to 12 inches in height, at which stage the infestation reached a maximum. The plants then dried out rapidly; any grain cast being only partially filled. From the farmer's point of view the crop was an entire failure.

Wheat attacked by the mite presents no symptoms other than a typically sick appearance when 6 to 8 inches in height and makes little additional growth, though climatic and cultural factors may be favourable. The plants dry up, and "en masse" have the colour of well-cured hay—i.e., the pallid green indicative of nutritious fodder rapidly dried.

N. bicolor swarmed on wild oats (*Avena fatua*), and oats growing as an escape from cultivation, without any apparent harm to the host plants. Close examination of these in bright light revealed pale longitudinal stripes in the leaf blades on which numbers of mites had been congregated. In some cases successive pale green areas followed each other in a line giving rather a characteristic appearance of irregular straight dashes. Whether these are typical on infested oats or likely to be noticed in wheat is uncertain.

Wild oat plants were brought to the office for experimental purposes. A number of mites were introduced into a seedling plant kept in a wide-mouthed test tube, sealed by means of a loose plug of cotton wool. After some time the mites began to feed, their fore limbs oscillating in rather a characteristic way. The mites preferred the upper surface of the lamina in the proximity of the ligule, and the precise positions of feeding were marked for convenience of further work. These parts of the leaf were sectioned. Examination of these sections gave some idea of the mode of penetration and the consequent injury to the plant tissue.

The following description of a typical section indicates the physiological effects of feeding. Two irregular cavities were visible on the upper surface of the leaf blade, one broadly open, the other deep and comparatively narrow mouthed. In each the epidermal cells had been forced into the mesophyll, suffering at the same time considerable derangement and losing the normal closely apposed structure. Such contusions would be made by the stiff unspecialised mouth parts possessed by *Notophallus bicolor*. Following this rough mechanical entry to the softer plant tissue the cells of the mesophyll are displaced and often ruptured, the contents of some having been extracted during feeding. In the surrounding tissues, the chlorophyll appears darker and more concentrated than in other parts of the leaf.

Feeding Habits.

The mites are very sensitive to intrusion, and exact observations in the field become a matter of some difficulty. At the slightest sound or movement they may crawl rapidly to the ground or should the plant be touched, fall immediately. Sometimes the adults crawl to the under side of the leaf. During feeding the body is set at an angle to the leaf, the anterior legs oscillating rapidly during the act of suction. When necessary the mouth parts may be withdrawn immediately, and the insertion appears to be only slight.

During the hotter hours of the day the bulk of the mites remain in concealment, the few specimens observed being confined to the leaf bases near the insertion to the stem. Most shelter in the soil, and all in some position not exposed to the direct effect of the sun's rays. Only rarely do they leave such sites during the day, and it is quite exceptional to find any immature individuals at that time. After sundown an efflux of the mites from concealment to the host plant takes place. Large numbers scatter over the plants, the bulk comprising immature forms. Most feed only on the upper surface of the oat leaves, but whether this is due to ease of penetration of the epidermal cells in this region requires determination.

Feeding appears to be restricted to the few hours round about sunset when the leaves are dry, the wind slight, and the solar heat at a minimum. The restriction of the mites' activity to this period suggests a disposition, negatively thermotropic and negatively phototropic. Immature forms compose the majority of the mite fauna observed at this time, a contrast to diurnal conditions when early instars are exceptional. At daybreak a heavy frost rind had settled on the ground, the leaves being wet and any interstices filled with dew. Adult forms were taken in the postligular space totally immersed in water. On drying these resumed their normal activity. Heavy dews apparently inhibit both the feeding and the movement of the mites, though total immersion for considerable periods does not have fatal results.

Life History and Habits.

Notophallus bicolor belongs to the group of softbodied mites known as the Eupodidæ, whose structure permits considerable activity. At rest the legs are partly withdrawn under the body, and detection is difficult if the mites are present in the soil. During the day shelter is found in the soil about the roots. On uprooting a seedling of oats, the disturbed mites move rapidly in all directions, their outstretched legs, bright red in colour, making them very conspicuous. Every effort is made to reach cover, aboundance of which is available in the soil.

Captured specimens were placed in jars together with seedling plants of wild oats. Examination of these plants at a later date revealed two egg masses, faint red in colour. These masses occurred on the upper suface of the leaf blade, a short distance, about one-quarter to one-half an inch, from the ligule. The mass has no definite orientation, the eggs being irregularly dispersed over an area of one-twentieth of an inch in diameter. Some twelve to twenty minute oval eggs, loosely attached to the leaf surface, were seen in the groups examined.

Under natural conditions large numbers of the mites are destroyed in the normal farm operations, their soft bodies offering little resistance to disturbances of the soil.

Host Plants.

W. W. Froggatt recorded the Blue Oat Mite from New South Wales in 1921 as a pest of cultivated oats. Cultivated oats were not grown to any extent in the neighbourhood of the farm on which the wheat had been attacked. The vigorous constitution, general in species of Avena, may account for the resistance of this plant, for no noticeable injury to it could be discerned.

While partial to oats, the mites may spread to any wheat grown in the immediate vicinity. If oats is a prominent weed in young wheat, severe injury may result to the latter plant. Along the headlands weeds occurred in profusion, but no trace of mites or any injury resulting from their attacks was observed.

Distribution.

Some three years ago the wheat failed in the upper part of the paddock near the top of a slope, and in the succeeding year the infested area included the whole hill. Two paddocks which covered the rise were generally infested; mites being found on oats growing here and there over the whole fallowed area. This extension downwards may have been accomplished by means of surface wash, evident after heavy rains, which would carry the light-bodied mites to previously unaffected areas. In addition to the small size of the mite, its readiness to lose hold of any surface, liberates it to the full force of such a natural distributing agent.

As the mite was originally described from the Delungra district of New South Wales, inquiry was made locally into fodder importations, in order to test the possibility of its having been introduced into the State by such means. During the dry periods of 1918 and 1923 considerable quantities of fodder were imported. There is, however, no evidence to show that any of this came from the district where the mite has been recorded previously. The alternative hypothesis, viz., that the mite is indigenous to the Nobby and Back Plains district, seems more probable. As the feeding habits and injury resulting from slight infestations are not such as would attract attention, only an abnormal influx of the mites, overrunning a crop sufficiently to cause serious injury, would make its economic status evident. These considerations place the mite among those organisms which may be regarded as potential pests, which increase to dangerous dimensions under exceptional circumstances, associated with some climatic or other variation in cultural conditions.

The limits of the local distribution of the mite in Nobby district were not ascertained, but it occurs within at least a 5-mile radius of Mount Glen.

Control.

The necessary conditions required for the use of sprays in the control of pests indicate that for the treatment of the mite the practice will prove of doubtful value. As previously mentioned, the least sound or movement sends the mites to the ground at once. Thus the impaction of the spray, if crudely applied to the seedling plants, would send many into cover on the ground where some protection from the effect of any spray used is available. The refinements of spraying which would be necessary are practically unobtainable on the farm, hence control measures of this type are of doubtful utility in this case. Even were it possible to secure effective control of the mites by this method, the high cost of application to cereals would prohibit its use in other than very exceptional cases.

Cultural operations seem the more practicable, and suggestions may be summarised as follows:—

1. *Deep Ploughing.*—The mite, in common with other Eupodidæ, is soft bodied in structure and hence easily destroyed. Occasional deep ploughing to a depth of 8 to 9 inches both disturbs the mites and buries them at a depth from which they can scarcely emerge. To render the practice effective, the use of a skim coulter is desirable, as the upper 2 inches of the soil, containing the mites and contaminated vegetation with the egg masses, will be securely placed at the bottom of the furrow. The frequency of the operation must be determined in accordance with the specific requirements of the crops being grown.

2. *Fallowing.*—Apart from the importance of fallowing to the successful growth of the wheat crop, insects and other pests are robbed of host plants for some time. Frequent working of the land keeps weeds, including wild oats, in check and disturbs the soil. Both these factors react unfavourably on *N. bicolor,* in the first place by starving the mite, and secondly by mechanically destroying large numbers. Where fallowing over long periods is impossible, harrowing, cultivating, and other modes of working the land are advantageous from the entomological point of view.

3. *Rotation of Crops.*—The cropping of wheat from year to year, a common practice in the district, affords a supply of host plants which is suitable to the spread and multiplication of the mite. As an alternative, the crop may be changed frequently, either by planting some other graminaceous crop or the insertion of a green crop, e.g., lucerne, into an elastic rotation. Such may be easily devised by anyone conversant with local agricultural conditions and possessing a knowledge of the potentialities of various crops in the soil of the district.

FARM TRACTORS AND THEIR MANAGEMENT.

By E. T. BROWN.*

No matter how skilful the tractor driver may be there are times when things go wrong with the engine. It may be loss of power or the engine may cease work altogether. This is the time when the technical knowledge of the driver comes into play, since it is his duty to locate the trouble as quickly as possible. Trouble invariably occurs when the machine is being used, and, therefore, the less time taken to discover the cause of the trouble and to set matters right the better. But it is not always an easy thing to decide at once what has really happened. There are ways, however, of diagnosing the complaint quickly, and correctly. The best method of tracing the trouble is by the elimination of those factors that cannot possibly have caused the trouble. But before one can do this it is essential to appreciate at the beginning what symptoms are likely to be displayed, and, moreover, to understand what the cause of these symptoms is most likely to be. Then by classifying the complaints and working in a methodical way, it is an easy matter to find out what is amiss.

The Systems to Examine.

The plan that I have always found to work best is, when anything goes wrong, to examine the ignition system first, then follow with the fuel supply, and, if the cause does not lie with either of these, to examine the engine. It is generally possible to remedy any defect in the ignition system or the fuel supply when out on the land, but in most instances when it is the engine that is at fault it is necessary to effect the repairs in the workshop, since most probably the engine will have to be dismantled. It is surprising, however, how much a skilled man can do in the way of remedying a fault when away from his shop. But there must naturally be many jobs that cannot be done at the time. There are six symptoms for which to look, and if these be taken in rotation, the work of diagnosing the complaint is simplified. These are: (1) Engine misses fire or stops; (2) loss of power; (3) knocking or pounding; (4) backfiring; (5) overheating; and (6) irregular speed. These I propose to take in order, and explain the causes that may account for the trouble.

Misfiring.

Misfiring may be due to (1) dirty distributor in the magneto; (2) vibrator points pitted or dirty; (3) sparking plugs dirty or cracked; (4) sparking plug points not properly set or the contact breaker stuck up. If the fault be not here, ascertain whether the fuel mixture is correct or whether there is any water in the fuel. If the trouble lies with the engine, look for loss of compression by turning the engine slowly over by hand and testing the compression, or the valves may be out of order.

Loss of Power.

Loss of power is very quickly noted and particularly when the loss is considerable. Loss of power may be due to: *Ignition*—The spark not sufficiently far advanced; the wiring may be faulty; the plugs dirty; the contact-breaker points pitted or incorrectly adjusted; the commutator brush may be dirty. *Fuel*—The mixture may be too weak; that is, have too much air; the intake manifold may be leaking; water in the fuel; the float of the carburetter may require adjustment. *Engine*—The oiling may be insufficient; the governor may require adjusting; loss of compression; worn, stuck, or broken piston rings; scored cylinder walls; sticking valves; leaking head joints.

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* In the "Farmer and Settler."

Knocking or Pounding.

This cannot be a fuel complaint, therefore examine the ignition system. The spark may be too far advanced, but as a general rule it will be found that the engine is at fault. It may be that the carbon deposit on the cylinders, pistons and valve parts has accumulated sufficiently to cause the noise; the bearings may be loose; the pistons too tight or insufficiently lubricated; the water system may not be working properly. Usually the cause is carbon deposit.

Backfiring.

This is generally caused by faulty ignition. The high-tension wires may be connected to the wrong plugs; there may be a short circuit in the primary wires; the spark may be too far advanced. This complaint is sometimes caused by a weak mixture, but this is not often the case. It is possible, however, for a stuck or leaking inlet valve or a leak in the manifold or the carburetter gasket to cause backfiring.

Overheating.

A weak spark or one that is timed too late may cause the engine to overheat, and this also is true when a too-rich mixture is used. In most instances, however, it is due to insufficient oiling; an impeded water circulation; or heavy carbon deposits on the cylinders, pistons, and valve ports.

Irregular Speed.

This is a complaint with which one frequently comes into contact. One minute the engine is running well and pulling strongly, the next it is very sluggish. It is not always an easy matter to account for this irregularity, but it is generally due to one of the following causes:—*Ignition*—Loose connection, partly broken wires, or pitted or badly adjusted platinum points in the contact breaker. *Fuel*—Irregular supply of fuel, a dirty needle valve in the carburetter. *Engine*—The governor working badly or sticky valves.

Beware of Loose Nuts.

One loose nut on the tractor outfit may cause untold damage. A tractor by the very nature of its work, and the unevenness of the ground over which it travels, is constantly subjected to severe shocks and excessive vibration. This undoubtedly accounts for the frequency with which one comes across loose nuts on the outfit. True, many of the most important nuts on the engine are secured with a split pin, but there are hundreds not so held. The only way of making certain that all nuts are screwed home as tightly as possible is to go round them at frequent intervals. An unbreakable rule should be made by every tractor operator that whenever he is looking over the machine, for any purpose whatever, he does so spanner in hand. It will be found that some nuts never require attention, but, on the contrary, there are others that seem particularly given to working loose. It is the latter that should receive attention every day, and this is an easy matter, for one quickly finds out which are most likely to suffer from the vibration.

The Need for Clean Air.

The average tractor operator does all that lies in his power to ensure fuel passing into the engine. A very large number of them, however, do not appear to appreciate the fact that it is equally important to take precautions to prevent dust-laden air from entering the induction pipe. To ward off the danger of allowing dirty air to be mixed with the fuel vapour, all tractors are fitted with air filters. These filters, however, are useless unless they be cleansed out at very frequent intervals. It will be realised how much dust the air is capable of carrying when it is stated that it is no uncommon thing to find that close on 2 lb. of sandy material has accumulated in the filter during a normal day's work on dry soil. The most satisfactory type of filter is that in which the air has to pass through water. This arrangement ensures only clean air entering. But it is essential to clean out the filter at least every day the tractor is at work.

A Tip for Benzole Users.

I have frequently heard tractor operators state that they object to the use of benzole as a fuel on the ground that when a cork float is fitted to the carburetter there is always a danger that the benzole will destroy the varnish on the cork. If this varnish be destroyed the cork will sink and a flooding carburetter will result. This difficulty can very easily be overcome. A celluloid varnish is not acted upon by benzole, and, therefore, this is the material to employ. Procure a few scraps of celluliod—an old comb or tooth-brush handle will answer the purpose admirably—and dissolve them in amyl acetate. This liquid can be obtained from practically any chemist. Dissolved celluloid is a tacky solution, but it can be successfully applied with a small brush. The life of a float treated in this way is a long one.

FAT LAMB RAISING.

J. CAREW, Assistant Instructor in Sheep and Wool.

In a recent radio lecture by Mr. J. Carew, assistant instructor in sheep and wool, the lecturer impressed upon his hearers that the carrying capacity of the holding should be first considered and then stocked with a type of ewe suitable for lamb raising.

In Queensland, he said, the natural pasture is, generally speaking, unsuitable for fattening lambs. The great proportion of the coastal lands in the State vary from poor rough country to rich alluvial river and creek flats, and many of the natural grasses on this class of country, while good in the early stages of growth, become too coarse and rank and produce seeds injurious to the well-being of the sheep, as well as being deleterious to the wool. That these pastures can be greatly improved has been conclusively demonstrated in many places; that is, in places where the land was put under cultivation for a year or two and then sown down with artificial grasses, principally Rhodes grass; and there are instances in which the pastures, after cultivation in this way, have been allowed to revert to natural grasses without any sign of spear or wire grass making its appearance. Stocking heavily during spring and summer is the method usually employed in controlling these grasses, and in keeping them suitable for sheep for the greater portion of the year.

In the scrub areas, where artificial grasses are sown, they will be found sufficiently good for fattening purposes, but even they are greatly enhanced by having cultivated crops that can be regulated to come in at a time when they will supply any deficiency in feeding values that may be known or expected, as seasonal influences play an important part.

Fat lamb raising should be combined with mixed farming, and anyone carrying on mixed farming will find that sheep will give a remunerative return. Assuming that an established farmer has his cultivation paddocks fenced off with the ordinary stock-proof fences, he would be able to convert them into sheep-proof fences with wire netting at a cost of about £30 a mile. Paddocks of about 20 acres or smaller are suitable, and in this way the sheep can be put in after a crop is taken off, and instead of burning off before ploughing, be cleaned up by the sheep; the manure that they will distribute will leave the paddock all the better for their being in it. Cultivation is one of the best means of converting a worm-infested paddock into worm-free country, and worms form one of the greatest enemies to the sheep industry along the coast and, indeed, well inland, especially in years when summer rains are abundant.

When the weight and probable price of the breeder's wool is taken into consideration, a fair margin of profit should be secured on the breeding flock. Should the lambs be sold when five months old at anything like present market rates a an admirable dual-purpose sheep, an essential in the farmer's breeding flock.

Mr. Carew described the Corriedale as the most suitable farmers' sheep, it being large, well-proportioned, possessing a strong constitution with a plentiful milk secretion, combined with a capacity for producing a weighty fleece of fair crossbred quality of about 50's to 54's spinning counts. The Corriedale could be considered an admirable duel-purpose sheep, an essential in the farmer's breeding flock.

"As the Corriedale is not suitable for producing fat lambs" (Mr. Carew continued) "it is necessary to mate the ewes to a breed of ram likely to give the best results, and, despite the claims made on behalf of other breeds, I would" (speaking from experience gained under Queensland coastal conditions) "recommend rams of the Dorset Horn or Border Leicester breeds for the higher and well-drained areas within, say, 50 miles from our sea-board.

"If the Corriedale breed is not procurable, or if for any other reason the sheep farmer wishes to raise his own breeding flock, full consideration must be given to geographical, climatic, and general conditions. The Corriedale is based on being fifty-fifty Lincoln and Merino. Therefore, Lincoln rams mated with Merino ewes will give a suitable type, but would probably be composed of a big percentage of rough-covered ewes that would greatly reduce the value of the clip. (The Corriedale, which has been developed by careful selection, is composed of a more even type.) Should the Lincoln-Merino first cross be used as the breeding flock, the pure-bred Lincoln ram will not produce lambs to mature as quickly as the Border Leicester or Dorset Horn, therefore, by introducing two breeds of rams, complications are being constituted unnecessarily. Should the holding be within 50 miles of the coast with low lying as well as elevated ridges I would recommend the Romney Marsh or the Romney cross as the breeding flock.

"On the higher and better drained areas the Border Leicester crossed with the Merino can be recommended as likely to give the best results all round. The first cross will be quick to mature. The wether lambs should be fit for market when four and a-half to five months old. The first cross ewe lambs should be retained as breeders, being very suitable both as wool and mutton sheep, growing to a good size, possessing plenty of vigour, capable of a quick recovery after a pinch, having a good milk secretion (which is so important in securing early maturing lambs) and being prolific; all these characteristics, combined with the quality of adapting themselves to the varied diet usually supplied on a mixed farm, help to secure for them a position amongst farmers' sheep that is difficult to displace. These half-bred ewes can be mated again with the pure Border Leicester ram, but, as the result of this mating I would recommend that all this drop be sold as fat lambs, as soon as fit, as the ewes from this cross are on the coarse side in regard to wool production.

"It will, therefore, be understood that only one pure breed of ewe and one pure breed of ram is necessary, that is, the Merino and Border Leicester. This will simplify matters considerably, as all the breeding ewes can be run in one flock during the whole year.

"The Dorset Horn is a very desirable breed for the fat-lamb trade, but as they are not so valuable as wool producers and do not possess any distinct advantage over the Border Leicester as a fat-lamb getter there appears to be no reason why they should be used instead of the Border Leicester and Merino Cross.

"Assuming then that this is the cross to be used, we find that the Merino is suitable to be mated either in spring or autumn, but the Border Leicester Merino cross will only mate successfully in autumn. For the purpose of getting fat lambs it is better to keep the rams away from the ewes except at mating time. Seeing that the autumn is the only season in which a good mating can be expected, I would recommend joining the rams with the ewes from the second week in February to the last week in March. The lambing will thus commence in the middle of July and finish the last week in August.

"At the time of mating, the ewes can be kept on good and suitable natural pasture. If the season be good, they will probably be attacked by the sheep maggot fly, but at this season the ewes can stand the knocking about that is necessary for crutching, jetting, &c., to keep them free. If stomach worms are present they are worst at this season. In this respect I do not mean that the effects are worse, as at this season the sheep should be better able to withstand the evil effects owing to the feed being more suitable and nutritious.

"When winter comes on the sheep should be practically free from worms, and as no worms are hatching out owing to cold conditions, the ewes can go right through the lambing without disturbance, as flies also are, as a rule, absent at this period. By the time the flies begin to get busy the lamb marking should be over, as the most suitable time to mark lambs is when they are from two to six weeks old. The flock will be fit for shearing by the end of September or early October. The shearing has a retarding effect on the attack of the fly, especially if all sheep are jetted as they go through the race after shearing.

"As the sheep are to be shorn, they should be examined for broken mouth and specially marked to be fattened off. The broken-mouthed ewes can be fattened off with the lambs and sold while they are still capable of fattening up, otherwise they are likely to be kept hanging on in an unprofitable manner. When the lambing is timed to take place in July and August provision should be made to have a supply of feed for the whole batch, as the more quickly they are fattened the more economic the fattening.

"If lucerne is grown on the holding there will be but little growth in it during July and August. If cut during June, the short growth during July and August is very suitable for grazing sheep, on which they will do well, thus giving the lambs a good start off. Up to the time the lamb is dropped the ewes should be kept going, but should not be put on luscious feed. After the lambs are dropped, the best and most luscious is not too good and for grazing purposes lucerne is among the best.

"There are other crops, however, that are suitable and that can be grown during our normal autumns and winters, such as oats, barley, wheat, turnips, rape, &c. I regard the latter as giving the best results for fattening purposes. If sown in April and May it will be suitable for feeding during August, September, and October. For feeding during November and December, lucerne is about the best; failing this, Sudan grass or one of the panicums will fill the bill and top off all the lambs by the end of January or the middle of February, which brings the proceedings to a close for one year, when a fresh start can be made to follow the same routine."

CONSIGNMENTS AND HOW TO DEAL WITH THEM.

By G. B. GALLWEY, A.F.I.A., A.A.A., A.A.I.S., Queensland Agricultural High School and College.*

A farmer grows produce to sell and has two markets in which to make sales. These are the local market and the city market. It often happens that he uses both, and with the former his transactions are not particularly complicated as he sells either for cash or credit and has dealings with one particular man and his accounts show straight-out debits and credits. In the city market he has to open a consignment account and work on it for the periods he is sending his produce afield.

It may be well to consider what a consignment is, the reasons for making the consignment, and who are the parties concerned. The first may be termed an adventure, because it is the forwarding of goods by one person to another for sale by the latter for a remuneration, usually a percentage on the sales, which is known as a commission.

The reason for making a consignment is generally the hope of obtaining a better price than is ruling locally and thus obtaining a better profit. In some cases the local demand is more than satisfied by the supply and the farmer is forced to seek another market. Often the particular produce grown can only be sold in certain places, and the farmer will then find it necessary to make consignments.

The parties to a consignment are the consignor and the consignee. The consignor is the principal—that is, the person who owns the goods comprised in the consignment and who is entitled to receive the proceeds of the sale of such goods. The consignee is the agent—that is, the person who receives the goods and sells them for the consignor or principal.

It should be noted that the ownership of the goods remains with the consignor or principal. The consignee or agent is really in a position of trust and must account to his principal for his dealings with the consignment.

The farmer, when he forwards his goods, should advise the agent, sending any papers necessary for delivery to be obtained. He should also advise any special instructions he wishes to be observed regarding the sale. If the farmer fixes a certain price on the consignment, the agent is expected to sell for as much above that price as he can, but should not sell below the price unless he has the permission of the farmer.

When a sale is made the gross proceeds are received by the agent. This amount is the total obtained for the sale of the consignment.

On this amount the agent receives his commission and deducts it from the gross proceeds. He then deducts all expenses for receiving, handling, storing, and selling, and has left the net proceeds which are due to the farmer.

In order to show the farmer the result of the consignment the agent forwards a statement which is known as an Account Sales. This statement may cover either partial or total sales and shows all the details of the goods sold, all charges and commission, and the actual net proceeds. The agent either forwards his cheque with the Account Sales or in some instances a few days after.

The foregoing is in short what happens when produce is sent on consignment. Other points arise in this connection, and the principal of these is the fact that the farmer enters into a contract with the person or firm who carries his goods. This contract fixes certain obligations on both parties, which, however, do not affect the relations of the farmer and his agent.

From the farmer's point of view the procedure outlined is known commercially as a Consignment Outwards, and the farmer interested in keeping books should make these entries. As it is not possible to know what the produce will realise, the farmer should note down what he has consigned and the date the consignment was made, and what he estimates he will receive. This amount should be debited to the consignment account and credited to the produce account concerned. If the farmer has made any payments he should debit consignment and credit cash. When account sales come to hand the amount of the net proceeds should be credited to consignment account and debited to a personal account of the agent. On the arrival of the agent's cheque, debit cash and credit his personal account. If a cheque accompanies the account sales there is no necessity to open a personal account for the agent, but debit cash and credit consignment account only.

An examination of these entries will show that the agent's account is written off, the cash will show the amount received and the payments made, and the consignment the profit or loss made on the venture. A profit is made if the credits exceed the debits, and a loss is suffered if the debits exceed the credits.

* In a radio lecture from the Queensland Government Radio Station, 4QG.

Consignment accounts of another class are called Consignment Inwards, and do not as a rule affect the farmer, but principally concern the agent.

Sometimes two or more farmers may join together in a deal or sale, and such cases are recorded in commerce as joint accounts. In these accounts there exists more often than not a big element of speculation. The primary cause is that it is considered a particular line can be turned into a big profit by a snap deal and one party finds the money and the other manages the transaction and receives a commission on the gross sale. After the completion of the deal and the managing party has been paid his commission the profits or losses are shared.

The farmer's interest in these accounts centres principally in Consignments Outwards, and in regard to these let me conclude with a little advice: Help the agent by sending your best; be straight with him and he'll be straight with you; and, as I said in a previous lecturette, if you are puzzled about your account sales consult your banker and your agent, and you will find how easy it is for transactions and business relations to move along smoothly.

RADIO LECTURES ON AGRICULTURE.

THE LIST FOR FEBRUARY.

By arrangement with the departments concerned by the Director of the Queensland Government Radio Service (Mr. J. W. Robinson) through his Market Reports Officer (Mr. Robert Wight), forthcoming wireless lecturettes on agricultural and related subjects are listed as follows:—

Wednesday, 8th February, 7.45 p.m.—A lecturette arranged by the Queensland Agricultural High School and College.

Thursday, 9th February, 7.45 p.m.—Meat Inspection, by Mr. Inspector Cheeseman, Department of Agriculture and Stock.

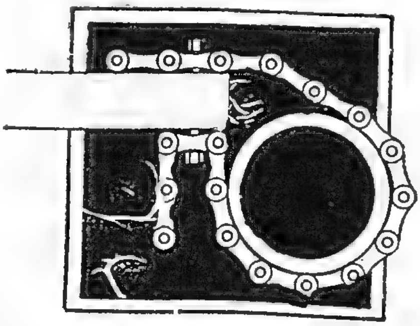
Tuesday, 14th February, 7.45 p.m.—Progress of Agriculture in Queensland, No. II.—Mr. J. F. F. Reid (Editor of Publications).

Monday, 20th February, 7.45 p.m.—Pig Raising—Mr. E. J. Shelton (Instructor in Pig Raising).

Tuesday, 28th February, 7.45 p.m.—Points in Fruit Growing Practice—Mr. George Williams (Acting Director of Fruit Culture).

A CHAIN AS A PIPE WRENCH.

When it is necessary to turn a pipe in making a pipe joint it is a difficult matter to grip the pipe unless the jaws of the turning tool have teeth that will bite into the outer circumference of the pipe. The pipe wrench is the proper tool to use for this, but so little need is found for this tool that it is rarely found in the collection of tools at hand. The accompanying illustration depicts a scheme that will accomplish the same result. It consists of a section of old roller chain, a long bolt, and a heavy steel or wood beam. The beam is drilled at one end to



take the bolt, and the chain is placed around the pipe, then bolted to the beam in such manner that the smallest number of links will surround the pipe. Applying leverage to the beam pulls the two ends of the chain in opposite directions, and causes the links to bite into the pipe in very much the same manner as the sharp jaws of a pipe wrench. The greater the leverage applied the greater will be the grip of the chain on the pipe.

POULTRY HOUSING.

HINTS FOR JUNIOR POULTRY CLUB MEMBERS.

By P. RUMBALL, Poultry Expert, Department of Agriculture and Stock.

Correct housing is very important if the best results are to be obtained from poultry raising. Poultry houses and buildings should be dry, well ventilated, free from draughts, with plenty of sunshine and sufficient room to allow the birds to move about with freedom and comfort. The foregoing features are all necessary factors in maintaining the good health and vigour of the birds, without which profitable production cannot be obtained. Poultry houses may be built in a variety of shapes, and a variety of material. It may be possible for old buildings to be remodelled to suit the requirements of the poultry, but in the building of a new house or houses it is better to follow the system of poultry house building generally adopted.

Making a Beginning.

Club members are commencing operations with only a few birds and consequently a very large house is not required. The house that is recommended although small will make a suitable breeding pen if the operation of poultry keeping is extended by club members. The material most suited for building fowl houses is hardwood, free from cracks and crevices for the frame work, and galvanised iron for roof, back, and ends. With this class of material the least possible harbour is offered to vermin which frequently infest poultry houses. If it is not possible for a club member to procure iron and good sawn hardwood for his building, timber may be used for both ends and the back of his house, but iron should be always be used for the roof, for it is most important that the interior of the shelter should be kept dry.

The Building.

A house, 4 feet long and 4 feet deep, will be sufficiently large to accommodate the stock, and large enough to hold six hens and a mate bird at a later date for breeding purposes. This house should be open in front and face the north or north-east. The ends and back closed in with iron or timber. If the timber is to be used it is as well to dress it with wood-preserving oil with the object of not only protecting the timber, but guarding against vermin making their home in the building. The height of the house at back should be 4 feet, and in front 4 feet 6 inches. If 6-foot iron is used for roofing purposes and a 3-inch overhang is allowed at back, it will be found that there is considerably more than a foot of iron projecting in front. This overhang in front largely assists in keeping the house dry, which is essential. Ventilation must be provided. This is best done by space of 2 inches between the top of the back wall and the roof. This is also an important point in building a fowl house, as without it the house becomes very hot in summer, and in houses where large numbers of birds are housed together and no ventilation is provided, the air in the house becomes very stale, and consequently injurious to the birds health.

In a building where the ends and back are to be constructed of timber, if the timber is just fitted together it will shrink and eventually leave gaps that will cause a draught. Draughts are largely responsible for the birds developing colds. The joins in all timber-constructed sheds should, therefore, be covered with a small lath or beading to prevent this. Where neither iron nor timber can be procured for the walls of the fowl house, wheat or corn sacks opened and stitched tightly may be used. These are fairly durable if given a coat of whitewash and reduce considerably the initial cost.

The material required for the most desirable class of house, that is iron and timber, is as follows:—

3 inches by 2 inches hardwood for corner posts—Two 5 feet 6 inches, two 6 feet.

3 inches by 1½ inches pine battens for roof, back, and ends—Six 4 feet, two 5 feet 6 inches.

6 inches by 1 inch hardwood for front of house—One 4 feet.

Iron—Roof, two 6 feet; back, one 8 feet; ends, two 9 feet.

This material will cost approximately £2, but it may be possible for many members to procure second-hand material that will do equally as well.

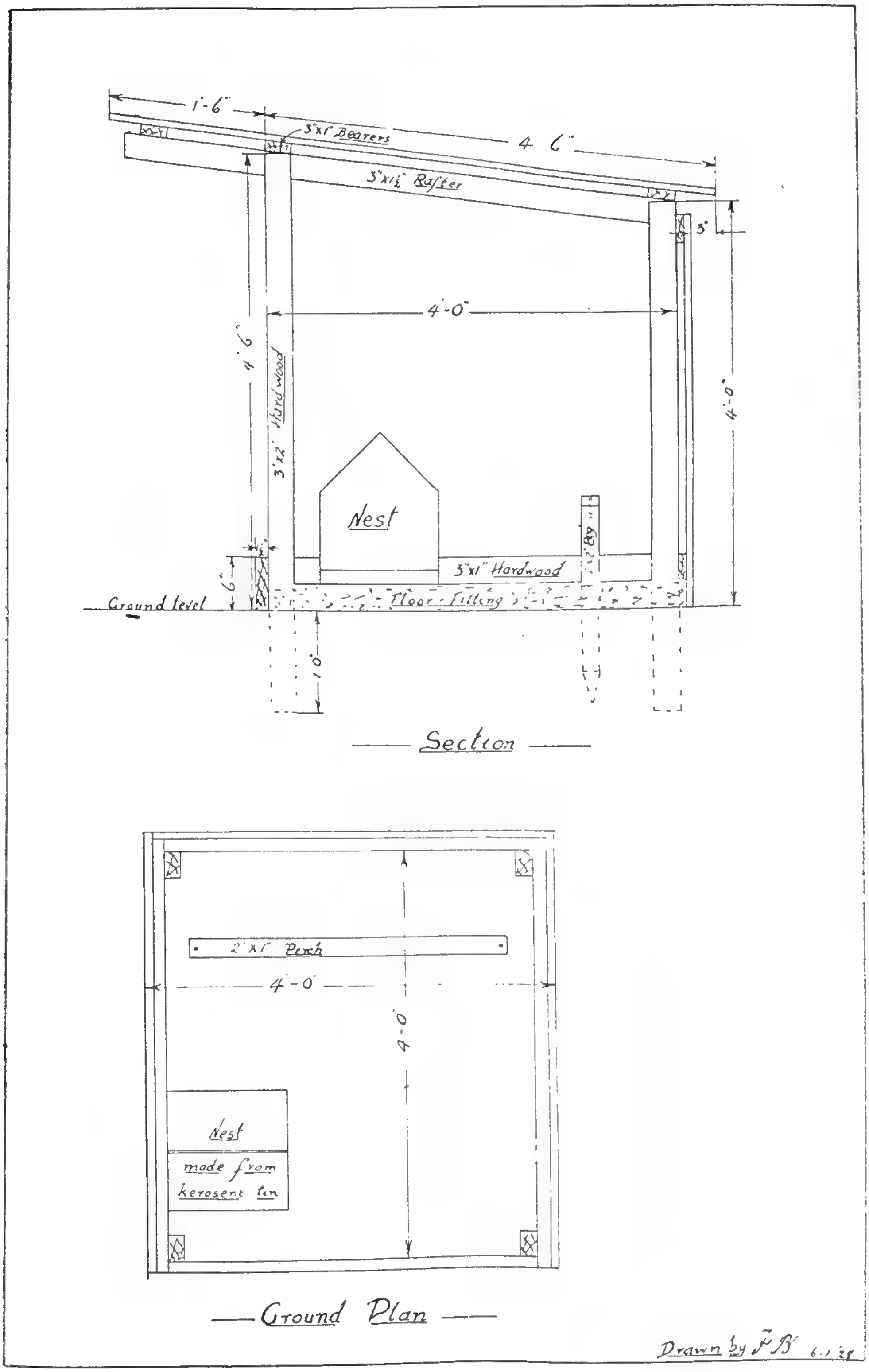

1'-6"
3"x1" Bearers
4' 6"
3"x1½" Rafter
3"
4'-0"
4' 6"
3"x2" Hardwood
Nest
3"x1" Hardwood
6"
Ground level
Floor Filling
1' 0"
4'-0"
Section
2"x1" Perch
4'-0"
4'-0"
Nest
made from
kerosent tin
Ground Plan
Drawn by F.B. 6.1.28

PLATE 52.

To this house should be erected a netting run. The number to be housed together, however, is so small that the run need not be large, and, therefore, no hard and fast rule will be laid down for this purpose. If it is possible to give the birds the run of the yard or free range, and this will be possible where no other fowls are kept, the expense of building a pen may be saved.

Location.

Having the material to commence operations, the next point to consider is the location. Poultry houses should be built, if possible, on a slope and well drained soil. Wet and damp houses mean a cold one, and this is frequently responsible, by its weakening effect on stock, for sickness and disease.

The interior of a poultry house should be simple and easy to clean. The first consideration is the floor. This should be raised several inches above the level of the surroundings. Cement floors are the easiest to clean and the most desirable, but here again expense has to be considered. Clay and ant bed filling well puddled and tramped down make a very good floor, and is readily cleaned. The roosts should always be placed at the back of the house, and be situated about 10 inches from the back wall. They should be made of timber 2 inches by 1 inch hardwood, and fitted on to two pegs standing 10 inches to a foot out of the ground. The best way of attaching the perches to the pegs is by driving a nail into the peg to within an inch of its full length, then bore a hole in each end of the perch which will enable it to fit loosely on the peg, and so allow of its removal for cleaning operations.

One nest will be sufficient for four pullets. This can be constructed out of a kerosene tin, as illustrated, and placed at one end of the building. This type of nest is fairly well secluded, a feature which birds appreciate, and one that also assists in preventing such vices as egg eating. Good clean nesting material is the next essential, as without this eggs cannot be kept clean, a highly important point in securing top market prices.

IMPORTATION OF PEDIGREE STOCK.

The proposal of the Empire Marketing Board to make available to the Commonwealth Government portion of the annual grant provided by the British Government to assist the export of pedigree live stock to the overseas parts of the Empire was discussed in detail recently at a conference held in Melbourne by the Minister for Markets (Hon. T. Paterson, M.P.), the Commonwealth Chief Veterinary Officer (Mr. R. P. Allen), the Commonwealth Chief Dairy Supervisor (Mr. P. J. Carroll), the Secretary to the Department of Markets (Mr. C. J. Mulvaney), and representatives of the Royal Agricultural Society of Victoria, the Chamber of Agriculture, and several breed societies.

The conference was convened in consequence of the Marketing Board's request that the various Dominions should suggest means whereby assistance under the terms of the grant could be most suitably rendered. The conference was unanimously of the opinion that everything possible should be done to encourage the importation of the very best class of pedigree stock into the Commonwealth.

It was also agreed that any financial help rendered should not act as an encouragement for the importation of inferior stock or for the purchase of stock for speculative purposes. The opinion eventually arrived at was that the cost of any assistance rendered should be borne by the Empire Marketing Board, the Commonwealth and State Governments, and the ship owners and should be available to Australian registered stud stock breeders only; also that such breeders should be relieved of two-thirds of the expense of bringing the stock from Great Britain to Australia.

It was stipulated that, where assistance is rendered, the breeder receiving such assistance must not dispose of the stock within twelve months of its importation into Australia, and should it become necessary to sell the animal within that period the amount of any assistance rendered be refunded.

Among those who attended the conference were—Messrs. C. E. Merrett (President, Royal Agricultural Society of Victoria.); H. Schwieger (Secretary, Royal Agricultural Society of Victoria); L. Monod (Secretary, Cattle Breeders' Societies); H. Kendall (representing the Chamber of Agriculture); A. H. Mactier, and the following representatives of Breed Societies: Messrs. J. McIntosh (Red Poll), H. H. Peck (British Breeds of Sheep), D. C. Morpeth (Shorthorn), J. Lidgett (Milking Shorthorn), W. Cockbill (Ayrshire), G. A. Bedwell (Australian Stud Pig Breeders Society), C. D. Lloyd (Jersey), and W. Finn (Guernsey).

SELECTING AND HANDLING THE BOAR.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

There is an old stock adage that the boar is half the herd. Though the statement needs some considerable backing, yet, in a general way it is true. It embodies an idea that must be constantly kept in mind when selecting a sire.

Mr. Shelton's notes on the subject will, therefore, be read with interest, for they cover a wide range and carry much practical information.—Ed.

Visiting a Southern farmers property recently and inspecting his stock, the topic of conversation turned to the class of boar he was using, whereupon the farmer invited the writer to "have a look at him"—i.e., the boar—which was penned some distance away from the herd.

Continuing our chat I observed, "Yes, but surely you are not using that fellow, he's a crossbred such as we would certainly not recommend for use on any farm, no matter what class of pig it was intended to use." This conversation, which, happily, was a very productive one, lead to the preparation of a few notes on the subject and this in turn to the present article, which it is thought, covers the ground required and gives information such as may be made use of on any farm, no matter in what part of the State the farm may be situated. It might be added that, before we left the farm referred to, an order had been booked to secure a really good purebred boar and to have him delivered as early as convenient to replace the crossbred, which our friend decided to replace as soon as another more suitable one came to hand.

Selecting the Sire.

There are many points to be observed in the selection of the head of the herd, for the boar represents a very important section of the pig stock.

Even if there is a tendency at times to exalt unduly the influence of the boar and seemingly to neglect that of the sow, the farmer should not permit himself to reverse things and entirely neglect the paternal head of the herd. Breeders cannot afford to neglect either the boar or the sow; they are both important factors in the production of a good herd of young stock. The boar, of course, has a greater influence in the herd for the reason that he will sire a considerable number of the pigs kept. Probably all the individual young pigs on the smaller farms will be the progeny of the one side, whereas they would not all have the same dam.

The more important the stud is or the more pigs there are on the farm, the more important is the selection of the sire. That there are risks associated with the purchase of all classes of stock is a well-known fact, but this does not lessen the importance of the selection of the head of the herd, or of the sows or of other farm stock.

Fundamentals of Success.

Fifty pounds stirling or even more spent on the purchase of a good boar would be money well spent by the man that had the work for him and that hoped to build up a really good stud herd. Similarly, £10 or more is not too much to pay for a good boar for use on pure or grade sows for the production of pork or bacon pigs. Whatever the price, so long as the animal is good and the stud warrants the outlay, get a good one, and don't stop and listen to the man that says, "Any old thing is good enough for me so long as he can serve its purpose." A boar of inferior quality will have a disastrous effect on any herd. A good boar raises the standard of the herd; an inferior boar lowers it.

Essential Characteristics.

The boar should, above all, have his masculine characteristics strongly developed; weak effeminate boars are disastrous. Recognising that the boar represents at least 50 per cent. of the reproductive force of the herd divided up amongst the sows to whom he is mated, it will be necessary first of all to consider the class of sow to

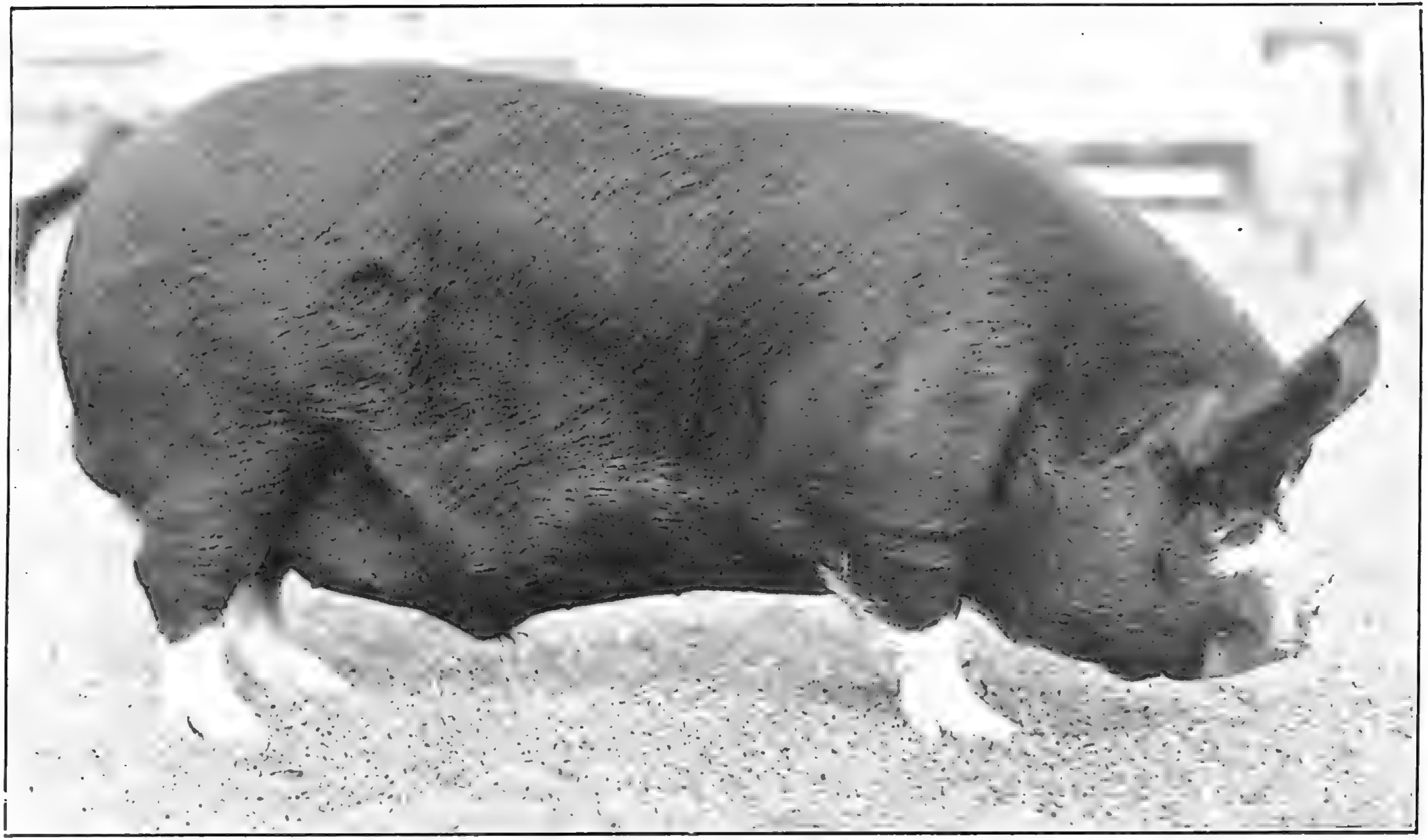


PLATE 53 (Fig. 1).—A CHAMPIONSHIP-WINNING BERKSHIRE BOAR.

"Murray Glen Star" (1969), the Berkshire Boar here shown, has proved a valuable investment as a stud sire. His progeny have been in great request and have sold readily. The property of the Queensland Agricultural High School and College (Gatton College) he has been a popular and attractive addition to the stud. Many of the best Berkshires in the College Stud to-day have in their breeding blood of the Murray Glen Star strain and of "Bylands Nancy" (5238), a Berkshire Sow purchased at the same time for the College stud. Note this boars type and character, his bodily developement and style, also his markings and quality.

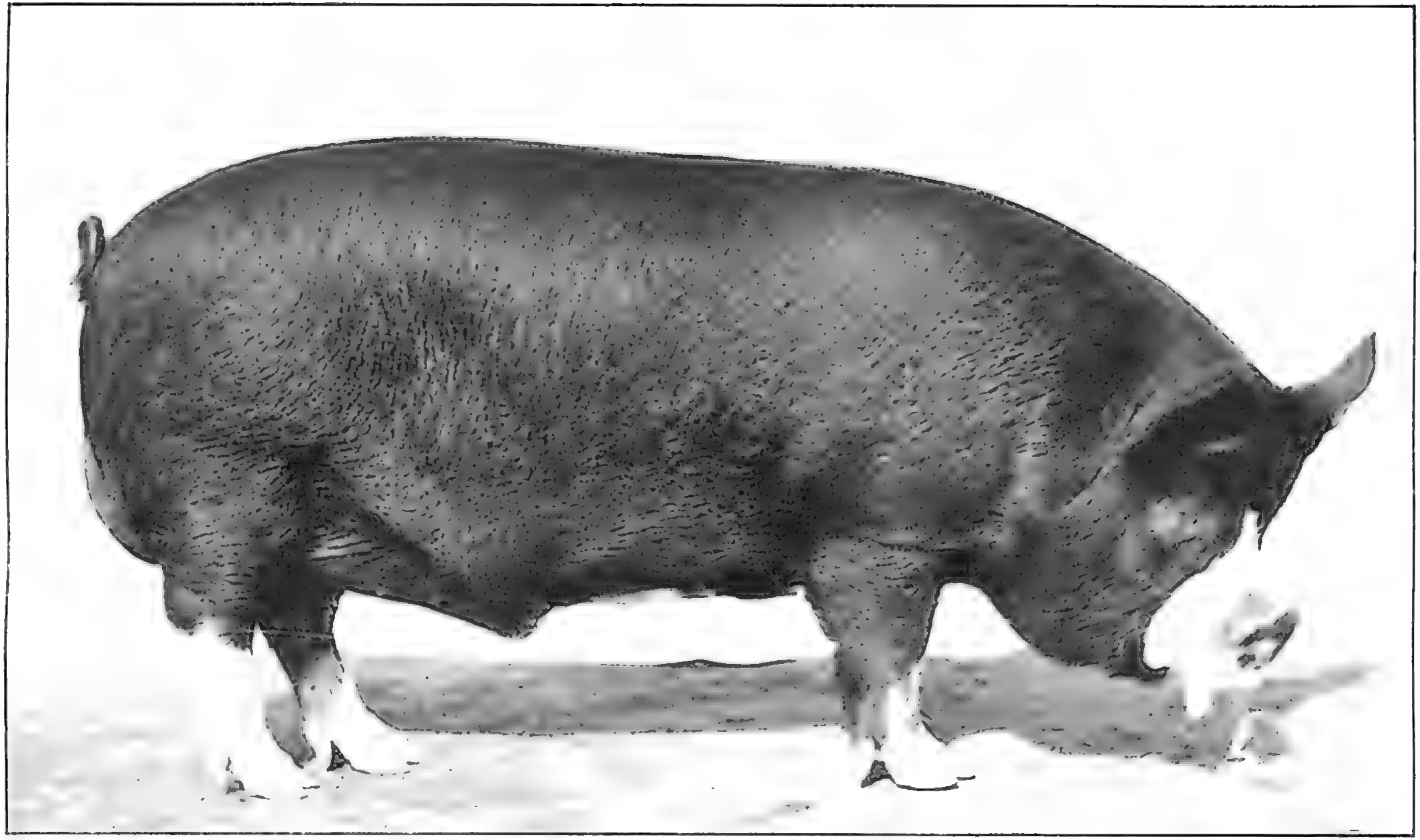


PLATE 54 (Fig. 2).—A LENGTHY WELL-DEVELOPED STUD BERKSHIRE BOAR.

Prominent among this boars characterastics are his great length and evenness and his well-developed hindquarters. Owned formerly by Mr. D. P. Hayes, a prominent New South Wales breeder, he realised a very high figure at the Stud Pig Sales held at Sydney Show in 1925. He shows breeding and quality second to none and is reasonably well marked. His legs are strong and he stands well off the ground, both points in favour of a young animal.

whom he is to be mated before deciding on type, age, price, &c. It is a considerable advantage in a general way to select a boar strongly developed, especially in points in which the sows show a tendency to weakness, that is, of course, comparatively speaking, for no weak-constitutioned animal should be retained in the herd or be permitted to reproduce his species.

Selecting the Herd Header.

A general outline of the points to be looked for in the selection of the "Herd Header" or sire would be (1) Robustness of constitution; (2) prolificacy of type; (3) symmetry of form and evenness of quality; (4) correct pedigree; (5) a mild and even temperament; and (6) a health declaration.

A Good Constitution.

(1) A good constitution, indicated by a general healthy condition of the skin and hair, which should be soft, pliable and silky (oily, if the animals have been sty-fed); width between the eyes and ears and along the back, with a wide and deep capacious chest; large girth and strong wide loins; evenness throughout with no sign of weakness at back of shoulders or in the region of the loins; the animal to be of good size for his age. Note his breathing to see that it is even and regular.

Prolificacy of Type.

(2) Prolificacy of type cannot be decided upon appearance, hence an animal's pedigree and stud records should be studied and as much information obtained from those conversant with the strain as is possible. There is an old saying, "It is useless buying a pig in a poke," i.e., buying a pig without first inspecting it and ascertaining of what type and quality it is; hence, careful inquiry should be made and, if possible, other stock in the herd from which he is to be selected should also be inspected and inquired of.

Select from large litters or strains of strong active stock, the boar you require for service a year or so ahead of the time you require his services and watch him grow and develop, and you will not regret your action. To secure the best results stock should only be selected from the very best and most reliable, healthy herds, where attention is given to careful feeding, management, and recording pedigrees or breeding.

Symmetry of Form and Evenness of Quality.

(3) Symmetry of form and evenness of quality is desirable, as also is trueness to type and good length and depth of body with wide capacious chest, strong legs and feet set on to the body in a way that suggests their capacity for carrying the animal properly when the condition is up. Fine, flat bone is preferable to the large, round coarse bone so common in some of the older strains. Other points to look for are strong muscular development with good width between the eyes and ears and continuity of width throughout the body; head to be characteristic of the type, medium, not too small or too large; eyes, bright and kindly; neck, medium length, set well into the shoulders, which should be compact and even, not heavy and coarse; ribs to be well sprung and broad; absence of a "Crease" behind the shoulders to be sought for, as this is a bad fault, sometimes referred to by pig breeders as "The Devil's Grip." This weakness should also be absent in the loins. Some pigs are very weak in this respect; the loin needs to be wide and fully fleshed, no sign of weak hollow back being allowed. The flanks must be deep and well let down (this is very important and a point too often overlooked, as a good bacon pig must be thick in the flank and belly); back to be level or slightly arched (indicating strength and robustness); the underline (belly) should be level and free from inflammatory areas or any indication of rupture or enlargements.

The quarters, both fore and hind, must be evenly developed, straight and wide. Development of the hams is one of the chief features to be looked to; they must be large, full, wide, deep, with flesh well let down on to the hocks; the legs strong, with flat fine bone, no weakness at the knees or in the region of the hocks being permitted. The pasterns should be strong and well set up, the feet neat, even, and not large or splayed.

Authentic Pedigree.

(4) An authentic and guaranteed pedigree, already registered or eligible for registration in the Herd Book is essential and is highly desirable. This pedigree should be backed up by individual excellence of the animals whose names are recorded thereon, more particularly in the near ancestry, as this is of far more importance than a lengthy pedigree in the absence of such excellency.

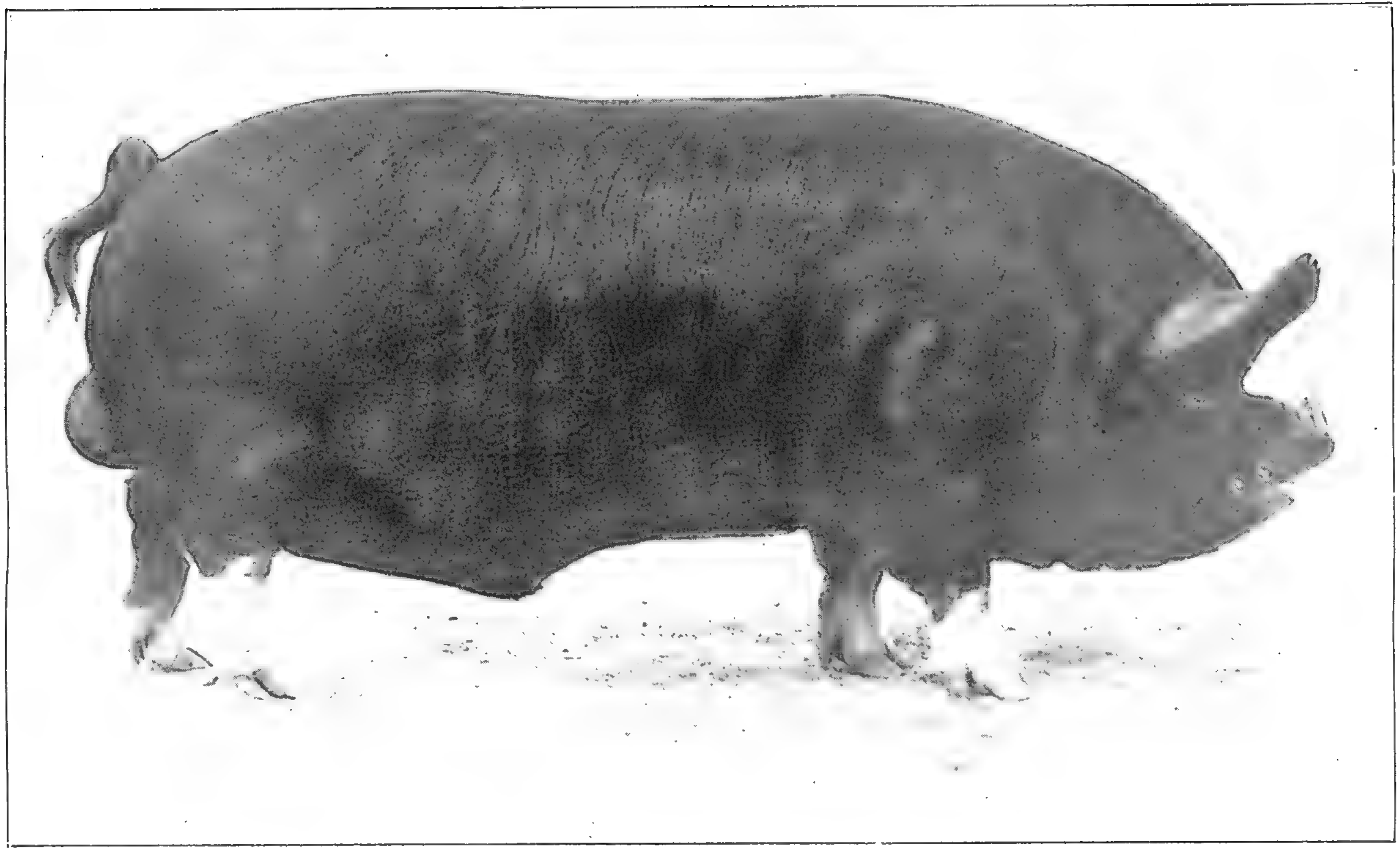


PLATE 55 (Fig. 3).—ANOTHER SUCCESSFUL STUD BERKSHIRE.

"Wileannia Special" (3709), one of the most profitable Berkshire Boars Australia has yet produced. Owned by Mrs. E. M. Lennie, of Tongala, Victoria. This boar has not only won many championships but has produced many pigs that have been successful both at work on the farm and in the show ring. His great length and depth are his special features; they are both very valuable and desirable qualities.

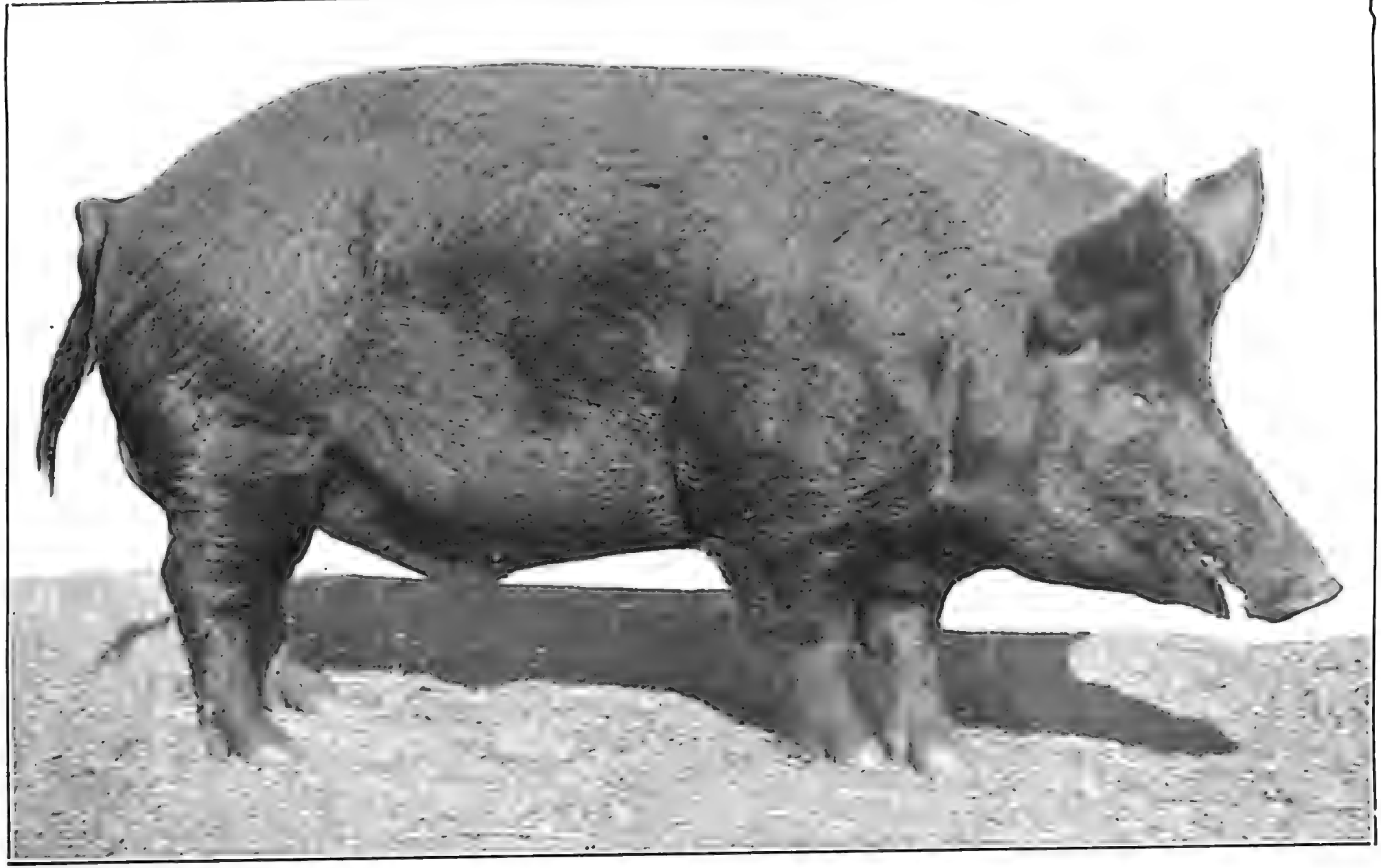


PLATE 56 (Fig. 4).—"SANDY MACQUEEN" (97).

A famous old champion winner, until recently the property of Mr. G. H. Whittaker, of the Broxburn Stud Piggery, Broxburn, via Toowoomba. "Sandy MacQueen" has left behind him more prize-winning Tamworths than any other Tamworth Boar yet produced in this portion of the world. He was constitutionally sound and of great vigour, ever active and alert. He did good service for more than ten years, yet was never pampered or overfed or otherwise incorrectly handled.

Even Disposition and Contentment.

(5) An even, gentle disposition, noted in the way in which the animal behaves himself upon the approach of farm folks or of visitors, and in his attitude generally, is also desirable. This is also indicated by a kindly eye and easy feeding disposition. A bad tempered boar with a white streak in the eye will not be long in advertising the fact that he is "Lord of the Harem."

Declaration of Health.

(6) It is a wise precaution to suggest that a Declaration or Certificate of Health should always be demanded when purchasing breeding stock. These are essential where stock are being transferred from one State to another or from one country to another. Declaration forms may be obtained from District Inspectors of Stock or from the Department of Agriculture. A simple declaration signed by vendor in every day language would be better than no declaration at all. This would not add additional cost, yet it acts as a verbal agreement that the animal and herd are and have been free from disease.

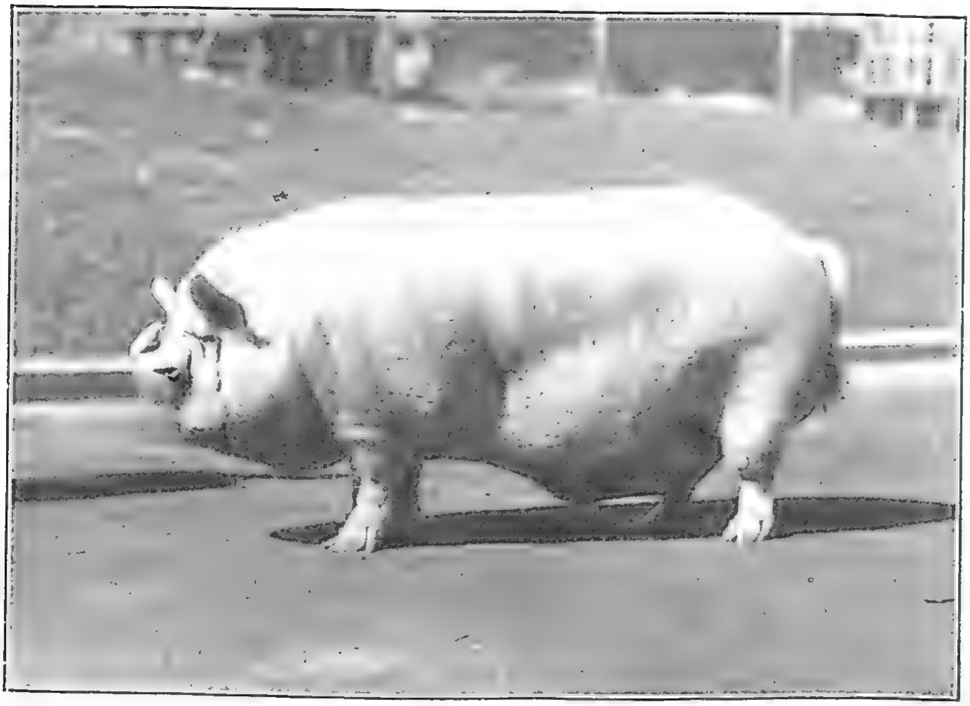


PLATE 57 (Fig. 5).—MIDDLE YORKSHIRE BOAR "DRAYTON'S CHIEF."

A prominent prize-winner owned by Mr. Ralph Joyce, of Kyabram, Victoria. A sire noted for quality, strength of constitution, and trueness to type. Note the strong yet fine bone of which his legs are composed and the length and depth of body. A typical sire of the Middle York breed.

Other Qualifications.

The boar should have a good set of embryo teats, twelve to fourteen in number, evenly placed, equi-distant along the line of the belly. As to the breed of the boar, that must be determined by local circumstances and requirements.

Compare the Strain.

When the prospective purchaser has satisfied himself that the animal he is about to buy is of guaranteed pedigree, and that the type or breed is right, he should compare the various animals in the herd that are representative of the same strain. This can, of course, best be done by inspecting on the farm the other animals from which the selected one is to be taken.

It is wise also, not only to be sure of the boar's qualifications (if such they might be called), but to see that he comes from a healthy, clean herd. In this connection one could keep an eye open to note the surroundings in which the boar

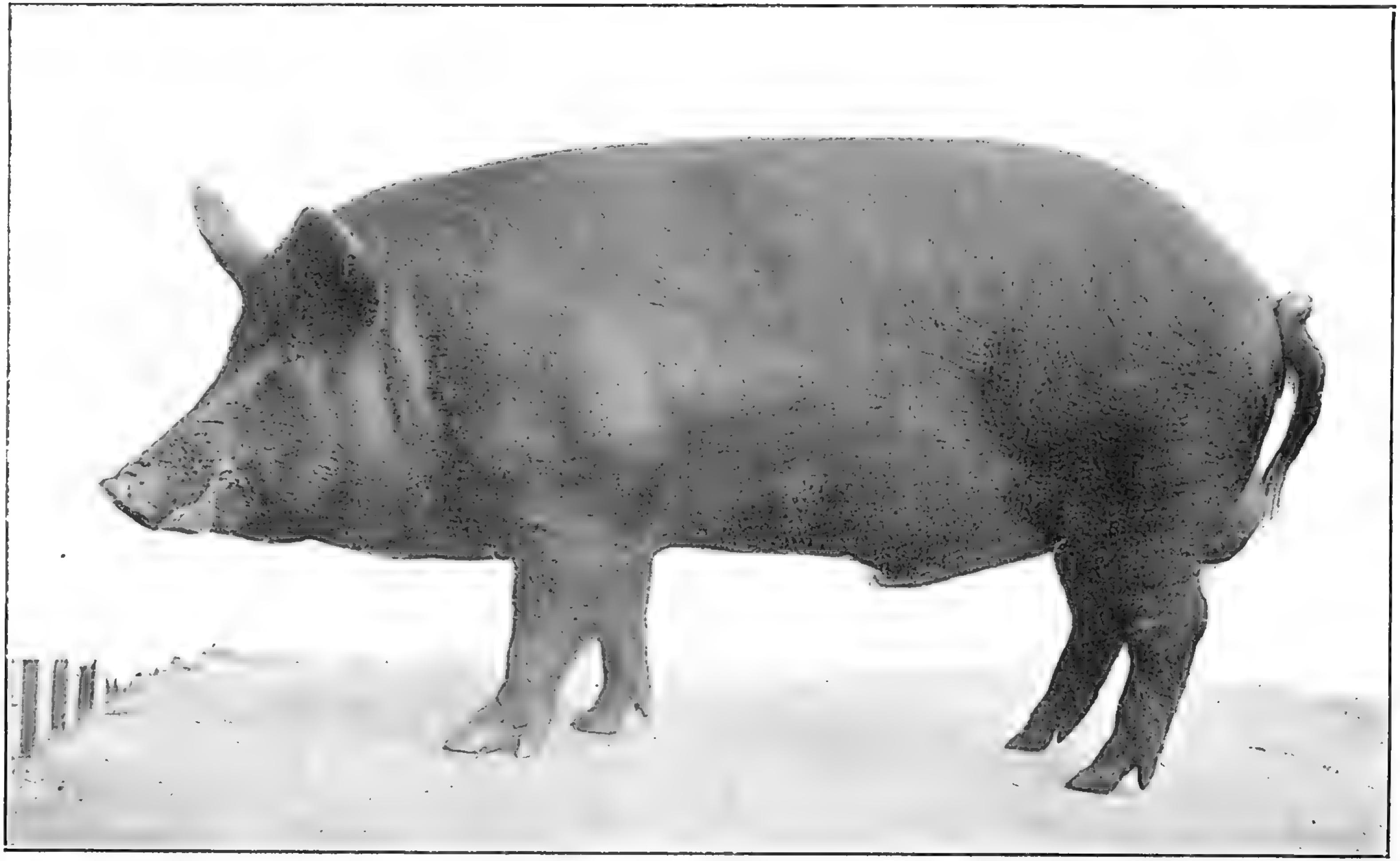


PLATE 58 (Fig. 6).—"BLAKENEY SYDNEY" (839).

A Champion Tamworth Boar, for some time the property of Mr. F. Gibbon, Macquarie Vale, Kelso, N.S.W.

This is a typical, well-developed, up-to-date Sire of the old world Tamworth breed, much in demand in these days for crossbreeding with the Berkshire for prime quality fleshy bacon pigs of the most popular type.

has been reared; ascertain also the nature of the food that the boar has been used to and how and where the pigs have been fed. Be sure to note the size of litters common in the herd. It is futile for a salesman to boast of the prolificacy of a certain strain, if, on inspection, one sees a big percentage of small, weedy litters.

The Skin and Hair.

The skin and hair are both indications of good health. Either fine or coarse breeding and good or bad health are indicated by the nature of the skin and hair. The hair should be glossy, soft, medium in length and thickness; a bristly mane is decidedly objectionable. Coarse hair shows a lack of refinement in breeding and denotes a slow-growing animal. A fine tail is an indication of refined breeding and it should be curled, not hanging limp and loose. A well-tasselled brush of clean, glossy hair on the tail adds much to an animal's appearance and value.

A distinguished carriage and a general healthy, thrifty, stylish appearance all give the animal the air of masculinity.

The genital organs are of great importance, and special attention must be paid to seeing that the animal is normal in this respect. Do not select boars showing any signs of rupture or uneven development, or an animal that shows only one gland. Note also that there is an absence of abscess formation, or malformation.

It is worth special note to remember it is possible for a boar to be permanently injured in service and to become quite useless as a breeder, hence this word of advice. It is also, of course, possible for an animal, otherwise perfect in appearance, to be sterile and useless as a sire. This, however, is the exception and by no means the rule.

Colour of the Hair.

Special note should be made of colour markings to see that these are characteristic of the breed to which the boar belongs. Improperly marked stud boars are not desirable, though colour is but a secondary consideration where the production of pork and bacon (not stud) pigs is the objective.

It is, however, to the advantage of the breeder to secure the very best value he can for the purchase price; hence, it is an advantage to have as a boar an animal "fit for the show ring." The stud breeder must place considerable store on an animal's colour markings for it is very important that colour standards should be closely observed.

Reliability.

It is certainly an advantage to secure a tried and proved animal, if possible, even though the price may be higher. Such a boar would be ready for service immediately, and could begin to repay his cost early. This is a matter largely dependent on local circumstances and capital.

Defects to Guard Against.

Points to be avoided in choosing a boar are an unduly long head, neck, and legs, as such a form indicates an animal that will require a large amount of feed to produce a pound of increase and he would be of a slow-maturing type. Weakness in the legs, pastern, and feet are bad points, indicating weak bone and constitution. Coarse, bristly hair with heavy, wrinkly skin is a fault, as also is a coarse heavy plate or shield on the shoulders.

Effeminacy or coarse masculinity are equally to be avoided. In pigs carrying some age, attention might well be given to the teeth, as occasionally "broken mouths" are a source of annoyance. The term "broken mouth" is a common one among sheep men, indicating animals with broken or overgrown or missing teeth.

HAY—STRAW—CHAFF.

By F. F. COLEMAN, Officer in Charge, Seeds, Stock Foods, and Fertilisers Investigation Branch.

Owing to many complaints received from buyers in different parts of the State, it has been necessary to take a series of samples, representing material sold at Roma Street or at other centres. A careful examination of these samples has been made, with the result that in most cases the buyers' complaints were fully justified.

Briefly, the findings were:—

(1) Excessive weight of battens on bales of hay.

(2) Excessive moisture in both hay and chaff.

(3) Poisonous weed seeds, such as *Datura* sp. (Thorn apple), *Ricinus communis* (Castor Oil plant), and in some cases leaves of prickly-pear that had been killed by some arsenical solution.

(4) An excessive amount of soil, Bathurst Burr, Noogoora Burr, Stagger Weed, Khaki Weed, and other foreign ingredients.

(5) Bags of mixed chaff and straw chaff, not marked in the prescribed form with the letters M.S or S.C.

In some cases it was found that material invoiced as HAY, principally consisted of straw, of little nutritive value. Some samples of so-called lucerne chaff consisted principally of weeds, which evidently had been chaffed to hide their identity.

The attention of producers and dealers is directed to the Stock Foods Act, which defines "Chaff" as being hay or straw cut into short lengths, and hay as any dried or cured cereal, grass, or legume cut before complete ripeness, and from which the grain or seed has not been removed; straw being defined as any dried, ripe, or mature cereal, grass, or legume from which seed or grain has been removed by any process or by any insect or by storm.

The serious attention of all concerned is therefore directed to the following extract from the legislation regulating the sale of hay, straw, chaff, grain, or seeds.

"THE STOCK FOODS ACT OF 1919."

AN ACT TO REGULATE THE SALE OF STOCK FOODS.

Sell.

"Sell" (with its derivatives) includes barter or exchange, and also includes agreeing to sell, or offering or exposing for sale, or having in possession for sale, or sending, forwarding, or delivering for or on sale, or causing, suffering, or attempting any of such acts or things.

Stock food.

"Stock food" includes hay, straw, chaff, grain, or seeds, mixed concentrated or prepared stock foods, and by-products.

DEFINITIONS OF HAY, STRAW, CHAFF, AND FOREIGN INGREDIENTS.

Hay.

"Hay"—Any dried or cured cereal, grass, or legume cut before complete ripeness and from which grain or seed has not been removed.

Hay chaff.

"Hay chaff"—Chaff consisting only of hay.

Straw.

"Straw"—Any dried, ripe, or mature cereal, grass, or legume from which seed or grain has been removed by any process or by any insect or by storm.

Straw chaff.

"Straw chaff"—Chaff made from straw.

Chaff.

"Chaff"—Hay or straw cut into short lengths.

Foreign ingredients.

"Foreign ingredients" includes—

(*a*) Any substance of whatever nature in itself deleterious to the life or health of stock;

(*b*) Any substance of whatever nature added for the purpose of fraudulently increasing the weight of the article sold; and

(*c*) All substances prescribed to be foreign ingredients in specified stock foods.

EXTRACT FROM REGULATIONS UNDER THE STOCK FOODS ACT.

3. The substances set forth in the second column of the Schedule hereunder are hereby prescribed to be "foreign ingredients" relative to the stock foods mentioned in the Act or these Regulations. The proportion or amount of such foreign ingredients which may be contained in any kind of stock food shall not exceed the proportion or amount set forth in the third column of the said Schedule opposite the name or description of such kind of stock food in the first column of the said Schedule.

SCHEDULE.

Kind of Stock Food.	Substance (Foreign Ingredients).	Proportion or Amount Allowed.
"Stock Foods"—Any kind mentioned in the Act or these Regulations	*Claviceps purpurea* (Ergot) or any substance of whatever character in itself deleterious to the life or health of stock; plants, parts of plants and seeds of *Cuscuta spp.* (Dodder), *Datura spp.* (Thorn Apple), *Ricinus communis* (Castor Oil Plant), *Jatropha spp.* (Physic Nut), *Papaver spp.* (Poppy)	None
Ditto	*Tilletia tritici* (Bunt), *Ustilago spp.* (Smut)	0·1 per cent. (one-tenth of one per cent.) by weight
Ditto ..	Any substance of whatever character added for the purpose of fraudulently increasing the weight of the stock food	None

SCHEDULE—*continued.*

Kind of Stock Food.	Substance (Foreign Ingredients).	Proportion or Amount Allowed.
Hay and chaff ..	Moisture	13 per cent. by weight
Maize	Moisture	14 per cent. by weight unless the actual amount is declared in the invoice
Grains and seeds other than maize	Moisture	13 per cent. by weight unless the actual amount is declared in the invoice
Grains and seeds (whether whole or crushed)	Any cultivated grains or seeds other other than the kinds of grains or seeds in question	5 per cent. by weight unless the amount is declared in the invoice
Ditto	Weed seeds other than those of a deleterious character	1 per cent. by weight
Hay	Any hay other than the kind of hay named in the invoice	10 per cent. by weight unless the actual amount is declared in the invoice
Straw	Any straw other than the kind of straw named in the invoice	10 per cent. by weight unless the actual amount is declared in the invoice
Chaff	Any chaff other than chaff made from the kind of hay or straw named in the invoice	10 per cent. by weight unless the actual amount is declared in the invoice

Marking on chaff bags.

7. All packages containing straw chaff or mixed chaff shall be distinctly stencilled or marked by the person in possession of the same in letters not less than two inches in length—

(*a*) In the case of straw chaff, with the letters—S.C.;

(*b*) In the case of mixed chaff, being a mixture of hay chaff and straw chaff in any proportion, with the letters—M.S.

Definitions of lucerne meal and cracked maize.

"Lucerne Meal" shall consist of the entire lucerne hay ground, without any admixture of straw or other foreign materials.

"Cracked Maize" shall consist of the whole grain coarsely crushed, and shall not be made from low-grade, or spoiled, or mouldy maize.

Penalty for offences.

11. Any person who commits a breach of these Regulations shall be liable to a penalty not exceeding twenty pounds.

Answers to Correspondents.

BOTANY.

The following replies have been selected from the outward mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Scrub Bottle Tree.

J.N.R. (Kilcoy)—

Your specimen is *Sterculia discolor,* sometimes known as the Scrub Bottle Tree. In the "scrub" it attains the size of a large-boled, soft-wood tree, but in cultivation is of a more spreading habit and is very floriferous. The tree is propagated from seeds, but I think cuttings are also worth trying. The leaf you sent is from a young tree; they change a good deal from this on the larger trees. The seed pods you sent contained several good seeds.

"Tamaran"—Bald or Swamp Cypress.

J.G.A. (Southport)—

Cupania anacardioides is a native tree fairly common about Southport. It is sometimes know as "Tamaran," but for the main part it has no local name. It often grows in small coastal scrubs, such as Myers' Ferry and Roe's Camp. Planted, it makes a good shade or street tree for seaside localities.

Taxodium distichum is the Bald Cypress or Swamp Cypress, a native of the warmer parts of the United States. In the swamps of Florida the trees produce the well known "Cypress Knees" you may have read about. In ordinary soil the knees are absent and in cultivation the tree makes quite good growth and is of very distinctive appearance.

A list of Queensland trees would be rather a lengthy one. Unfortunately, F. M. Bailey's little book on "Queensland Timbers" is out of print. The Provisional Forestry Board might have a copy available of their Bulletin No. 2, "Principal Commercial Timbers of Queensland." It lists all the trees the timbers of which are cut at the various mills.

"The Wheel of Fire."

H.J. (Brisbane)—

The leaves from Mount Mee, sent by you for identification, belong to *Stenocarpus sinuatus,* the "Wheel of Fire," one of the most beautiful of our native flowering trees. It belongs to the silky oak family and possesses a white wood with a quiet silky oak figure. Sometimes in the adult trees the leaves are quite undivided.

Plants from North Queensland.

N.P. (Townsville, N.Q.)—

1. *Lyonsia eucalyptifolia.* A vine with a variable reputation. It has been recorded as a fodder and a poisonous plant.
2. *Atalaya hemiglauca.* White Wood. This tree has attracted some notice in connection with the "walk-about" trouble, being blamed by one authority as the cause.
3. *Pittosporum phillyræoides.* Cattle Bush.
4. *Santalum lanceolatum.* Sandalwood (true).
5. *Acacia sentis.*
6. Mixed material of *Eremophila longifolia* (?), *Berrigan,* and *Pittosporum phillyræoides.*
7. *Cassia oligophylla.*
8. *Canthium oleifolium.*
9. *Denhamia obscura.* Called "Wild Orange" in parts of North Queensland.
10. *Capparis lasiantha.* Mulpup. Produces an edible fruit.
11. *Salsola Kali.* Russian Thistle. A "Roly Poly."
12. *Denhamia obscura.* A "Wild Orange."

Wild Lime.

R.W. (Biloela)—

We have no doubt the plant you refer to is *Eremocitrus glauca*, commonly known as the Wild Lime. It produces small berries about twice the size of a pea, largely used for making drinks.

1. The tree grows to a height of about 15 feet, or perhaps more in favourable situations.
2. When ripe? —About November.
3. Can the seeds be used for planting?—Yes.
4. How long would it be before full size?—No information on this point, but the tree is slow-growing. It fruits, however, before full grown.
5. What the plant looks like when 4 to 6 feet high?—A thorny bush, often of straggling growth.

A Nut Grass Enemy.

R.F.C. (Ayr)—

The Chief Entomologist, Mr. R. Veitch, advises that the nut grass enemy you refer to is a species of moth introduced to Hawaii in recent years. The information available regarding its progress in Hawaii does not indicate that it has achieved any marked measure of success. Under the circumstances, Mr. Veitch is of the opinion that it would be unwise to consider the importation of this insect until such time as definite proof of its beneficial activities is available. Even then, the dangers inseparable from the ordinary plant-feeding insect introductions would require very careful consideration before any steps could be taken to introduce it to Australia.

Introduced Grasses in Inland Areas.

F.P. (Dirranbandi)—

The Director of Agriculture, Mr. H. C. Quodling, advises that it is certain that the price is probably too high to admit of giving practical effect to your idea of resuscitating natural grass pastures. Something might be done with limited quantities of grass seed sown on small netted-in nursery areas for the purpose of collecting the resultant seed to gradually bring about a better distribution through your paddocks of the better and more favourably known varieties. It is not to be expected that country, which has suffered to such an extent as yours has, will recover rapidly unless there are fair quantities of grass and herbage seeds lying dormant in the soil. If it is possible to spell paddocks and allow for reseeding of the grass, the carrying capacity of the country will be gradually improved. There are few introduced grasses which will stand up to the conditions common to the more inland parts of the State. One grass which may give satisfactory results is Rhodes grass, the seed of which is procurable from almost any seedsman. This grass has the capacity to spread by throwing procumbent stems which, under good growing conditions, root from the joints. It is not, however, a good winter grass, although once established it will provide a fair amount of seed until heavy frosts occur, and will restart into growth during the following spring or early summer. If sown in paddocks it can be reserved. Three to four lb. of seed per acre would provide a fairly good dressing, but for a more even distribution the seed should be mixed with damp sawdust merely as a distributing agency. If the surface is naturally bare of any vegetation cultivation should not be necessary. Grass seed could be sown in the spring. Brush harrows will provide sufficient covering for the seed, or if so desired, the ground might be harrowed if such is practicable after the sowing of the seed. Any seedsman should be able to quote you for Rhodes grass seed, but it would be as well to inquire as to its percentage of germination by Departmental test.

Another method which may be worthy of attention is the sowing down of appreciably sized areas in the paddocks with wheat or barley. To effect this little or no cultivation would be required on soil which has been subjected to dry conditions. A quick-maturing variety of wheat like ''Florence'' can be sown up to, say, the first week in August. A similar method could be applied in the case of a summer-growing fodder like Soudan grass, and it could be sown any time from September right up to the end of January, providing sufficient rain is experienced. Ordinarily, it would require about 6 lb. of seed per acre when sown thinly in drills spaced 14 inches apart. Soudan grass is particularly hardy and will provide a lot of grazing for sheep. Being a sorghum it may contain a poisonous principle, hydro-cyanic acid, in its young stages, but if sheep are put on to feed of this sort when their stomachs are fairly full and gradually accustomed to the change of diet, there should be little danger of loss on this account. On parts of the Downs, Soudan grass is used to a considerable extent and is grazed off at all stages of growth, but once stock are introduced to the pasture it is customary to give them regular access to it.

Plants from Central Queensland Identified.

G.F. (Clermont)—

A.G. 1. *Eragrostis leptostachya.* A Love Grass. The Love grasses are, on the whole, useful grasses in the mixed native pasture.

2. *Pappophorum nigricans.* White Heads. A very common grass in Central Queensland of no particular fodder value.

A. 1. *Eriochloa punctata.* Early Spring Grass or Dairy Grass.

2. *Cynodon tenellus.*

3. *Andropogon sericeus.* Blue Grass.

4. *Cynodon tenellus.*

5. *Arthraxon ciliare.*

6. *Cyperus rotundus.* Nut Grass.

7. *Andropogon sericeus.* Blue Grass.

A.A. 1. *Tritaphis mollis.* Purple Heads.

2. *Aristida calycina.* A 3-awned or 3-pronged Spear Grass.

3. *Pappophorum nigricans.* White Heads.

B.B. 1. *Crotalaria juncea.* A species of "Rattlepod."

2. *Adriana acerifolia.* Herbaceous shrub, said to be liked by stock.

3. *Phyllanthus simplex.*

4. *Cucumis* sp. Wild Melon. Fruits required to determine the species.

5. *Ipomœa heterophylla.*

6. *Spermacoce* sp.

7. *Pimelea hæmatostachya.* Often called Native Poppy; reputed poisonous, but not usually eaten to any extent. No definite feeding tests have been carried out with it.

8. *Wedelia spilanthoides.*

9. *Rhynchosia minima.* A useful native leguminous fodder. I do not know a common name.

10. *Phaseolus Mungo.* Mung Bean.

11. *Ipomœa reptans.* Said to be a good fodder; a native vine of the Convolvulus or Morning Glory family, allied to the Sweet Potato.

12. *Corchorus trilocularis.*

13. *Sida corrugata.*

14. *Bœrhaavia diffusa.* Tar Vine or Sticky Weed. Reputed good feed.

B. 1. *Pratia erecta.* Milkweed. This plant has been suspected of poisoning sheep at various times. No definite feeding tests have been carried out with it, but it belongs to a dangerous group of plants—the Campanulaceæ.

2. *Polygala arvensis.*

3. *Rhynchosia minima.* Both specimens belong to this species. The plant is rather a good native leguminous fodder.

B.M. 1. *Enchylæna tomentosa.* A plant of the salt-bush family—eaten by stock in dry times.

2. *Trichinium exaltatum.*

B.G. 1. *Cassia occidentalis.* Coffee Senna. This plant has been accused of poisoning stock, but feeding tests showed to simply act as a purgative. As "senna leaves" of commerce, are the product of several species of Cassia this might have been expected. The plant is a native of Tropical America, and only occurs here as a naturalised alien. The local name "Coffee Senna" refers to the fact that the seeds have been used to adulterate coffee.

C. 3. *Salsola Kali.* One of the plants commonly known in Queensland as Roly Poly. It has a wide distribution over the sub-tropical and warm temperate regions of the globe. In America it popularly goes under the name of Russian Thistle, and is regarded as rather a bad weed. It is very common in Queensland; stock seem rather fond of the flowering and fruiting tips of the branchlets, and these probably have a fair nutritive value.

The Indigo Plant.

A.C. (Yelarbon)—

The plant sent is in leaf only, bearing no flowers or pods, but we think it belongs to *Swainsonia luteola,* a species of "Indigo." This particular species has been proved poisonous by definite feeding tests. Sheep poisoned by this plant have a staring, dull look in the eyes, and keep their necks fixed and high. They become thin and the wool becomes hard and dry looking. Taken off the Swainsona, however, they often recover.

SITES FOR FARM BUILDINGS—IMPORTANT CONSIDERATIONS.

A very considerable proportion of disease and mortality can be more or less directly traced to errors in constructing the buildings in which animals live all or part of their time. Although for each kind of animal different considerations carry weight, yet there are certain principles common to the proper construction of all buildings intended to house stock. Primary considerations are those of site and aspect.

In selecting the site for stables, cowsheds, and pig and calf pens, some freedom of choice is generally offered to the farmer. These structures should not be placed on low-lying swampy ground or on ground liable to be flooded, or they will always be damp and probably associated with chills and rheumatism, while the animals, having to expend so much of their food in maintaining bodily warmth, will not thrive so well as those in drier and better situated buildings.

Buildings are better on higher land, which can more readily be drained. It is also desirable to take into consideration the dryness of the soil. A shallow soil with a clay subsoil, for example, is not the most suitable, and alluvial flats and "made" soils are unsuitable places on which to place buildings for stock.

This is often important—partly in relation to its effect on the health of stock and partly because it affects the comfort, not only of the animals but of those working among them. Whenever possible, in most parts of this State, a southerly or westerly aspect should be avoided and shelter from the south and west secured. Despite the great heat of summer in many parts of the State, more loss is certainly occasioned by the cold of winter, and anything in the housing of stock that tends to protect them from southerly and westerly winds is of advantage. Continued exposure to cold westerlies when the animals are confined in small pens which prevent them exercising themselves will rapidly lower their vitality and disease-resisting power, especially in the case of young stock, and will retard their development by forcing them to devote so much of their food toward the maintenance of temperature. In like manner, the sudden changes of temperature which occur with southerly winds and winter storms are liable to produce catarrh and pneumonia in all classes of stock exposed to them, particularly when such exposure follows recent shearing or clipping, detrucking after a long railway journey, sudden release from close confinement in a hot atmosphere, or overheating from some other cause. After sudden falls in temperature or cold rain, semi-starvation often leads to heavy losses. Penned animals have no chance of taking advantage of shelter afforded by the ground and suffer accordingly.

The selection of an easterly, north-easterly, or northerly aspect has the further advantage of catching the morning sun in winter and allowing sunlight to enter freely into buildings all the year round. The top of a ridge is never a good place for housing stock or placing cow-bails; on such a site the buildings are exposed to all the winds that blow.

General Notes.

Australian Dairy Breed—Question of Name.

Mr. R. S. Maynard, of the Illawarra Milking Shorthorn Society of Australia, writes—Breeders of that great Australian breed of dairy cattle known by two names, as Illawarra Milking Shorthorn and, until recently, Milking Shorthorn, but now Australian Milking Shorthorn, have come together on all except name. What shall it be?

The I.M.S. men say that the breed is an Australian breed, equal to any dairy breed in the world; that all Australians should be proud of it, anxious to let the world know its origin and how it was evolved by the pioneers of Illawarra a century or so ago. They want to give the breed a name which will indicate clearly that it is a distinct breed, and they wish the name of Australian Illawarra Shorthorn.

The A.M.S. men, on the other hand, while equally proud of the fact that it is a distinct breed, and of its great achievements, want to persist in giving it the name of an overseas breed which has never had much of a reputation as a dairy breed. They want the name of Australian Milking Shorthorn.

Now, the contention of the I.M.S. men is that the name of Australian Milking Shorthorn is misleading and confusing to breeders in other countries, for it means something different to what it appears to mean, that it is derogatory to our high producing cattle, bad from a business point of view.

What advantages do the A.M.S. men think will come to breeders by adopting this other breed's name? This is what has to be considered between now and Easter when the conference is to be resumed. Why call the cattle Milking Shorthorns when it has been agreed between the parties that Milking Shorthorns (or Dairy Shorthorns as thy are called in England) shall not be eligible for registration in the new Amalgamated Herd Book? Why call them Milking Shorthorns when there is hardly a man amongst the advocates of the name who would use a Milking Shorthorn bull in his herd if you imported one and gave it to him?

Why not end all the confusion and argument of the past fifteen or more years, now that we have the opportunity of starting afresh, by giving the breed a name that will not be confused with any other lesser breed?

Staff Changes and Appointments.

The following officers of the Sugar Experiment Stations have, in addition to their original appointments, been appointed inspectors under and for the purposes of the Diseases in Plants Acts:—

> E. Jarvis, Entomologist; R. W. Mungomery, Assistant Entomologist; J. H. Buzacott, Assistant to Entomologist; W. A. McDougall, Cadet Student; F. Keogh, Chemist in Charge; E. J. R. Barke, Chemist in Charge; G. Wilson, Cadet Student; and A. P. Gibson, Field Assistant.

Mr. T. E. Tuck, inspector of Slaughterhouses, Coolangatta, has also been appointed inspector under the Diseases in Plants Acts.

Mr. H. J. Cole, greenkeeper of the Yeerongpilly Golf Links has been appointed an officer under and for the purposes of the Animals and Birds Acts.

The Mining Warden and Police Magistrate, Charters Towers, has been appointed Government representative on the Dalrymple Dingo Board.

Constable R. Askin, Bedourie, Constable A. McSween, Marlborough, Mr. H. J. Walker, Stock Assistant, and Mr. P. J. Short, Stock Inspector, have been appointed inspectors of Slaughterhouses.

Mr. J. J. McLachlan of Annerley, South Brisbane, has been appointed Inspector of Poultry.

Constable T. R. Herman, Jericho, has been appointed Inspector of Slaughterhouses.

The Officers in Charge of Police of Millmerran and Alma-den have been appointed Acting Inspectors of Stock.

Messrs. C. S. Shaw and E. Bloomer of Redland Bay have been appointed Officers under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. F. Bostock, Assistant Instructor in Pig Raising, has been accepted as from 20th January, 1928, as tendered. Mr. Bostock has secured the position of Instructor in Pig Raising at the Hawkesbury Agricultural College, New South Wales.

The Value of Top-dressing Pastures.

Excellent results have followed the top-dressing of native grass lands on Goonambil Station, near Urana (N.S.W.), and are regarded as proving definitely that this method of pasture improvement can be applied profitably to light-carrying country in localities of comparatively limited rainfall. Goonambil, the property of Messrs. W. A. Macpherson and Son, lies a few miles south-west of Urana. The rainfall records at Urana over a period of fifty years average 1,715 points annually. At Goonambil the average would be about the same.

In top-dressing, superphosphate was applied during March, 1926, at the rate of 112 lb. an acre, 1,000 acres of a paddock of 1,700 acres being treated. This particular paddock was chosen, as being of a low stock-carrying standard, when compared with some of the rich black plains on the holding. From March to December 1,421 points of rain fell, and from January to May last, inclusive, a further 312 points was recorded on the station. Normally this paddock, known as the island, was rated as being able to carry one sheep to two acres. After the shearing, from September last this 1,700-acre paddock has maintained 2,000 dry two-tooth ewes, and from that date to the end of May the total rainfall recorded was 834 points. These ewes are now in good order and condition and equal to, if not better than, any other stock on the estate.

The manager (Mr. R. Macpherson) said that the results from the application of super. were better than he thought possible. He intended to extend this work on the lighter-carrying section of the property. On the other hand, he was of the opinion that the heavy-carrying lands on Goonambil, with Merino sheep as the primary objective, carried on the average all the feed necessary for such sheep. Had he a small holding, and if he were going in for crossbred sheep and fat lambs, he would not hesitate systematically to top-dress every acre of his grazing land, irrespective of its natural richness.

Obituary.

A wide circle of friends throughout Queensland will learn with deep regret of the death of Mr. John Payne, M.L.A. for Mitchell, and one of the pioneers of the Labour movement in Queensland, who passed away at a private hospital in Brisbane on 14th January, after a long illness.

The late Mr. Payne was born in Spring Valley, Goulburn, New South Wales, on 9th November, 1860. He was educated at public and private schools. Coming to Queensland in 1882, he worked as a shearer and general bushworker, and occasionally at mining, until 1885, when he started a business as blacksmith and wheelwright at Arrilalah. There he remained only one year. After spending about a year at Croydon, he resumed shearing, and was engaged on the Flinders, Barcoo, and Thompson till 1890. In October, 1891, he started business as a blacksmith and wheelwright in Longreach, and this he carried on for about four years. He was returned as a Labour member for the Mitchell at a by-election in 1905, and represented the Mitchell electorate continuously thereafter. On many occasions Mr. Payne was unopposed. For over twenty years he was trustee of the Australian Workers' Union branch at Longreach. For some years he had been a member of the Public Works Commission and chairman of that body. He possessed a wide knowledge of land matters, and any of his speeches on the land question in the House were always worthy of attention. His prominent association with industrial matters gave him a solid grasp of questions pertaining to labour and industry. Of a cheerful and breezy temperament, Mr. Payne was a popular figure in the House, and in every sense a big Australian. His favourite seat was on the front cross-bench with Mr. E. M. Land, M.L.A., another pioneer who has passed the Great Divide. Mr. Payne was an ardent worker, and was scrupulous in his attendance to the requests of his large constituency, which had an area of 28,000 square miles. He was a student and deep thinker, and his work earned for him widespread affection and appreciation.

Sugar Levy.

Regulations have been approved under the Primary Producers' Organisation and Marketing Act, to provide for a further levy of one farthing per ton of cane supplied to sugar mills, for the purpose of augmenting the Canegrowers' Defence Fund. Provision is made, however, for a poll to be taken before the levy is made, and if at least 100 growers of sugar-cane make, in writing, before the 21st February, 1928, a request for a poll on the subject, a poll will be held.

Mill Suppliers' Committees—Appointment of Deputy.

A further Regulation has been approved under the Primary Producers' Organisation and Marketing Act providing for the appointment of a deputy in the case of absence of a member from a meeting of a Sugar Mill Suppliers' Committee or District Canegrowers' Executive. In the case of a Mill Suppliers' Committee, the deputy must be a bona fide cane supplier to the particular mill represented by that committee, and in the case of a District Canegrowers' Executive, any other member of the Mill Suppliers' Committee of which the absent member is a member.

School of Instruction in Pig Raising.

Arrangements are being made between the Queensland Department of Agriculture and Stock and the Department of Public Instruction for a School of Instruction in Pig Raising to be conducted at the Queensland Agricultural High School and College (Gatton College). The course will cover two weeks, from 25th June to 8th July, 1928, inclusive, and will be open to farmers and to young men interested in the pig industry, and will be of immense practical value in focussing attention on improved methods of breeding, feeding, management, accommodation, and marketing of both market and stud pigs. A further announcement will be made in our next issue in regard to fees, and to the nature of the various lectures, demonstrations, and practical talks, as well as to the evening lectures, cinema, and social aspect.

Chilled Meat from Australia.

The Minister for Agriculture, Mr. W. Forgan Smith, informed the Press recently that some months ago the Government had arranged to grant ½d. per lb. up to £150 on a consignment of beef to be treated by the Perfect Food Process Pty., Ltd., prior to shipment, and on the understanding that the profits, if any, on the consignment, were to go to the growers of the beef.

Pursuant to this arrangement, a shipment of 150 hindquarters and fifty crops of beef were loaded on to the "Port Huon," which left Brisbane on the 1st September and arrived at Hull on the 19th October.

The meat was unloaded and distributed at Hull. Sixty hinds and thirty-five crops being despatched to the Smithfield Market, London, the remainder being retained and sold in the Manchester and Leeds districts. The meat despatched to the Smithfield Market was inspected by the Agent-General and others, and although the quality was not all that could be desired, it was agreed by those interested that the consignment had carried remarkably well, and as chilled meat it compared favourably with, although somewhat below, the usual quality of Argentine beef. The hindquarters required practically no trimming or wiping and were free from mould. The appearance of the crops was almost equally good.

The engineer who had charge of the "Port Huon" consignment is of the opinion that the problem of shipping chilled meat from Australia to Great Britain has been solved. Assuming this to be so, there are, however, two other equally important problems still to be dealt with, namely, (*a*) regular supplies, and (*b*) uniform quality.

The shipping freight for chilled meat is somewhat higher than that demanded for frozen consignments. The chilled article, however, will always find a ready market whereas the frozen meat frequently remains unsaleable for varying periods.

The average prices obtained on the whole shipment were as follow. The comparative Argentine prices of that date are also given:—

	Queensland.	Argentine.
Hinds	$5\frac{1}{16}$d. per lb.	$5\frac{3}{4}$d. per lb.
Crops	3.53d. per lb.	4d. per lb.

Had this particular consignment consisted of frozen meat, it is doubtful whether it would have been possible to dispose of it promptly upon its being placed on the Smithfield market.

The Cow and the Plough.

If the Australian dairy cow is to have her wants supplied, her owner must use the plough to a much greater extent than at present. If he finds that the situation can be met by growing a succession of fodder crops there should be no great need to conserve fodder as silage; but in times of drought, though they may hold out longer than the pastures, the crops, too, may fail, and it is safer to have a reserve.

Although some parts of our coastal districts are amongst the very best in the world from a dairying point of view, our average yield of milk and butter-fat is often low in comparison with that of other countries, largely owing to the periods of semi-starvation through which the majority of the cows have to pass all too frequently. Because of the geniality of the climate and the abundance of succulent pastures in good seasons, insufficient preparation is made for dry spells. Some dairy-farmers have found it profitable to hand-feed their milking-cows whenever the pastures go off, and when a really dry time comes these men certainly score if they have a sufficient reserve to see them through. If it were the general practice, and more attention were paid to breeding for high production, the average yield of butter-fat per cow could be increased 50 per cent. in the next ten years. The desired change may come about through the multiplication of herd-testing societies; for, if the records of the herds were published, the owners would see to it that their own particular herds were well looked after in the matter of feeding.

It is rather a reflection on our average dairy cow that Melba XV. of Darbalara gave, in the eleventh month of her lactation period, a greater quantity of butter-fat than the average cow does in a year.

The average cow might quite reasonably reply that she was not allowed to choose her parents, and that her owner is less generous as to her diet than the breeder of the champion mentioned, and less punctilious as to her general care.

Causes of Inferior Cream—Careless Washing of Utensils.

In a large percentage of the cases where inferior cream is supplied to factories, the trouble, when investigated, is found to be caused by faulty methods of washing the utensils. Often it is found that warm water only is used for washing purposes, and that the separator parts and utensils are left with a greasy surface, which, when exposed to the heat of the day, often produces a tallowy smell, and immediately affects the cream at the next separation. To remedy this fault all separator parts and utensils should be washed in cold or luke-warm water, then again in hot water that contains a quantity of washing soda, and finally, they should be rinsed by being plunged into a can of boiling water or placed in a vat in which the boiling water is poured over them. It is essential that the water be boiling, for not only is the germ life then destroyed, but the utensils dry almost immediately, and the liability of rust formation is lessened.

Where the same lot of boiling water is used for several cans in succession, there is a very rapid loss in temperature. In an American experiment on this point, when 6 quarts of water at 210 deg. Fah. was used to scald or rinse four 10-gallon churns in succession, the water was found to be only 138 deg. Fah. after the fourth churn. In some English experiments, boiling water was carried as quickly as possible from an ordinary farm copper to the churns, which were nearly 20 yards away, and records of the temperature showed that the water lost from 11 to 17 deg. Fah. during the time that it was being carried from the copper to the churns. These instances are quoted merely to show how important it is to make certain that the water is at boiling point when used—it is not sufficient to know that it was at boiling point some little time before being used.

In quite a number of cases where milking machines are used, trouble is caused by insufficient attention being given to cleanliness. Very often it is found that the milk rubbers contain on the inside surface a coating of stale, cheesy milk, which results in the immediate contamination of the warm fresh milk as it passes through the vat at the next milking. Sometimes the trouble is caused by neglect to dismantle the vacuum tank. To avoid trouble with machines they should have pumped through them after each milking (1) cold or luke-warm water, (2) hot water to which has been added a tablespoonful of caustic soda to every 4 gallons of water, and (3) boiling water. After each milking the vacuum tank should be dismantled and washed.

Badly-tinned vessels, such as benzine tins, often result in a metallic flavour being imparted to the cream; and the faulty placing of the exhaust outlet from the engines, so that fumes come back through the open door or window, are other frequent causes of inferior cream, the remedies for which are obvious.

Maize Storage—Southern Trials.

The New South Wales Department of Agriculture has undertaken to try out the storage of maize in galvanised iron silos on various State Experiment Farms, particularly on the North Coast of that State, where weevil infection does enormous damage to the grain. Experiments are also to be conducted in treating seed maize with dry copper carbonate to determine the resistance of the grain to weevil infestation.

In indicating this forward move to the Press, Mr. A. H. E. McDonald, Director of Agriculture in New South Wales, emphasised that the department already had proved that maize storage in iron tanks was a safe and payable proposition if carried out on the lines that were advocated. As a matter of fact, maize stored on Trangie farm in an iron tank had kept sound for a couple of years. The trials that will now be made, however, will afford more advice and convincing proof of the value of maize storage, especially if undertaken on the North Coast, where the bulk of the State's maize is grown, and where the weevil menace is so troublesome.

Referring to the fact that maize, when stored in watertight tanks, did not become weevil infested, Mr. McDonald said this probably was due to the generation of natural gases given off by the maize, and apparently these gases prevented the development of the weevils. In the trials to be made, tanks will be filled with shelled maize, and the grain will be left undisturbed for two years.

The economic aspects of maize storage enter very largely into the questions that the trials are intended to demonstrate beyond the shadow of a doubt. For, if the coastal growers can successfully store maize, they will not only protect the grain from weevil infection, but they will no longer be forced to sell at unprofitable prices. Thus maize storage is a question vital to the progress of the maize-growing industry.

Colic in Horses—Common Causes.

Perhaps the commonest cause of colic is giving horses food to which they are not accustomed. A sound physiological reason exists for not doing this. It has been proved that the character of the food influences the quantity and quality of the gastric and pancreatic juices. A definite and constant diet produces juices capable of digesting it, but utterly incapable of dealing with sudden changes of food. Under proper conditions, no food will cause colic, although some (as for example, wheat and barley) are more indigestible than others; but many foods will do so if given in excess, or at the wrong time, such as giving lucerne to a horse that has been starved for a time. Horses can be made to exist on practically any food that is digestible, provided they are gradually accustomed to it; but to give a horse a full feed of, say, maize, if he has never had the grain before, is to invite digestive troubles that may cause death. Again, grass-fed horses suddenly put on to dry feed on being taken on a long journey get colic, owing to the sudden change of food.

If you wish to avoid colic, give food at regular intervals, and see that the food is of good quality and of proved dietetic value. Mouldy corn, damaged oats, or musty hay, very often produce colic, while proprietary foods of unknown composition, and frequently of doubtful feeding value also, often do a great deal of harm. Do not give green forage in an immature, fermented, or over-ripe condition.

Bran mixed with maize is a favourite food, but it is much too laxative for a horse in work, and is a frequent cause of an attack of colic.

Do not give large quantities of bran to a working horse. Bran is a good food to maintain the contents of the bowels in a soft condition, and to keep them acting, especially during periods of rest; but its nutritive value is practically nil owing to all the flour having been extracted from it.

Do not suddenly alter the amount of food given. It is a common practice to have horses fed up for a day or two prior to severe work, and this causes much intestinal trouble, such as stomach staggers.

Never forget that young horses cannot digest as much corn as old ones. Horses when rested, even for a day or two, should have their food, especially corn, reduced. Failure to do this is the cause of much colic.

Another common cause of repeated slight attacks of colic, especially with working horses on farms, is the dry, rough, coarse, and indigestible nature of the herbage found in many paddocks. Too much coarse food prevents digestion by reason of its irritative effect on the stomach. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest.

Ants in the Beehive.

Although the little black ant rarely disturbs a colony of bees to any extent, it is as well to have them removed if they are inside the hive. The ants should be brushed out, the hive set up on pegs, and a tarred rag wound around each peg to prevent their re-entry. For the destruction of these ants in their nests when on the ground, mix 1 oz. borax and ½ lb. sugar boiled for three minutes in sufficient water to produce the consistency of thin honey. Small quantities of this mixture can be placed anywhere in the track of the ants, and they will generally disappear, as it appears to act as a poison to the young. The bees will not take the mixture, owing, it is believed, to its being repellent to their taste.

Honey-yielding Trees.

There are considered to be thousands of species of flowering plants which are of assistance to the apiarist, but the value of only a proportion of these has so far been determined. The following list is taken from the Farmers' Bulletin, No. 129 (The Beginner in Bee Culture), issued by the New South Wales Department of Agriculture, and contains the names of trees and plants that have been definitely proved to be of value to the apiarist:—

For Inland Districts.—Yellow box, white box, red box, red gum, white gum, sugar gum, stringybark, apple box, peppermint, and wollybutt, all of which are eucalypts. Other useful trees, plants, and scrubs are tree lucerne, black thistle, pepper tree, Cootamundra wattle, golden wattle, silver wattle, blackberry, fruit trees of all kinds, Cape weed, clover, lucerne, maize, and pumpkin vines.

For Coastal Districts.—Grey ironbark, broadleaf ironbark, grey gum, spotted gum, white gum, flooded gum, swamp mahogany, red mahogany, bloodwood, and tallow wood are the best of the eucalypts. Other trees, plants, and shrubs include silky oak, tea-trees, orange trees, clematis, maize, pumpkin vines, clover, black thistle, wattles, and dandelion.

Fodder Trees.

Some of the best of our fodder trees will grow on a variety of soils and under varying conditions. Although a number of them—particularly the kurrajong—is a slow grower, growth may be accelerated somewhat by cultivation, and it will be found that any additional care given in this direction is amply repaid by the production of a bulk of very valuable fodder, amounting to many tons per acre. Not only are such trees as the wilga, myall, mulga, and others valuable for the fodder they produce, but they are also useful for shade and shelter, although it is wise to depend on other trees for shade and shelter, as fodder trees when lopped cease to be useful as shelter trees, and this at a time when shade is urgently required, i.e., during droughty periods.

Dry years are so regular in their occurrence in parts of the State that it is only common sense to give some attention and care to these trees that nature has so thoughtfully provided as a standby when pastures are scanty. Apart from the conservation of existing trees, there is much to be gained by sowing plantations of the best fodder trees. The labour involved in starting a plantation is not great, the chief items being the preparation of the ground and protection of the young trees from stock by a permanent fence. In certain parts where conditions are very unfavourable towards tree growth, the failure of planted trees may prove disappointing, but in such districts only those species which occur naturally in the surrounding country should be planted, together with some species which have proved their hardiness.

Lopping necessitates a certain amount of care and labour, but any trouble taken is amply repaid by conserving intact the source of supply for future years. Many of the native fodder trees will stand fairly heavy lopping, but the degrees of severity varies with different species. Some trees require two or three good leaders to be left uncut, whereas other species will stand a general pruning. Cuts should be made as cleanly as possible, in order to prevent undue injury to the tree and the subsequent entry of fungus and insect enemies. Lopping can also be made a method of improving the shape of the tree and increasing its future yields of leafy material.

Another point of importance when lopping is to cut from a number of different fodder trees at the same time so that the stock will get something in the nature of a mixed ration. If fed solely on one species, and where there is no succulent feed to be had, the animals frequently suffer from constipation and impaction. The following lick is recommended for stock that are being fed on scrub:—Epsom salts 5 to 15 per cent. bonemeal 5 per cent., and the balance Liverpool salt. If available, molasses may be added to increase the palatability of the lick.

The Slaughtering Act—Additional Regulation.

An additional Regulation has been approved under the Slaughtering Act providing that, when an inspector is satisfied that any stock is in a diseased or moribund condition or that its flesh is unfit for the food of man, he shall condemn the same and order the owner to destroy same by such method as the inspector may direct. If the owner fails to observe such direction he shall be guilty of an offence and the inspector may, at the expense of the owner, do all things necessary for the disposal of such stock or flesh.

Butter Fat and Butter.

Some dairy farmers who submit their cows for testing experience some little difficulty in converting the weight of butter-fat shown on the test sheets into commercial butter. In practice it works out that 83 lb. butter-fat is required to make 100 lb. commercial butter, and accepting that as a basis it is not a difficult problem to work out, mathematically, the amount of commercial butter that can be manufactured from any given quantity of butter-fat. It simply means multiplying the weight of the butter-fat by 100 and dividing by 83, the resultant figure being the weight of commercial butter.

The simplest method of converting butter-fat into commercial butter, and one that is approximate enough for all general purposes, is to add one-fifth to the butter-fat figure, the result being very near to the exact weight of commercial butter.

Write to the Under Secretary of the Department for a copy of these commercial butter tables if you are interested.

Cold Storing of Potatoes.

Down in Sydney a civic commission has been inquiring into the problem of cold storing tubers. This is the substance of the Commissioner's (Mr. W. J. Williams, F.C.S., Manager of the Municipal Cold Stores) report:—

Cold storage of potatoes must come. This is the definite opinion of Mr. Williams, whose advice on cold storage problems was recently sought by the West Australian Government. His report shows that his last experiment, when bagged potatoes were placed in temperatures of 36, 38, and 40 deg. Fah. for seventeen weeks, was a great success.

The best results, he states, were obtained from tubers taken from the room at 36 deg., as the loss of moisture was only 3.3 per cent., represented by a loss of 25 lb. on a total of 743 lb. In this room, the shrinkage of the Factor variety was exceptionally small, total weight of 459 lb. losing only 2.8 per cent. in store. The average loss on the whole experiment, including Factor, Surprise, Manhattan, Guyra Blue, Brownell, Satisfaction, and Dakota Red, was approximately 4 per cent., as against 15 per cent. when the potatoes are dry stored for the same period.

The edibility of the cold stored potatoes, the report adds, was found not to have been marred in the slightest. Upon being cut, the potatoes had a good white colour. The Surprise variety is considered to be too "soft" for cold storing. The experiment confirms, Mr. Williams declares, the fact that potatoes stored for about sixteen weeks at a temperature of 36 deg. lose in weight only from 3 to 3.5 per cent. weight, equal to about 67 to 78 lb. on a ton, as against a loss in common storage of about 336 lb., or 3 cwt.

"After forty days," the report states, "it was found that, though living larvæ and pupæ were present, the caterpillars had become torpid and had ceased feeding. This proved that the lower temperature had the effect of inhibiting the work of the potato moth. A checking effect was also noticed in regard to fusarium fungus. An examination, after about two months, showed that the cold had caused all the larvæ to leave the tubers. . . . After about seventeen weeks it was discovered that there were no living forms of the potato moth, all stages being totally destroyed. The fungus was also found to be inoperative."

The potatoes, when sold after having been in cold store for just over four months, were favourably commented upon by the selling agents, who secured good prices.

"There is no difficulty in storing local potatoes, provided the produce is in good condition, free from disease, and the conditions of the cold store are complied with. There is no reason that the method of keeping by cold storage should not be used in preference to common storage, and become a universal aid to producer, merchant, and consumer."

Surplus Honey Production—Lessons from New Zealand.

The New Zealand Honey Control Board has succeeded in standardising New Zealand honey, before shipping, to a quality or qualities which were suitable for the English market, and had made such arrangements that a continuity of supply could be assured. This honey, which is light in colour and of excellent quality, is brought over in bulk, is bottled in London, and distributed by a wholesale firm to retailers.

New Zealand honey is only sent on to the London market in a set condition, whereas Australian honey is frequently in liquid form, and the tins on landing are frequently leaking. The most popular varieties of honey are pale to white in colour, though in some quarters (opinions among merchants still vary) the amber-coloured product is now preferred. Indeed, one firm which some few years ago asked for New Zealand honey to be as white as possible have now made requests for the amber colour.

New Zealand honey is only distributed through one house, and as far as possible the price is fixed, the goodwill attaching to it in consequence of care in preparing, advertising and other charges. It has a ready sale, and is now recognised as being one of the best honeys, if not the best, imported by English merchants.

Broom Millet—Trade Requirements.

The soil, climate, and cultural methods largely determine the quality of the brush produced, but even a poor crop can be made attractive to the buyer by harvesting at the correct time, proper curing, careful hackling, honest grading and baling.

In the manufacture of brooms three classes of brush are required—''inside,'' ''cover,'' and ''hurl.''

''Inside'' millet is used for forming the inside of the broom, and for the best brooms is generally not more than 17 inches long. There is a type of dwarf broom millet, largely used for ''insides'' and for small brooms in America, which local manufacturers say they could do with here, but the yield is small, and it has not yet been decided by experiment whether it will be profitable to grow this class of millet under any conditions in this country. In the meantime, ''inside'' millet is generally made up by the manufacturers from some of the poorly developed brush of the long White Italian variety.

''Cover'' is the class used for covering the inside and also for forming the shoulders of brooms. For the best brooms it should be 17 to 20 inches long.

''Hurl'' is the longest brush, ranging from 20 to 25 inches for good brooms. The best ''hurl'' is fine, even, straight fibre, and forms the outside of the broom to give it a nice finished appearance. About 1½ lb. of brush are required to make an ordinary broom, and the three grades are used in about equal proportions.

The manufacturer and the farmer need to be brought into closer touch, for many improvements could be effected by the farmer when he knows the manufacturer's requirements. Some of the most important of these are:—

(1) Complete removal of the seed.
(2) Grading out inferior, broken, or badly bent or very coarse brush.
(3) Uniform length of stem cut with heads.
(4) Uniform and good colour.
(5) Regular sized bales, well packed and pressed.

It is also to be deplored that dishonest practices exist among farmers, such as facing the outsides of bales, filling with inferior material and rubbish, watering bales to increase the weight, &c. Unfortunately, manufacturers have been compelled in some instances in the past to import millet from Italy rather than risk the poor get-up of the local product, but a noticeable improvement has taken place in recent years, though, as the imported article is usually of very good quality, our growers should bestir themselves still further in the direction of improving their product for market.

A fairly good market exists at times in New Zealand for locally grown broom millet, but this can only be maintained by a uniform high standard, and good honest growers have at times to suffer low prices because of the negligent or dishonest farmer in the neighbourhood.

Grading is a process that farmers seldom practise, the millet being put up into bales which are called ''self-working,'' being composed of all three grades as well as bent and inferior brush. Grading into separate bales on the farm involves much extra labour, and the growers contend that the extra price received for the graded article is not sufficient to justify the grading. At the same time, a rough grading out of all millet which does not come up to the manufacturer's requirements is usually worth while, and is reflected in a sufficiently increased price to justify the practice.

Marketing Millet Broom Brush.

The brush is prepared for market by the removal of the seed, a hackling machine being used for this purpose. This machine consists of a roller studded with small narrow iron spikes mounted in a drum, which is turned rapidly either by hand or power. The brush is not fed into the machine, but it is held in small handfuls in such a manner that the upper portion of the brush containing the seed comes in contact with the roller, which strips the seed off cleanly.

Many farmers make their own hacklers, and they answer the purpose quite well for small crops at any rate. However, there are firms which will supply these machines for a small figure.

After hackling, the brush should be packed back in deep layers on the shelves where it had been drying prior to hackling. Curing will then continue until baling time. Keep all the butts level so as to facilitate handling when baling.

Grading is a practice that farmers do not practice enough, the millet being put up into bales which are called "self-working," being composed of all grades—"insides," "covers," and "hurl," as well as bent and inferior brush. The extra prices obtained for graded brush, or at least for brush that is free from rubbish, makes the work well worth while.

A lucerne or hay press can be adapted for baling broom millet. The best type is a box press (resembling a wool press), which keeps the butts even. The brush is packed with the butts outward and the heads overlapping in the centre. A good pressure is desirable to reduce the bulk for the saving of freight on rail. Battens are placed on the top and bottom of the bales, being secured by four to six strands of stout wire. A convenient size of bale is about 46 x 30 x 24 inches, weighing about 300 lb.

Millet Cultivation.

So much stress is often laid on the importance of the early preparation of the soil prior to the sowing of broom millet, that the after-cultivation of the growing crop is sometimes neglected. A high yield of good quality broom millet is almost impossible unless the winter rainfall has been conserved in the soil, weeds destroyed, and the seed bed made firm by careful, early cultivation. Important as is this aspect of broom millet growing, it is no more important than after-cultivation, which has as its main object, not only the conservation of moisture and the keeping down of weeds, but the maintenance of warmth in the soil in order that the crop might be kept moving.

If heavy rain falls shortly after sowing, the germination will be affected, owing to the formation of a heavy crust on the surface, and the field may require replanting, especially if the seed has been sown in furrows. If sown on the flat, light harrows can be run over the land to break the crust. If done in furrows, this harrowing might cover the seed too deeply.

Owing to the slow growth which broom millet makes, especially if sown early in spring, harrowing is one of the most important operations in the cultivation of the crop, as it has the effect of warming the ground and inducing faster growth. The crop may be harrowed till it is six or eight inches high, and this should be done during the warmth of the day when the plants are supple.

The first cultivation is best given with a narrow tine cultivator, working as close to the rows as possible to get rid of the young weeds. It is usually found necessary to go twice up the rows with this first cultivation, and it is required to be done carefully to avoid injury to the young plants. The cultivation should be continued until the crop is about half grown, and should be shallower with each succeeding cultivation to avoid damage to the roots. A double-row cultivator should be used for the later cultivation on larger areas. The amount of cultivation necessary is determined largely by the rainfall, and the growth of weeds. Keeping down the weeds is the most important object of cultivation.

"Don't Argue."

How foolish it is to try and cure by argument what time will cure so completely and so gently if left to itself. As I get older, the anxiety to prove myself right if I quarrel dies out. I hold my time, and time vindicates me, if it is possible to vindicate me, or convicts me if I am wrong.—Mark Rutherford's "Deliverance."

Wheat and Sheep—and Oats: Experiences of Southern Farmers.

Progressive wheat farmers have long ago learned the value of a flock of sheep, which not only turn the stubble and the weed growth on the fallows to account, but which are also helpful in compacting the soil, and can be used for the purpose of checking a too-forward crop. The past dry season in the north-western wheat districts introduced still a further problem for solution. When the feed failed the farmer had to decide between feeding off his wheat crop and thus greatly reducing the ultimate yield, or letting the sheep die. Generally the choice was in favour of feeding off to sheep, and to the detriment of the wheat crops.

These facts should turn farmers to the question—"Is there any other crop that will provide the same or more grazing, and will enable the wheat to be harvested to the best advantage?" To that question the Department of Agriculture has an answer—it is the one word, "Oats." Oats are a better crop for feeding off because they give a greater bulk of feed of better quality. And experience is beginning to confirm this with many farmers in the Gunnedah section.

Messrs. Wood Bros., of Curlewis, for instance, had 30 acres of Mulga this year, on which they fed 400 ewes for one month and also ran twenty-three horses at intervals; the stock were removed for five weeks, and were then turned on again, and the large stock have been there intermittently ever since; early in October, following rain during the last week in September, there was again a nice shoot. Mr. J. Cavanagh had a series of experiment plots with this cereal, which had been sown at the rate of 1 bushel per acre on 22nd April after a short fallow. The plots were fed off twice and rolled between, and early in October they presented a most attractive appearance. Buddah was the earliest variety of all, but Myall and Mulga were not far behind, and Guyra was still green enough to promise good development. Messrs. Stanger Bros. pointed out a pure-seed plot of about 3 acres of Mulga on which they shepherded seventy sheep per acre for one week in June, and a little later the same sheep again for two days; yet a yield of 9 to 10 bags of grain was expected at the time of the inspection. Not far away the same farmers had 22 acres of the same variety, on which they lambed 120 ewes, grazing them over it for some six weeks, and also ran twenty head of draughts every night, four milking cows, and nine poddies. In October the large stock were still on this crop, which had been well worth sowing for its grazing alone.

"I'd always have a bit of oats now, especially for feeding off for sheep," said Mr. C. Boyer, on whose farm at Wynella oat variety trials were grown this year. Belar, Mulga, and Gidgee in that order were the best-looking at this centre, but the crop has made an impression upon him as feed that he will not forget.

Farmers, particularly those who had to sacrifice their wheat crops this year, should need little urging to convince them of the profitableness of sowing a few acres of oats ahead of their wheat next year. Even on the low rainfall of the past season it provided weeks of grazing for both sheep and larger stock, at a minimum of cost, and in greater abundance than a wheat crop.—A. and P. Notes, N.S.W. Dep. Ag.

The Need for Care in Handling Fat Lambs.

The New Zealand Meat Producers' Board draws attention in its annual report for the year 1926-27 to the losses that result from the careless handling of fat lambs in transit. "It may not be generally known," reads the report, "that a great many lambs graded second class are put into this grade on account of bruising; and from investigations made by officials of the board it has been found that a good deal of this bruising has been caused by pulling the lambs by the wool, particularly in trucking. The loss that takes place from this cause should be a matter of concern to every farmer. As an illustration of the damage that takes place in this direction it may be noted that in a report received from one of the Board's graders he mentions that in a lot of lambs inspected at a freezing works, he counted 101 second class, forty-three of which would have gone into the prime grades but for the bruising, whilst a number of second-quality lambs were also bruised, and out of ten rejections, seven were on account of bruising."

Confirming the correctness of this statement, the Government Sheep and Wool Expert (N.Z.) states that not only by pulling the lambs by the wool is damage done, but if lambs are caught by the hind legs—a very common practice—there is a big chance of one of the joints being wrenched and a swollen and bruised leg is often the result, which may not have time enough to assume normal condition before the lamb is offered in the market. The proper way to catch a lamb is around the body just behind the shoulders.

Beeswax—Melt the Damaged Combs.

The market for best quality beeswax is almost invariably good, yet there is much waste of this valuable product in many localities because apiarists neglect to melt up unsatisfactory or damaged combs; or, if the melting is undertaken, it is not carried out properly, and the result is a poor quality wax for which there is very little demand. Moreover, the careless beekeeper often spreads disease to a neighbouring apiary by leaving about old damaged combs, frequently allowing combs attacked by wax moths to go to waste, and afterwards purchasing foundation comb at a high price. In seasons after drought more care than usual is necessary to keep the apiary free from disease. The Department of Agriculture points out that under the Apiaries Act the wax moth is a proclaimed pest, and with infested combs on hand apiarists are sure to meet trouble when the inspector calls.

The natural colour of beeswax is yellow, but by bleaching it can be lightened in colour even to pure white. Wax can be bleached by moulding it into thin sheets and exposing these in the sunlight. Dark colour in wax may result if rusted iron or galvanised vessels are used for melting.

Melting the Wax.—Where a patent cappings reducer is used, the wax is melted and separated from the honey as the work of uncapping the honey proceeds. In this case, where the blocks of wax so produced are cool, they should be put through a refining process before being sent to the market. Where no cappings reducer is used, a wax extractor is useful for melting the wax from the strained cappings.

Melting the combs is considerably more difficult than the treatment of cappings, but it pays to make a good job of it. For the ordinary apiarist, or where only a small number of combs have to be melted annually, the only plant required would be a few kerosene-tin buckets and a small wax press. A fair-sized vat with a tap or gate at the bottom is also desirable. A good supply of water should be available; clean, fresh water of any description will do provided it is not mineralised.

Stand the kerosene tins on bricks built up about a foot so that a fire can be built under the tins; then a little more than half-fill the tins with water and proceed to heat. Put in the tin sufficient comb to make a free mush, and allow this to stand at about boiling point, stirring occasionally until melted up; then pour a quantity into the press, which has previously been kept warm and which contains a straining cloth. Small quantities of the melted mass, with a fair supply of hot water, give the best results. When a sufficient quantity is in the press, fold the straining cloth neatly over and apply the screw pressure gradually.

After apply the first pressure and allowing to stand for a time, ease the screw sufficiently to allow the hot water to get over the slum gum; then apply the pressure again, leave the hard pressure on for a few minutes, and tip the press forward, draining the water and wax into a bucket, which is then emptied into the vat. The slum gum is removed from the press and the remaining quantities of melted comb treated.

When the melted comb from the tins on the fire has been treated, the hot water can be drained from the vat into the melting tins again, and a start made with a fresh lot of comb. After completion of the day's work the wax can be drained from the vat into the moulds, which should be placed in warm water and covered to allow the necessary slow cooling. To obtain a high-grade wax, the blocks of wax from the moulds, when cool, should be cleaned at the bottom and then properly refined.

How to Refine Beeswax.—A fair-sized tinned vessel is quarter filled with water, and the blocks of wax, which have previously undergone the treatment already described, are added. The vessel is then heated, and the wax melted slowly but thoroughly, the fire withdrawn, and the wax allowed to stand (well covered) in a warm room for a few hours. It is then drained off from the top into suitable moulds until the underlying impure matter is reached. The moulds should have flanged sides previously smeared with glycerine, and when containing the wax should be placed in warm water to ensure slow cooling. When properly cooled off the wax is removed from the moulds and any adhering impurity scraped off.

To expedite the work of cleaning wax from utensils, kerosene will be found of service where its use is practicable.

Persons have sometimes tried to sell adulterated wax—usually a mixture of tallow or paraffin—but since the adulterated article is easily detected under the specific gravity test, and generally results in a loss to the seller, very little adulteration is carried on nowadays.

Good Use for Old Iron Tank.

An effective orchard burner can be made so cheaply that it is rather surprising that so few fruitgrowers are using them to dispose of prunings, fallen fruit, &c. In Victoria some enterprising foundries manufacture orchard burners, but there is really no necessity to go to the expense of purchasing one of these handy devices, it being a comparatively simple matter to construct one. A discarded square iron tank answers the purpose readily, and much of the material for the under-carriage can often be recovered from the farm scrap heap. The advantages of having an orchard burner are many. Burning the prunings, fallen fruit, and other rubbish that accumulates in the orchard, is quicker and cheaper than carting them away. The danger of spreading disease throughout the orchard is minimised by the destruction of all this rubbish, while the ashes, which contain, among other things, potash and lime, can be returned to the soil.

Lucerne Seed.

Test for Purity before Sowing.—The wise farmer never takes for granted the quality of lucerne seed. It pays to test all seed for purity and vitality before sowing. The tests are simple, and are carried out as follows:—

Testing for Germination.—Take a piece of blotting-paper about 6 by 8 inches in size, fold across the middle and place on an ordinary dinner plate; moisten the blotting-paper with water, and spread 100 seeds evenly over one-half of the paper; turn the top flat down, and invert another dinner plate over the lower one so as to serve as a cover. The plates should then be set in a warm place, where the temperature can be approximately maintained at about 80 degrees Fahr. The blotting-paper must not be allowed to become dry, and every twenty-four hours the germinated seeds should be removed and the number recorded. There should not be less than 85 germinable seeds in every 100.

Testing for Purity.—Take a given weight, say 1 oz., of the seed; spread it out on a sheet of white paper and pick out all impurities. These may consist of sand, dirt, vegetable matter (small twigs of the plant, for instance), mouse dung, weed seeds, or insect remains. These should be carefully weighed, and the proportion in the sample computed. Lucerne seed should not contain more than 1 per cent. by weight of impurities and weed seeds, with no dodder or harmful weed seeds present—i.e., it should have a purity standard of 99 per cent.

The weighing can be done with very little trouble. If the individual cannot manage it, no doubt the local chemist would oblige, the simplest weights to use being avoirdupois—437½ grains to 1 oz., or 7,000 to the lb. The calculations are then easily made.

If it is found that seeds of noxious weeds exist (more especially dodder), the bulk should be sifted, using a mesh that will retain the lucerne whilst allowing the dodder and other small things to pass through. Broken and small seed may pass through also, but this will be no loss.

Other Points in Selecting Seed.—In addition to testing up to the standards of purity and germination mentioned, good lucerne seed should be sound, mature, plump, bright, well saved, and reasonably even in size. A further point to remember is that lucerne seed of local strains gives better results than the imported seed. This locally grown seed is generally sold by seedsmen and growers under the names of the districts in which it is produced, such as Hunter River, Tamworth, Mudgee, &c.

Dodder.—In selecting lucerne seed special precautions should be taken to see that it contains no dodder seed. Dodder is the greatest enemy of lucerne, the young dodder plants attaching themselves to the lucerne seedlings. As soon as the thread-like vine is firmly attached to the lucerne plant, the stem connecting it with the ground withers away, and the dodder draws its sustenance from the lucerne by means of tiny suckers, which enter the tissues of the host plant. The dodder flowers are a beautiful golden colour. As the parasite develops, the tangled masses in which it occurs have the appearance of ringworms, working from the centre outwards.

On no account should dodder be sown with the lucerne seed. Fortunately the removal of seeds of dodder is a simple process, as they are much smaller in size than lucerne seeds, and can be removed by screening through a mesh sufficiently close to retain healthy lucerne seed, whilst allowing the dodder to pass through. If dodder appears in a lucerne paddock it should never be allowed to seed, but the affected growth should be removed as soon as possible. The plants should be chipped to the crowns, or straw should be carted on to the patches and burned. The patches should be mown and treated before the general crop is cut, as otherwise the parasite may be distributed throughout the field by the machinery. Burning is the safest remedy, and will not injure the lucerne plants.—"A. and P. Notes, N.S.W. Dept. Agr.

The Spiritual Values.

"Never before has there been such an overwhelming demonstration, in every sphere of life, of the hopeless futility of any system of civilisation which is based upon the rejection, or the but qualified acceptance, of the spiritual values upon which human wellbeing depends. The insolence of every such system has been visited by a judgment which will serve as a warning to all succeeding generations. The incompetence of all efforts to rebuild the shattered fabric of the world upon any other than the best spiritual foundations is being exhibited daily in every province of human life. Never before has there been such an opportunity, created both by the conscious helplessness and by the truer vision of mankind, for advancing to the acceptance of higher ideals and for a concerted attempt to apply them in all directions to the problem and task of human progress."—Dr. SCOTT LIDGETT.

The Citrus Harvest—Wisdom of Early Preparation.

Growers are advised to plan well ahead for their citrus harvest. If not already done, the picking boxes should be thoroughly overhauled and cleansed, and any loose boards on the cases should be securely fastened and protruding nails removed. To secure the best results it is necessary to keep the skin of the orange in a sound condition—free from abrasions or punctures.

When sizing machines are used they should be thoroughly examined and any necessary adjustments made. The advent of sizing machines has done much to assist the grower, and those growers who have not yet installed a sizing machine in their packing shed should do so as soon as possible. Hand-sizing is a slow, costly, and not altogether an accurate way of carrying out the work. Sizing by machine is far more accurate, considerably quicker, and much more economical.

Though citrus fruits do not show injury from bruises for some time after picking, in reality the oil cells of the skin are very easily damaged, and it is through such injuries to the skin that decay germs, such as those causing blue mould, make their entrance; hence great care is necessary when picking and packing for market. Gloves should be worn or the finger-nails kept extremely short, and the fruit should be picked or clipped with the button adhering but no length of stalk that will come into contact with and puncture other fruit. The fruit should be placed right into the picking receptacle, and not dropped in from the top, and the same care should be exercised in all subsequent handling between picking and packing.

The grower should make arrangements now to secure sufficient case-lining paper to be used in the packing of his fruit. Though paper-lining, by checking the circulation of air in the case, may tend to produce conditions favourable for the development of blue mould, the rough timber of the unlined case injures the skin and allows infection by the disease, so that lining-paper is an advantage when packing citrus fruits, unless the inside of the cases are planed, as is done in some other countries.

Feeding Fowls, Wet or Dry Mash—Which?

Many successes have been obtained with both the wet and dry mash systems of feeding, but according to the New South Wales Department of Agriculture neither experiment nor observation has shown dry mash to be the equal of wet mash either for growing chickens or for egg production. On the other hand, it is recognised that there may be circumstances which would justify the adoption of dry mash feeding. Indeed, where the attendant is not a skilful feeder, dry mash might be his salvation because of the fact that it is not sufficiently appetising to induce the birds to eat to repletion. Wet mash is much more palatable.

Ration Formula.—The following mash can be used either dry or wet:—Pollard 60 lb., bran 20 lb., lucerne meal 15 lb., and M.I.B. meat meal 5 lb. This formula will make 100 lb. of morning mash. Bran is of approximately the same food value as lucerne meal, and can be used instead of the latter, but then lucerne meal gives variety to the ration. In lieu of M.I.B. meat meal, 5 to 7 lb. Compo. meal can be used if desired. While the mixture given above may be regarded as a standard, it is advisable to reduce the meat meal somewhat for breeding hens, while for laying stock 1 or 2 lb. more to every 100 lb. of mash is permissible.

When the mash is mixed wet, 22 oz. of common salt should be dissolved in the liquid with which the mash is mixed. If the mixture is used dry, it should be fed in hoppers, and only half the amount of salt used, while great care should be taken to see that it is thoroughly mixed right throughout the ration. Oil cake might be used sparingly in mashes, say, up to from 2 to 5 per cent. Any change of this nature should be brought about gradually.

Quantity to Feed.—The evening ration of grain consists of two-thirds wheat and one-third crushed maize. If desired, the maize may be increased so that it represents half or more of the ration. Good plump oats or barley, free from awn, might be substituted for a portion of the wheat.

In practice, 100 lb. wet mash will feed approximately 800 laying hens, but this is not definite enough to be relied upon always. It is better to feed all the birds will eat. If they eat too much, feed less until it is noticed they are keen for their food at the regular feeding hour. Of dry mash the adult birds will not eat too much and the chickens will not eat enough. Hence the advice to feed only wet mash to the latter.

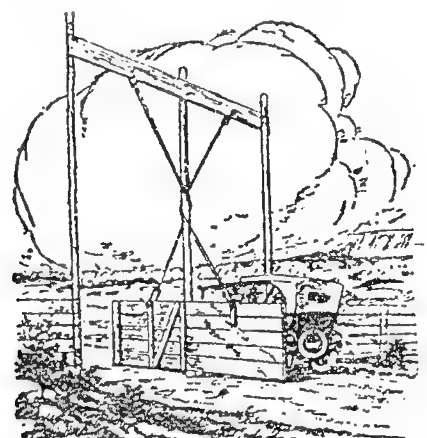
Greenstuff and Shell Grit.—Succulent green feed, chaffed up for preference, should be given daily, preferably at midday. If a little pollard is mixed with it, and it is wet, the green stuff is eaten up more readily. Among the best crops to use are lucerne, Bokhara clover, barley, rape, chou moullier, thousand-headed kale, and green maize while young and tender. This range of green crops will provide feed throughout the whole year. Chaffed up green lucerne, clover, or barley may take the place of as much as one-third of the entire bulk of ingredients of the morning mash.

The importance of a plentiful supply of seashell grit should not be overlooked. Oyster shell is a good substitute, but is rather soft in itself. The best material for this purpose is a mixture of two-thirds sea or beach shell to one of oyster shell, crushed to a size that it can be eaten. Although the primary purpose of supplying this material is to furnish lime for shell-making purposes, poultry farmers are warned that burnt lime is injurious to poultry when eaten; nor will it in any form take the place of shell grit.

AUTOMATIC GATE.

The following illustration and description from an American paper gives details of construction of an automatic gate in use in the States where ranching operations are carried on. The idea is that the car pushes open the gate, there being no need for the driver to dismount for the purpose. The twist, imparted to the suspension chains, causes the gate to swing back to the closed position when the car has passed through.

Two pipes, 4 inches in diameter, and extending 16 feet above the ground, are set at the ends of the opening, in line with the fence. A third pipe, usually 6 inches in diameter, is also set vertically midway between them. These three



pipes are connected by a length of 2 inches by 8 inches timber, from which chains are attached with links crossing at the centre post, then down to each side of the gate, as shown. When the front bumper of the car strikes one side of the gate, it is swung open. The chains wrap about the centre pipe, causing the gate to lift. But when the car has passed, the gate swings back into place. The gate is attached to the centre post with U-bolt so that it will turn freely. The larger the centre pipe is the harder the gate will be to open and the quicker it will close.

The Home and the Garden.

THE CARE OF THE BABY.

Far more babies die during the hot months than during the cool season. Let no one blame the Queensland climate for this. Babies thrive and keep healthy in hot weather when proper care is taken. With a little knowledge of infant management all our unnecessary summer mortality might be prevented. During hot weather the baby should not be overclothed. He should have plenty of fresh air day and night, but should be shaded from the direct rays of the sun when he is out of doors, as he ought to be every day. During hot weather he is more thirsty and should be given a drink of water whenever he wants it. As he uses very little body fuel to keep up his body temperature, he needs rather less food, and is not so hungry as in cold weather. Any excess of food is more likely to upset him, and if the hot weather comes suddenly it is wise to cut down the quantity or strength of his food slightly, but he should have as much as he needs. Food that agreed with him before may upset him now, and advances in diet should be made cautiously. It is wise to wean babies in the cool months rather than in the hot months, though this is not always possible.

Last year the infantile mortality of Queensland rose from 45.4 per 1,000 to 50.4 per 1,000, or, to state the truth more simply, there were 100 more deaths during the first year of life. Every one of these hundred babies were needlessly sacrificed. Every summer we have outbreaks of dysentery amongst our babies, no years are free from them, but last year the epidemics were worse than usual. Dysentery is an entirely preventable disease. It is characterised by loose motions, containing blood and slime, often passed with much straining. There is rapid wasting and there may be high fever and great prostration. In many cases death ensues. It is sometimes called gastro-enteritis or summer diarrhœa, but its right name is dysentery. It is caused by dysentery bacilli, which are contained in the motions passed. Dysentery bacilli during epidemics are found also in the motions of many people who are only slightly indisposed or perhaps not ill at all. They may be conveyed by the mother's hands from the baby's napkins to the food of other children. From one house to another they are conveyed by flies which visit the closet-pans and infect the babies' food or the teats of their bottles or their dummies. Dysentery epidemics occur during the fly season.

The best preventive of dysentery is breast feeding. Flies cannot convey dysentery to the food of a breast-fed baby, but they are very fond of settling on the baby's dummy. The present fashion of using dummies and pinning them outside babies' frocks is a direct invitation to disease. It is exposing healthy babies to a serious risk of death. If a mother wishes to keep her baby safe from this dread disease she will put its dummy, if it has one, into the kitchen fire. If the baby is bottle-fed, she will take the utmost care to protect its food, its bottles, and teats, after scalding them, from flies. The lives of Queensland babies depend on the care taken by Queensland mothers. Are we to have 100 unnecessary babies' deaths this year?—Dr. A. TURNER, Director of Infant Welfare.

RAISING SEEDLINGS.

The soil for the seed-bed or seed-box is prepared by mixing good garden loam with sand. Such a soil holds moisture well, allows the young plants every opportunity of pushing their way to the surface, and encourages a large root development. Too rich a soil in the seed-bed or seed-box has a tendency to produce long, spindly plants, while if the soil sets hard it is quite unsuitable for its purpose, and where the garden loam used in the mixture gives it such an inclination more sand should be used.

The seed-box need not be more than 4 to 6 inches deep. It is important that drainage be allowed for, and although the chances of successful seed-raising are very remote without good drainage, the provision is one which beginners often neglect to make. Unless the bottom boards of the box are divided by a well-defined space, it will be necessary either to replace them by narrower ones or to bore holes in them with an auger, so that the water may have an easy get-away. Small openings between the bottom boards are of little use, as the swelling of the timber after watering may make the box practically watertight. The bottom of the seed-box should be spread with a layer of pieces of broken pots or small stones. Over this should be placed (if available) a layer of leaf mould, and finally the sandy loam mixture in which the seed is to be sown. The surface should be pressed down with a piece of board before sowings are made.

To sow small seeds, whether in boxes or in the garden bed, make very shallow drills—just slight depressions—across the surface of the soil and sprinkle the seed evenly along them. For light seeding the seed should be picked up between the finger and thumb and dropped with a slow rubbing movement. After sowing, shake a little prepared soil over the surface and again press down lightly with a block of wood.

The watering of the seed-box or seed-bed must at all times be carried out with care, so that the flattening of the plants and the washing of the soil from their roots may be prevented. The boxes should be on a level, so that the effects of watering may be uniform. Unless the rose of the watering-can is an extremely fine one, it is preferable to immerse the boxes in water in a suitable receptacle in which the water is deep enough to percolate upwards to the surface of the soil, but not so deep that water will lie actually on the surface of the soil. If the original seeding has been too thick the young plants should be thinned out or pricked off into other boxes. Pricking out into a second set of boxes or a seed-bed has the effect of producing well-rooted, stocky plants which can be transplanted untimately into the open with the least risk of failure. The young seedlings should not be pricked out until they have thrown out their third leaf.

THE PLANTING AND CARE OF HEDGES.

When properly planted and kept in good order, a hedge is a great shelter and a lasting ornament to any place, and will add considerably to the value of a property.

It is advisable in this State to plant hedges on the level ground, on account of the long spells of dry weather and the hot winds which prevail during the summer. Where the ground is swampy, however, it is necessary to form a bank or what is generally called a turf wall, two or three feet above the ground level, tapering on both sides, and about two feet broad on top. A line is run along the centre of the bank, and a little trench cut out, and the rooted cuttings are planted against the back of the trench, where the line is set. Where the turf has been removed to form the bank will now act as a drain.

The trench should be about 18 inches wide and a good spade deep. Some manure should be put in the bottom, and covered with a light layer of soil, and the plants placed up against the straight solid wall. The roots are covered with a little soil and well watered, and the trench filled up with the remainder of the soil. When this is done it is advisable to look along the row of plants to see if any are out of place. When the plants are made firm, cut them each to six or eight inches from the ground, and dig the ground for about three feet on each side of the hedge.

Hedges that are exposed to cattle must be fenced as soon as planted, either with a temporary stake and bush hedge, with hurdles, or with a light post and wire fence for four or five years, till the hedge grows up, care being taken not to place the fence too close to the hedge. The hedge must also be duly weeded while young, especially during the first two years.

In order to preserve hedges in proper form, they must be clipped on the sides and tops at least once a year, and, if possible, oftener. The best time for the first cut is midsummer, with the second cut in April or May. The shoots should always be cut the same season while in leaf, and before they become hard. The work may thus be performed more expeditiously and with greater exactness, as the cutting should be as even as a wall on the sides, and the top as straight as a line. After the hedge is formed to its proper width, the growth should be cut as nearly as possible to that of the former cut, particularly on the sides. It should never be allowed to grow more than a foot or 18 inches wide, or too much on the top.

When the cutting cannot be carried out more than once in the year, the clipping should not be performed until the end of April or May in this State, for if cut sooner it will shoot again, and appear almost as rough all the winter as if it had not been touched.

High hedges are very troublesome and expensive to keep in proper order.

BUDDING FRUIT TREES—NO TIME LIKE THE PRESENT.

Following the rains in December and January, the sap should be running freely, and the present month is likely to be most suitable for budding both old trees and nursery stock. Old trees which were cut back at the end of the winter with a view to being worked in the summer should by this time have made quite sufficient mature young shoots to bud into. It is by far the best policy to work many more of these young shoots than will be required for the ultimate formation of the new tree, as there is likely to be some loss from heavy winds and other causes. Moreover, the leaf surface of the tree is very much reduced by the cutting back in the winter, and it is to the benefit of the tree to allow as much new foliage to grow as possible. The development of shoots from several points round thick stumps keeps the bark healthy all round, whereas if only a few shoots spring from one side the bark often dies away on the other side. The thinning out of superfluous shoots can be spread over several years.

There are three seasons—spring, summer, and autumn—when budding can be carried out, but autumn finds most favour with nurserymen for budding citrus trees. The operation is best carried out on fine days, avoiding wet days.

Insert the buds in the young stock about 4 to 6 inches above the ground, but when old trees are being worked over the buds may be inserted in the branches close to the trunk of the tree, and just where a limb is required. This will give the tree a good shape. It is generally found best to put the bud on the under side rather than on the top side of the limb, as, by inserting the bud on the top of the limb in an old tree, the growth tends to be all inwards, thus unduly crowding the centre of the tree.

Medium-sized shoots afford the best buds, and well-developed buds are the best to use. The buds towards the top of a shoot are not usually well-developed, and those near the base are, as a rule, also small and poorly developed; and, while they might grow all right, the chances are they will not make such fruitful trees as those grown from buds which are large and well-matured, and which have clustered around them two or more fruit buds. This applies more particularly to peaches, apricots, nectarines, and plums.

As soon as the bud stick is cut from the tree, the leaves should be cut off just close to the bud, and the quicker the latter is inserted the better. This, together with tight wrapping, is the reason why men accustomed to the work have better success than amateurs, as they never mutilate a bud when cutting it, and from the time it is cut until it is inserted is only a matter of a few seconds. It is a good idea to carry the bud stick wrapped in wet sacking during hot weather to keep it from wilting and spoiling.

To make the cut in the stock, preparatory to inserting the bud, take a *sharp* budding knife and make a vertical cut from 1 to 1¼ inches in length, then a horizontal cut directly across the top of the first cut, allowing the knife to press back, so that the bark is cut and slightly raised with the one operation. If the sap is flowing freely these two cuts extending through the bark are all that is required. As the bud will have to be slipped downwards into this cut, we must cut the bud from the bud stick by commencing the cut below the bud and finishing above it. This leaves the bottom portion of the bud in a very smooth condition, and allows it to keep its shape while being forced underneath the bark of the stock. It will be observed that the bark has not been loosened, except when making the horizontal cut, and then only sufficiently to allow the lower point of the bud to enter the bark, preparatory to being forced down with either knife or thumb.

To cut the bud from the bud stick, insert the knife half an inch below the bud, cutting through the bark into the wood, pass the knife under the bud and bring it out half an inch above it, thus severing the bud with a thin slice of wood adhering to it. The bud is now placed in the top of the cut made on the stock and forced down with the thumb or the blade of the budding knife. The bud is now ready to be tied, and if raffia is used it should be moistened before being used.

Care must be taken to see that the bud is tightly wrapped and securely fastened, for if the wrapping becomes loose the chances are the bud will not take. The bud will not be damaged even if it is completely covered by the wrapping, but if it is large it is as well to leave it slightly exposed. If there is any reason to expect rain about budding time, it is best to use a waxed cloth, and by starting the wrap from below the bud and finishing at the top it can be so wrapped that very little moisture will find its way underneath the waxed cloth.—A. and P. Notes, N.S.W. Dept. Agri.

Orchard Notes for March.

THE COASTAL DISTRICTS.

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which has again proved its superiority in the recent shipments of oranges from the Southern States to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

CAPE GOOSEBERRIES.

When making the tomato bed and sowing seed, sow also the cape gooseberry. The cape gooseberry is a member of the same family group as the tomato, and the treatment that suits one suits the other. The plants like a fairly light soil, which has been well manured with either thoroughly rotted cow manure or well treated with meatworks manure and superphosphate. When the young plants are put in they should be well firmed into the ground, and given a good watering. It may be desirable, for a day or two, to give them a little shade. One who has had great success with the cape gooseberry recommends the following treatment:—"Although the cape gooseberry is a perennial, I find that it does best with us in Queensland when treated as an annual. It fruits very heavily in its first season, and I think far more heavily than in subsequent seasons. I like to sow the seed in large pots of fairly rich soil, though the soil must be light. The seed is quite big enough to let me put out each seed separately, and in that way I am able to ensure that the young plants are not crowded together. I sow the seed, water it, and then stretch a piece of white paper right over the pot. I put this pot out in the sun. It is not many days before the seeds show signs of breaking through the soil. I then remove the paper covering, and all I have to do is to see that the soil is kept moist. The plants grow very quickly, and soon as they develop their second pair of leaves I put them out in the beds where they are to grow. I have a neighbour who, being an Englishman, and an old-time gardener, pricks his seedlings out. That is to say, after removing them from the seed pot he puts them into a small pot, and lets them develop in that pot before he transfers them, soil and all, into the bed. I think he probably has better results than I have, but then he has a lot more work."

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February, 1928.		March, 1928.		MOONRISE. Feb., 1928.	MOONRISE. Mar., 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.26	6.46	5.47	6.23	p.m. 2.40	p.m. 2.40
2	5.26	6.45	5.48	6.22	3.45	3.38
3	5.27	6.45	5.48	6.21	4.46	4.30
4	5.28	6.44	5.49	6.20	5.42	5.16
5	5.28	6.44	5.49	6.19	6.34	5.54
6	5.29	6.43	5.50	6.17	7.18	6.30
7	5.30	6.42	5.50	6.16	7.56	7.2
8	5.31	6.42	5.51	6.15	8.30	7.31
9	5.31	6.41	5.51	6.14	9.8	8.0
10	5.32	6.40	5.52	6.13	9.31	8.30
11	5.33	6.40	5.52	6.12	10.1	9.4
12	5.34	6.39	5.53	6.11	10.30	9.49
13	5.34	6.38	5.54	6.10	11.3	10.15
14	5.35	6.37	5.55	6.9	11.37	10.58
15	5.36	6.37	5.55	6.7	...	11.48
16	5.36	6.36	5.56	6.6	a.m. 12.20	a.m. ...
17	5.37	6.35	5.57	6.5	1.7	12.41
18	5.38	6.34	5.57	6.4	2.0	1.39
19	5.38	6.34	5.58	6.3	2.57	2.41
20	5.39	6.33	5.58	6.2	3.56	3.45
21	5.40	6.32	5.59	6.0	5.1	4.49
22	5.40	6.31	5.59	5.59	6.6	5.55
23	5.41	6.30	6.0	5.58	7.10	6.59
24	5.42	6.29	6.0	5.57	8.14	8.6
25	5.42	6.28	6.1	5.56	9.19	9.14
26	5.43	6.27	6.1	5.55	10.23	10.24
27	5.44	6.26	6.2	5.53	11.28	11.39
28	5.44	6.25	6.2	5.52	p.m. 12.35	p.m. 12.33
29	5.45	6.25	6.3	5.51	1.40	1.32
30			6.3	5.50		2.26
31			6.4	5.49		3.13

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

6 Feb.	○	Full Moon	6 11 a.m.
14 ,,	☽	Last Quarter	5 5 a.m.
21 ,,	●	New Moon	7 40 p.m.
28 ,,	☾	First Quarter	1 20 p.m.

Apogee 13th February, at 2 6 a.m.
Perigee 24th February, at 9 30 p.m.

An occultation of Eta Leons (magnitude 3·6) by the full moon will take place on the 7th at about 2·15 a.m. at Townsville and about 2·25 a.m. at Warwick. At the latter place its reappearance will occur about 10 minutes later; both disappearance and reappearance being on the upper edge of the Moon, somewhat to the right.

The elusive planet Mercury will be at its greatest distance east of the Sun (18 degrees) on the 9th.

An occulation of Nu Scorpii (magnitude 3·9) should occur at Warwick at about 12·45 a.m. on the 15th while the Moon is rather low down in the east.

Venus and Mars will be in proximity to one another, especially on the 14th and 15th, when seen about one and a-half hours before daybreak, above the eastern horizon.

Saturn will be two degrees north of the Moon at 5 a.m. on the 15th. An interesting spectacle will be formed by these bright objects an hour or two earlier in the east, before the sunlight dims the effect.

There will be an occultation of a small star in Sagittarius (Magnitude 4·8) in Southern Queensland, where it will be only just covered by the northern edge of the Moon, at about 2·45 a.m. on the 17th at Warwick.

Early risers on the 19th will find a pretty sight awaiting them; the crescent-shaped Moon and the beautiful star Venus will be displayed in juxtaposition well above the eastern horizon, about 24 degrees, or four times the length of the Southern Cross, south of east.

The conjunction of Mercury and the Moon on the 21st will be invisible on account of their nearness to the Sun.

Mercury, instead of passing directly between the Earth and the Sun on the 24th, will be three-and a half degrees below it, well avoiding a transit.

The Southern Cross will again be coming into view a good deal east of south during the evening hours, especially during the end of the month.

6 Mar.	○	Full Moon	9 26 p.m.
16 ,,	☽	Last Quarter	1 20 a.m.
22 ,,	●	New Moon	6 29 a.m.
28 ,,	☾	First Quarter	9 54 p.m.

Apogee 11th March, at 1 6 p.m.
Perigee 23rd March, at 8 36 p.m.

The occultation of Kappa Geminorum, a little before 7·30 p.m., will be obsevable at Cairns, and should form an interesting spectacle at Townsville, though the star will hardly disappear but skirt the upper edge of the Moon.

The occultation of Gamma Sagitarii should be observable at Brisbane, Warwick, and Toowoomba so soon after moonrise that it will be interesting to watch at these places for the reappearance of this star above the southern edge of the Moon.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Writing Australia's Name in the Skies—An Epic and a New Epoch.

LIEUTENANT BERT HINKLER'S lone-hand flight from Croydon (England) to Bundaberg represents to date the most remarkable achievement of man in his conquest of the air. Through it this young Queenslander has brought fame to his home city, to his native State, to Australia and the wide-flung British Commonwealth. With Hawker, Ross and Keith Smith, Bennett and Shiers, Parer and McIntosh, he has written the name of Australia across the skies. His single-handed aerial voyage around half the world's circumference constitutes an epic of pluck, determination, endurance, and mechanical genius. His great accomplishment marks the opening of a new epoch in the science of aerial navigation, and the passing of yet another stage along the course of human progress. Australia is proud of Lieutenant Hinkler, D.S.M. (who previously won high distinction as an airman in the Great War) as one of the greatest of her sons, not only for his magnificent feat, but for the characteristically Australian way in which he did it; for the way he tackled the job and carried it through; for his zeal and unflagging cheerfulness under every stress; for his modesty and level-headedness in the hour of triumph. Without any fuss he left England, alone, in his miniature machine, and kept on his journey from day to day, to time and plan, in the same steady, unostentatious way. The flight was not a stunt accompanied by merely lucky circumstance. It was a feat that without a combination of extraordinary coolness, courage, judgment, tenacity, and high mechanical skill would otherwise have been impossible.

When aerial development becomes a theme of history the share of young Australia in the promotion of aviation must make a remarkable chapter. It was an Australian—Hargreaves—who invented one of the first flying machines, now treasured as an exhibit in a German museum. In actual flying, we have the remarkable record of the Australian Flying Corps in every theatre of the Great War. Other Australians to bring honour to their country were Hawker, whose gallant attempt to fly across the Atlantic is not forgotten; Ross and Keith Smith and their two mechanics, Bennett and Shiers, who were the first to fly from England to Australia; Parer and McIntosh, who essayed the same feat successfully, coming through under every handicap and only after extraordinary adventures that called forth the highest degree of indomitableness, resourcefulness, pluck, and skill. Then there were also those other Australians—Douglas, Ross, Wilkins, Rendle, Williams, Potts, Howell, and Fraser—whose attempts to fly home from Europe, though they all ended in disaster, and some in tragedy, may be classed as splended failures that added greatly to our knowledge of aerial navigation; while at home in Australia we have already established great civil aerial transport services, excellently manned, that are proving one of our greatest developmental factors in inland settlement.

Australia then has reason to be proud of her achievements as a pioneer nation in aviation, and has still greater reason to be intensely proud of her youth whose magnificent flights have captured popular imagination, and of whom one of the greatest is Bert Hinkler, whom the world acclaims to-day, and whom we all delight to honour.

Hinkler's Flight—Its Practical Lesson.

APART from the thrill he has given us as a young Australian who, alone and unassisted, has covered 11,000 miles in a plane that with wings folded fits comfortably into an ordinary garage, the flight of Lieutenant Hinkler has a very practical side to it. Acting as his own navigator, pilot, and mechanic, and without any ground organisation, he has demonstrated the possibilities of a small plane for transport over long distances, and has proved that air travel may be cheaper than other means of voyaging. His outlay on the whole journey was only £57, while the actual flying time from England to Australia was just about six days. Allowing for the full time taken on the way—sixteen days—Hinkler has shown that communication with Britain can be brought within the compass of fourteen days. On the evidence of those facts it is easy to conjure up a vision of the future of aerial navigation. In a country like Australia, where conditions for flying are almost perfect, it is easy to imagine what a place aviation might have in internal development. From this point of view alone Lieutenant Hinkler has performed an inestimable service, not only to his own homeland, but to the whole world. For the moment, however, we like to think more of his achievement as one of the greatest sources of inspiration to the youth of Australia; while we know that in the records of the race his name will remain for all time.

Maize-Growing in Queensland—Southern Appreciation of Departmental Activities.

COMMENTING interestingly and informatively on the expansion of maize-growing in Queensland, the "Australasian" (Melbourne) had this to say in a recent issue:—

> The Department of Agriculture and Stock (Queensland) is doing everything possible to stimulate maize-growing, and farmers are appreciative of the encouragement they receive. Maize-breeding, which is one of its principal activities, is designed—(1) to improve the standard and type of Queensland-grown maize; (2) to increase the average yield and production on individual farms, and similarly of the State; (3) to produce varieties and types to suit the climatic conditions and soils common to different districts. The breeding and propagation of new strains of maize are carried on by the maize specialist of the department (Mr. C. J. McKeon), and strains of the standard varieties are grown under departmental supervision, and specially selected pure seed is distributed to farmers on application. Last season a flat rate of 11s. a bushel, including railage to the nearest railway station, was charged to enable applicants living at long distances to benefit. The use of good seed means bigger and better crops, and helps to reduce the cost of production. Extraordinarily high yields have been obtained from seed of high productivity, notably from T. O. Reid's Yellow Dent and Improved Yellow Dent, of which maximum yields of 116 and 117 bushels an acre respectively (five times the average yield of the State) have been secured under field conditions. Farmers are not slow to realise the value of such seed, which is absorbed long before the planting season arrives. Officers of the department regularly visit the various maize-growing centres, and keep in constant touch with farmers. They advise on all matters appertaining to the cultivation of the crop, and assist those engaged in the industry by every means in their power. A proposal to establish a maize board last year under the provisions of the Primary Producers' Organisation and Marketing Act was defeated. Of the 5,264 votes recorded, 1,924 (37.4 per cent.) were in the

affirmative, and 3,225 (62.6 per cent.) were in the negative. This indicates that the majority of growers are opposed to Government control, although they are not unmindful of what is being done to advance their interests. The Department of Agriculture is performing work of the greatest significance, and its activities are an important factor, not only in expanding maize-growing, but also in placing the industry and the subsidiary industries on a more satisfactory footing, and assuring the prosperity of those engaged in them.

No crop is more easily and rapidly improved by selection and breeding than maize, and the best variety for any locality can be determined only by local variety tests. Such tests have been conducted in many countries in the United States of America through the effort of the local organisations in co-operation with the State Experiment Stations. The number of samples tested in sixteen counties in Iowa was 1,478, of which one-tenth giving the highest yields averaged 62 bushels an acre, while one-tenth giving the lowest yields averaged 44.5 bushels an acre, or only about two-thirds as much as the best yielding samples. Over 100 samples of imported seed averaged less than nearly 1,000 samples of home-grown seed. The results show wide differences in yield, and emphasise the importance of the farmer selecting for his soil and locality the variety that will do best. Such selection will evidently made a great difference in the total yield of maize on a given area. In order to assist farmers in obtaining pure, pedigree seed, the Queensland Department of Agriculture and Stock, by arrangement with certain growers in the principal maize-producing districts, supplies them with selected seed, which is specially grown for the department under the supervision of its officers. These growers are located in isolated areas, where no other variety excepting the one in which they are specialising is grown near the crop, thus eliminating the risk of cross-fertilisation. The farms are periodically inspected, and the inspectors select seed for the following season's planting in the field, and that for sale from the crib. The growers are paid 1s. a bushel above the ruling top market rate on rails at their nearest railway station, and the fact that a number have been growing for the department for upwards of ten years proves that they are satisfied with the arrangement. Before the seed is distributed to farmers it is graded by the department, and the demand is so great that it has been impossible to supply all orders. Early in August stocks of early varieties were exhausted, although planting would not be general for another month. Last year there was sufficient seed to plant 2,000 acres, in addition to the departmental plots, of which there are approximately 200. New varieties are constantly being tried out in different districts to determine their suitability or otherwise for the conditions. This branch of the departmental activities is of the greatest benefit to farmers, as it enables them to secure the best seed at a reasonable price, and to the State by the increased yields of grain and fodder resulting from its use.

Value of Scientific Research—The Futility of Expecting Salvation by Ballot.

GRADUALLY we were recognising that our fundamental problems were production and efficiency, and by those means to be able to send overseas our exportable surplus, and sell it in competition with the open markets of the world, declared Prime Minister Bruce, at Frankston, Victoria, recently. This recognition has grown throughout the world as the basis of the restoration of all nations to the condition of prosperity. Wool was the only commodity in the world for which the buyer sought out the seller. We had to sell in the best markets of the world, but we had run into trouble because in other commodities room for improvement in production methods was greatly to be desired. Science research was beginning to run down lines where we could hope for successful results. The sum of £650,000 had been set aside for the Council of Scientific Research, and of that amount £100,000 was being utilised for the purpose of training our own scientists. There were some people, who generally described themselves as sound, hard-headed business men, who criticised the spending of money in this way, but they merely condemned themselves.

We did not know what was a balanced ration for sheep. We did not know the mineral contents of our grasses, which explained why sheep transferred from one place to another did not thrive; but we were starting to investigate this problem. The reason it had not been done before was because we had such a wonderful country; it did not matter very much how we mismanaged, we got on very well. But we had passed that stage to-day. For years we slung our fruit into cases, and declared that any self-respecting community should be clamouring to buy it. We had sent our butter overseas, but our butter four years ago had brought 10s. a cwt. less than the New Zealand commodity, simply because we had never taken the trouble to keep up our reputation. All that was wanted was a little more vision on the part of the people and a greater recognition of our advantages. It was utter nonsense to look to Parliament for the salvation of the country.

Bureau of Sugar Experiment Stations.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

BY EDMUND JARVIS.

Keep the Ground Moving.

Continue to work the surface soil at intervals, where possible to do so, between the rows of young cane plants, especially when the surface is caked after rain; going as close to the stools and as deep as can be ventured without risk of material injury to feeding roots. Such treatment, in addition to checking the evaporation of moisture from the ground and promoting plant growth, often disturbs and brings within the reach of ants and other enemies a small percentage of first- and second-stage cane grubs.

A well known and very successful canegrower, recently living at Highleigh, succeeded in beating the grubs on his selection by carrying out systematically the cultural methods advocated above. Although his land and that of his neighbour was of poor quality he was always able to produce a fine stand of healthy cane, while at the same time that of his adjoining neighbour (only eight feet away, on the other side of the dividing fence) was seen to be stunted and falling over as the result of grub injury.

He told me he used very little manure, and attributed his success entirely to cultural methods. Not having too much land, he was able to work it intensively, and keep the soil in well worked condition at all times.

Caterpillars Eating Cane Leaves.

During this month one is likely to meet with infestations of the so-called "Leaf-eating Grass-worm" (*Laphygma exempta* Walk.) which occasionally strips the leaves of cane and maize plants.

This caterpillar is dark brown with three stripes on the back and one on each side pale yellow, the first body segment being brownish black with three white stripes. Head reddish brown, eyes lighter, and indistinctly mottled with yellow; a large V-shaped mark on face. Under surface of body light yellowish green, dotted with white or brownish on the area between legs and lower portion of sides of body. Length of caterpillar about 1 inch.

The first serious outbreak of this pest occurred at Meringa, during February, 1920, when the larvæ were noticed swarming in countless thousands over an area of about 100 acres planted to maize and sugar-cane. ("Queensland Agricultural Journal," Vol. XVI., pp. 276-280.) In cases where the cane is seen to be seriously injured, while the caterpillars are only about half grown, it is advisable to spray the leaves with arsenate of lead (2 lb. in 50 gallons of water). The swarm of advancing caterpillars can be checked by spraying herbage, &c., lying between them and the crop, with a solution consisting of arsenite of soda 1 lb., black sugar 8 lb., water 10 gallons. Fortunately, the species in question is normally well controlled naturally by various predaceous and parasitic insect enemies, chief of which is a small tachnid fly. (For additional control methods see Bull. No. 3, Second Edition, Revised, 1927, pp. 40-42.)

Plant Lice Attacking Cane Leaves.

Many growers are familiar with the appearance of the common cane aphis, a small, soft, yellowish-green insect, which sometimes congregates in great numbers on the under sides of the lower leaves, and more rarely upon the heart-leaves. Such occurrence generally remains unnoticed until such time as the aphides increase sufficiently to favour development of a black fungus, known as fumagine, which grows upon a sweet secretion scattered over the surface of the leaves by these insects while feeding. As a general rule, aphide attack of cane leaves seldom assumes serious proportions unless the heart-leaves become affected. In such cases it becomes advisable at times to spray the stools with tobacco water (1 lb. to about four gallons of water); steep the tobacco in the hot water and apply while warm.

"Mealy Bug" of Sugar-cane.

These pinkish plump soft-bodied insects, which appear to have been dusted over with flour, occur quite commonly at times amongst standing cane. Upon pulling back the older leaf-sheaths, specimens of all sizes (from one thirty-second to three sixteenths of an inch long) can often be noticed clustering together more or less numerously around the nodes of the sticks. Although kept well in check by various natural enemies, this pest may very easily be introduced into clean plantations by means of infested seed; seeing that portions of the leaf-sheath frequently adhere to cane sets, thus serving to harbour numerous specimens of the tiny larval forms of this mealy bug. By soaking such seed cane in water of ordinary temperature for seventy-two hours before planting, these insects, together with borers, &c., are destroyed, while germination of the cane is stimulated.

How to Combat Cane Hoppers.

Leaf hoppers, or frog hoppers, as they are sometimes termed, are usually of small size (seldom exceeding half an inch in length), and when resting on the leaves may be recognised by their slender wedge-like form, the head end being broadly rounded in front with prominent eyes, and the body tapering towards the end of the folded wing cases. Most of the species, when touched or alarmed, hop with agility to a considerable distance, while others (the larger species) will often seek to evade notice by quietly slipping out of sight, with curious sidling motion behind some leaf or stem.

Many are prettily marked by red, green, or brown stripes, spots, or blotches; such colours being in some cases protective, by harmonising in shade or tint with the surrounding leaves, bark, or twigs, &c.

When chancing to be present in great numbers these insects injure the cane by continuous puncturing of the leaves and feeding on the plant juices.

Control of the nymphal stages, when the wings are in a rudimentary condition, can generally be effected by spraying with kerosene emulsion (10 per cent. strength), with tobacco water, or with strong soap emulsion. The adult winged hoppers should be captured at night time on tarred screens, carried—together with a bright lamp—between the infested rows of cane; the leaves being gently shaken while passing along to disturb the hoppers, which, flying out towards the light, will stick in thousands to the prepared surface.

For fuller information regarding leaf hoppers and their control the reader is referred to my Progress Report for January to February, 1928, published in this month's (March) issue of the "Queensland Agricultural Journal," and "Australian Sugar Journal."

Look Out for Leaf-eating Caterpillars.

The "Army Worm" (*Cirphis unipuncta* Haw. and *C. loreyi* Dup.), and "Grass-worms or Caterpillars" (*Laphygma exempta* Walk. and *Mocis frugalis* Fab.) cause more or less damage this month to young leaves of maize, sugar-cane, and other plants. For descriptions of these caterpillars, remedial measures, &c., see "Queensland Agricultural Journal," Vol. XXVII., pp. 275, 276; and Vol. XXVIII., p. 442.

Ordinary outbreaks can usually be controlled by spraying the leaves with lead arsenate, in such manner as to form a poisoned strip or band of about two or three cane rows wide immediately in front of the line of advance. Use 2 lb. lead arsenate in about 50 gallons of water, taking care to keep the mixture well agitated while spraying it over the leaves, in order to ensure and maintain uniform suspension of this arsenical matter in the water. In cases of scattered infestation spray the area affected.

CAIRNS CANE AREAS.

Mr. N. L. Kelly, Assistant to Pathologist, has made the following report (25*th January*, 1928) *to the Director of Sugar Experiment Stations on the Cairns cane areas:—*

In a brief survey of the Freshwater area, I found that Leaf Scald is showing up extensively on practically every farm visited, and is to be suspected on those two on which it was not seen because of the past history of their stock and of the different growing conditions. With another fortnight of dry weather every diseased farm should show some phase of the disease. This, the only major cane disease in the district, can only be dealt with efficiently in one way—by the introduction of clean N.G. 15 (Badila) and the use of this by the farmer to plant up a nursery plot or even his whole farm, and at the same time by the more or less speedy elimination of his present infected stock.

It is well known that the girth of Badila is not what it used to be, and it may be that, besides bringing in entirely healthy cane, a reinvigorated stock may be introduced.

With the secretary of the Cairns Cane Growers' Executive (Mr. Curlewis), the cane inspector of the Mulgrave Mill, and others, I proceeded to the Tableland to investigate the possibilities of the area for plant purposes.

The cane already growing there is well separated, and the farmers for the most part are keen, both of which are distinctly advantageous; but, while the N.G. 15 inspected appeared healthy, its past history makes it unwise to recommend it for planting, except after more frequent visits by a Pathologist.

A supplementary scheme which is entirely safe is to bring to the Tableland about 10 to 20 tons of cane from a well-kept farm in the nearest clean and well-controlled district (the Herbert River), and to keep this under observation until it can be sent down to the Leaf Scald areas nearby.

Several farmers on the Tableland have shown their readiness to fall in with this scheme, and Mr. Curlewis assures me it will have the whole-hearted support of many members of his association. The idea is, of course, for every farmer to participate; which they doubtless will do when they see the advantages to be gained by themselves severally and collectively. Seven Tableland farms were inspected, two of which had diseased Mahona. A few other farmers were interviewed. All farmers in the Malanda-Atherton area who are growing cane should notify the secretary of the Cairns Cane Growers' Association or this Bureau, so that the scheme may be properly controlled.

Top Rot is quite extensive in the Freshwater area. As many farmers as possible were shown the symptoms of this disease. It is pleasing to record that the majority were familiar with it. No control measures can be given for this minor disease until after the Pathological Laboratory has been established.

Quite a number of farmers are still growing maize near their cane. Apart from the fact that cowpea or some other leguminous crop is a better green manure, it must be repeated that the maize was in nearly every case found to be infected with Mosaic disease, and infested by its carrier the Corn Aphis. Prevention is better than cure, and farmers should not grow maize within a furlong of cane.

CANE DISEASES IN QUEENSLAND IN 1927.

By E. J. FERGUSON WOOD, B.Sc.

This report is intended to give the results of the inspection of the cane districts of Queensland, made during the year 1927, and to emphasise more fully certain comments made in my report published in the Annual Report of the Bureau. In my monthly reports, the diseases were discussed under the heading of districts, and as few diseases are confined to one district, a considerable amount of repetition was involved, for farmers are not usually interested in areas outside their own immediate vicinity. I shall give a brief description of the symptoms, control, and distribution of the diseases, for I feel that some such record is necessary, especially as the Pathological staff is to be increased and reorganised. It is intended to conclude with a discussion of the varieties, their relation to soil, climate, and disease, as far as observations will permit.

I.—GENERAL POSITION.

Queensland, as a whole, has no characteristic disease such as the Mosaic of Louisiana, but the various districts have their own diseases which probably cause as great a loss as the serious epidemics of other canegrowing countries. These local epidemics are severe in the affected areas, but do not extend over the whole State. This is fortunate for Queensland, as it follows that it is possible to confine these epidemics. Moreover, the scattered centres of production give us natural quarantine areas. I suggest that this matter of district quarantine be given first consideration when the staff is complete and in full working order.

Our first need then is a rigorous quarantine between districts whereby no plants can be sent from one district to another, except through some farmers' association, and after inspection by an officer of the Bureau. It is generally considered amongst farmers that change of soil appears to increase the vitality of cane plants, but farmers are afraid to get plants from outside, owing to the fear of introducing disease, and the pathologists in the past have rightly discouraged the practice. With an efficient quarantine this exchange would be possible, and in many cases of great benefit, especially in the case of districts such as Bundaberg or Babinda, where no field can be guaranteed free of disease, and where clean plants would be the greatest boon. The farmers could follow the example of the Cairns canegrowers, who have decided to keep a nursery of clean cane on the Atherton Tableland, from which they can buy as they require plants. This nursery is to be supervised by officers of the Bureau, and should provide a store of clean seed cane of known ancestry. With this end in view, I have kept a lookout for suitable places for nurseries, far enough from canegrowing centres, to enable us to hold reasonable hopes that clean cane introduced thereto will not become contaminated. This is the first step in a general direction of improving the varieties by selection and supervision. A visit was made to the Warren State Farm, near Rockhampton, but the climatic conditions appeared unsuitable for the purpose.

The sugar-growing districts of the State divide themselves naturally into well-marked quarantine divisions, as follow:—

(1) Beenleigh to Maryborough.—Here occur Fiji Disease, Mosaic, and Gumming. No Iliau or Leaf Stripe have been seen in these districts. They are already under strict quarantine for Fiji disease.

(2) Bundaberg and Childers.—Fiji disease has lately been reported at Bundaberg. Gum is epidemic there and is bad at Childers. Iliau occurs in both places, and Leaf Stripe at Bundaberg. Little Red Rot is known, but Mosaic is prevalent.

(3) Mackay, Sarina, and Proserpine.—Red Rot and Mosaic are serious. Leaf Stripe and Gumming are present but very slight. No Iliau is known. Leaf Scald is on three farms at Proserpine.

(4) Ayr and Giru.—Leaf Stripe and Mosaic predominate. Gum and Leaf Scald were not seen. Red Rot is very unimportant. Top Rot is serious.

(5) Ingham.—Gumming seems under control, but the weather may influence this. Leaf Scald, Mosaic, and Leaf Stripe are very slight and restricted.

(6) Innisfail, Tully, and Babinda.—Leaf Scald bad. No Mosaic, Gumming, or Leaf Stripe seen. Spindle Top is bad.

(7) Cairns.—Leaf Scald serious; Mosaic, Gumming, and Leaf Stripe present. Will (with sufficient control measures) be merged into the Innisfail area. Top Rot is very bad again here.

(8) Mossman.—Leaf Scald and Leaf Stripe present. No Gum seen and only one stool of Mosaic, but more are suspected.

This list will show the possibility of introducing new diseases into each area along with imported plants, and illustrates the need for some supervision.

II.—DISEASES AND FARMING OPERATIONS.

Few farmers realise the bearing of their operations on diseases. The careless farmer has almost invariably the most disease, and this stands to reason.

1. Preliminary Cultivation.

Ploughing Out and Replanting Immediately.—A large proportion of farmers often do this, which is very injurious for the following reasons:—

(i.) Improper and insufficient cultivation. The soil is insufficiently aerated, becomes the harbour for harmful bacteria and fungi, and for plant poisons, and inhibits the growth of cane. The crop falls off, ratoons become light and less in number, grass and weeds get in and harbour rats and pests and weaken the cane, rendering it more susceptible to disease.

(ii.) Stools from the old crop volunteer, and often these are diseased and carry the trouble over to a plant crop which has possibly been carefully selected, thus rendering somewhat valueless a good piece of work. I have seen farmers actually planting between the old rows which they intended to get rid of later. The old rows were full of disease, which would be transmitted to the plant cane, and the result would be alarming.

(iii.) It tends to perpetuate the occurrence of harmful organisms which would be killed by proper cultivation and fallowing. An instance of this is the Iliau fungus, of which the fruits or spores, as they are called, are killed by the action of sunlight.

2. Green Manuring.

This practice, besides giving the land a rest and a chance of cultivation, restores humus to the ground, alters the soil acidity, and checks the growth of harmful organisms which can only exist on cane and the grasses. By preventing grasses from growing on the field, it checks the diseases which occur on them and which spread to the cane. Such are some of the root diseases and possibly Top Rot. Its value in the case of Root Fungi is great, and it is thought probable that it will have an important bearing on the control of Red Rot. At least, farms which had been green manured in the Mackay district seemed most free from the disease.

3. The Plant.

Plant selection is the most important part of canegrowing, and on it depend—

(*a*) The health of the plant. Diseased canes will, in the case of most diseases, invariably give rise to diseased stools and carry the infection into the fields in which they are planted. This is the way in which new fields become infected, though sometimes secondary infection plays an important part.

(*b*) The vitality of the plant. It seems a rule in Queensland that stock are bred from the best parents, cane from the worst. Farmers fail to see the analogy, and will cut for plants, cane which is too poor to mill. The result after generations is a weak cane of low vitality, subject to disease. It is said that the cane is running out and becoming susceptible to disease, and the Stations are asked for new varieties. What is required, however, is discrimination on the part of the farmer, and it is his everyday job to look after the varieties which he grows. The selection of a clean seed plot should be the aim of every farmer. Most farmers will complain bitterly that they are nearly ruined by diseases, but few of them can tell of any steps they have taken to improve their position.

The procedure would be:—

(i.) Select the best sticks from the best stools and plant them in a plot;

(ii.) From this plot, plant up a paddock as seed cane for next year, choosing the best canes again for a subsequent plot similar to plot (i.). This process repeated from year to year would at least keep the variety up to the standard, and possibly improve it. The expense and time would be little, and the benefits great. New strains could be introduced (under supervision) and treated in the same manner.

4. Planting.

There are two methods employed—

(*a*) Cutting up the plants in the field from which they are to be taken, and planting them by hand or by a planter. This is the correct method, as it gives the farmer a chance to examine the plant. It causes increased handling which enables gumming or borer to be the more easily detected. Many diseases and pests can be recognised by examining the ends of the cuttings, and Gum and Red Rot are most easily detected in this way, whereas if the plants are taken by

(*b*) Whole sticks, thrown straight into the drills, and cut up therein, the chance of detection of disease is small.

In areas where gumming is present, canes should never be planted without being left overnight covered with a moist bag in order to sweat out the gum, so that the gummed sets may be discarded.

By this second method also, the cane is planted end to end, and I hold the opinion that some of our diseases caused by weak parasites gain a strong hold in this way, through too close planting; the root system becomes cramped and insufficient, some of the canes smothered, and susceptible to parasites; too close planting seems to have some bearing on Spindle Top though no definite data are available.

5. After Cultivation.

This is the time for reducing disease infection. During the period while the cane is able to be cultivated, most of the diseases can be recognised, and farmers can easily dig out diseased stools in fields of which the plants have been selected. One method is by carrying a hoe on the cultivator, and the other (more certain) is to give up so much time every day to walking over a field row for row and digging out the stools. In this way several farmers I have met have rid themselves entirely of serious outbreaks of disease. If this practice is repeated in the ratoon crops the field can soon be cleaned up.

6. Harvesting.

It is a good plan to have a kerosene tin of some disinfectant placed near the barracks in cutting time and to have the cutters place their knives therein every night, or when moving from one field to another. It is an inexpensive way to minimise knife infection. Disease is often carried in this way from an old diseased block to a young selected block, and may throw back the work of months in selection and digging out by reinfecting a healthy field.

7. Trash.

Burning trash is only recommended where a disease such as Spindle Top or Red Rot or some bad root rot is present. In such cases the fungus can live over on the trash until the canes are ready for reinfection, and this is one of the important modes of spreading such diseases. In other cases trash restores humus, and is a help to the soil.

8. Disinfection of Plants.

No work has been done on this in Queensland, but it seems probable that it would be of benefit in disease control work in the case of external fungi. Sprindle Top might be somewhat checked in this way, but no definite information can be given.

III.—DISEASES, THEIR SYMPTOMS, DISTRIBUTION, AND CONTROL.

MOSAIC.

The symptoms of this disease are—

(1) Leaf Symptoms.—An irregular mottling of the leaf in shades of green, some lighter and some darker than normal. The mottling tends to run parallel with the length of the leaf, and varies to some extent according to the variety. Q. 813 shows a marked yellowing; Clark's Seedling (H.Q. 426) shows a green and cream mottling, and B. 208 a dark green mottling on a creamy white ground in severe cases. Black Innis, M. 1900 Seedling, H.Q. 285, Badila, the E.K. canes, &c., have light and dark green markings.

(2) Stem Symptoms.—The stem is frequently mottled with white stripes against the natural colour. In severe cases these become shrunken, and the stem is corrugated, and finally cracks. It is usually thinner than the normal canes and is always much lighter in weight. In Q. 813, Q. 970, and Malagache, the stunting of the stool is very conspicuous, and often a stool of Q. 813 which is infected dies. This shows an important fact. A distinction between resistance and tolerance must be made. A resistant cane such as Q. 813 does not readily take on the disease, while a susceptible cane such as Shahjahanpur No. 10 may be 100 per cent. infected wherever found. Now Shahjahanpur No. 10 is very tolerant to the disease, and though it loses in weight, it never appears to succumb to Mosaic. On the other hand Q. 813 does die, and is always badly stunted. It is therefore resistant but intolerant. From the disease control point of view it is resistance that matters and not tolerance; in fact, intolerance is a virtue in that the cane by dying removes a centre of infection. This aspect has been treated in my report on the Nambour and Beenleigh districts.

Transmission.

(1) Primary, by plants. This is a most important way of carrying the disease from one field to another. Every diseased plant produces a Mosaic stool.

(2) Secondary, by insects. There is one known vector, *Aphis maidis*, which, however, does not seem to be sufficiently abundant to carry the disease as it is spread in Queensland. The Leaf Hopper (*Perkinsiella saccharicida*) has been suspected, but no proof obtained. It appears, however, in great abundance when the disease is spreading rapidly, and this spread seems periodic. I inspected one farm, and found two stools per chain in a certain field adjacent to some Shahjahanpur No. 10, and on a subsequent inspection found fifteen stools in the same distance. One inspection took place in March, the next in June.

Control.

(1) Seed selection. This, of course, combats the primary infection.

(2) Digging out, in young plant and ratoon, less than 5 per cent. infected; in cases of higher infection this process does not pay.

(3) Resistant varieties become the only resource in severe cases, and selection follows. Uba is immune to the disease, but has a disease of the Mosaic type. This, however, has never been reported from Australia. Q. 813 is highly resistant but intolerant; it is a good cane to plant where Mosaic is bad. Badila is also resistant. P.O.J. 2714 is reported resistant, but as it is almost a new cane in Australia, it has not been tested here as yet. M. 1900 Seedling, D. 1135, H.Q. 285, the E.K. canes, H.Q. 426, Pompey, Q. 970 are susceptible; B. 147, B. 156, and M. 189 (Black Innis) are highly susceptible; and B. 208, N.G. 47, and Shahjahanpur 10 are still more highly susceptible to the disease.

Distribution.

Mosaic is very prevalent in the south of Queensland as far as Giru; north of Townsville it becomes insignificant. None was seen at Tully, Innisfail, or Babinda; one stool at Ingham, one at Mossman, and a few fields (including the canes Shahjahanpur 10, B. 156, and H. 109) badly infested in the Cairns district. These were duly reported in my report on these canes.

Effect of Corn.

Little corn is grown in canefields north of Mackay, and this is noteworthy when we consider the distribution of the disease. At Ayr and Giru, B. 208, a highly susceptible variety, is grown. In the North, too, the disease does not seem to spread rapidly, and both the corn aphis and the leaf hopper are seldom seen. The introduction of corn (which is taking place in North Queensland) is a dangerous step, and should not occur without careful consideration.

Districts Affected.

Ayr and Giru.—B. 208 is the main variety affected, and infected fields should be ploughed out. It is feared that the disease will spread to H.Q. 426 and E.K. 28, which would be serious. On one farm at Home Hill some Badila was seen seriously affected, and this variety is usually considered resistant. The cause was some badly infected sorghum which had been growing wild since the field had had a crop of B. 208. Some years ago sorghum grown near B. 208 was almost invariably infected.

Proserpine.—Mosaic is very restricted here, and occurs in M. 1900 Seedling and M. 189. Digging out of stools will control the disease here.

Mackay.—Mosaic occurs on every area to a slight extent, but around Farleigh, at Mount Jukes, Habana, Finch Hatton, Netherdale, and Gargett it is serious, and also in parts of the Sarina area. The freest seems to be the Homebush area, judging by the farms visited, and the Carmila and Flaggy Rock end is almost clean. The same applies to Hampden. The canes infected include Shahjahanpur 10 wherever grown, M. 189 in some areas, B. 208, H.Q. 426, E.K. 1, Malagache, M. 1900 Seedling, D. 1135, &c. M. 189 shows itself very susceptible as usual. E.K. 28 and Malagache do not show serious infection as a whole, which is probably due to the fact that the plants have never been contaminated, as they are fairly susceptible varieties. Q. 813 as usual shows high resistance. The Cane Growers' Association in Mackay seems alive to the situation, and is warning the farmers, who are taking suitable measures. It is hoped that by continued diligence, the disease will be overcome without very much effort or expense. Great assistance was received from this body, who are very progressive.

Bundaberg.—Every farm visited in this area was infected with Mosaic to some extent. All the river farms are seriously affected with the disease, and their tonnages must suffer very greatly. The disease is more serious here than elsewhere in Queensland, except perhaps at Bauple. Moreover, the farmers do not seem to be alive to the seriousness of the position. H.Q. 285, M. 1900 Seedling, and M. 189 are the principal canes affected, and Shahjahanpur 10 is affected wherever it is grown. The infection of the two early maturing canes, H.Q. 285 and M. 189, is serious, especially as on the river farms it is almost impossible to cultivate and get rid of the wild sorghum and susceptible grasses, owing to the sodden nature of the ground for months during the wet season and autumn. These grasses carry the disease over to the cane, and lower the prospects of successful control. Q. 813 is strongly recommended for these badly-infected river farms. It is the only safe resistant variety at present in the area, if we exclude Uba which is so objectionable for other reasons.

The red soil farms are on the whole better off, but none the less they require to clean up their farms by seed selection, rogueing, and the use, where possible, of resistant varieties.

Childers.—The position here is similar to that on the red soils at Bundaberg, and Shahjahanpur 10, M. 1900 Seedling, D. 1135, H.Q. 285, M. 55, Rappoe, and Striped Singapore are affected; Q. 813, where it is grown, is resistant, though not immune. The elimination of Shahjahanpur 10 and selection and rogueing are the measures recommended. There is a great deal of wild sorghum growing in the creeks, and this should be dealt with. Too much corn is grown for safety, and the same applies to a greater extent to Bundaberg.

Maryborough.—The disease here and at Pialba is due to the persistance of the farmers in growing Shahjahanpur 10, which they do, despite all recommendations. M. 1900 Seedling, D. 1135, H.Q. 285, M. 189, and Petite Senneville are all affected; efficient selection and digging out are the measures recommended. Shahjahanpur 10 should be immediately ploughed out.

Bauple and Yerra.—The situation at Yerra is very similar to that at Pialba, but that at Bauple is much more serious. Farms show as much as 92 per cent. infection in first ratoons. Shahjahanpur 10, M. 1900 Seedling, D. 1135 are seriously affected, while Q. 813 is slightly so, and shows the marked resistance which characterises it. Farmers with highly-infected fields have been selling cane for plants, and have caused serious infection in other farms. It is hoped that with the gazetting of Mosaic as a disease under the Diseases in Plants Act this practice will be stopped.

Nambour.—Corn and cane are grown together on nearly every farm, and the result is a heavy Mosaic infection. Most farmers disregard the disease, and continue to plant cane without discrimination. I have often seen in this area fields of plant cane badly infected with Mosaic. In such cases as this the farmers deserve the diseases that they so deliberately conserve. M. 1900 Seedling, D. 1135, H.Q. 285, Q. 1098, and M. 189 are commonly infected.

Beenleigh.—Corn is the bane of the industry here also, and Green Baruma—known locally as "Green New Guinea" or "Green Goru"—is often 100 per cent. infected. Purple Top (N.G. 64) is almost as bad. M. 189, D. 1135, M. 1900 Seedling are also affected. The planting of Q. 813 to resist Fiji disease is expected to aid in the solution of the Mosaic problem.

Other Grasses Affected.

As cane is a member of the grass family, it is not surprising that it suffers from the same diseases as other grasses. This is especially the case with the Mosaic family, and we find that cane Mosaic is easily transmissible to grasses, and that the disease can be returned to the cane. The grasses in Queensland which are especially bad from this point of view are Wild Sorghum, Summer Grass, Johnstone Grass, Guinea grass, and, also, among the cultivated crops Sorghum, Imphee, and Corn. Wherever these grasses are present in a cane district we find that Mosaic is very prevalent. Corn is rarely free from Mosaic, and is therefore very dangerous. At Bauple I observed the corn aphis (*Aphis maidis*) on corn and on wild sorghum, and the nearby cane was seriously affected. This is only one instance of many that I could quote.

GUMMING.

This disease, of which the practical control is perhaps as hard as that of any disease affecting cane, is widespread in the areas south of Rockhampton. It occurs to a diminishing extent at Aloomba, and has been seen to a slight extent in Mackay, but a quick control can be effected in these areas by eradication of the diseased fields. Bundaberg has suffered severely this year, and the farmers at Nambour, Beenleigh, and (to a less extent) Maryborough are warned to look to the future and attempt to control the trouble before it reaches such proportions.

It is caused by bacteria (*Bacillus vascularum* Cobb. Greig Smith), and the only definite symptom is the oozing of a bright yellow gum from the cut ends of the cane. The vascular bundles or fibres of the canes are usually red (crimson coloured). These are the stem symptoms. The leaf symptoms are apparent, but not characteristic enough to enable the determination of the disease without the oozing of the gum. At times, however, the gum cannot be obtained from plants which are known to be diseased.

The leaf symptoms are in some cases a yellowish streak lined with red dots running obliquely. Patches within the yellow strip often die and wither. When the disease is bad, as in December, 1927, at Bundaberg and Nambour, the young plant and ratoons, and also some of the standover cane, show whitish leaves, the white shading gradually into the green towards the base of the leaf. In the case of plant cane, the cutting of the plant itself will show the gum. This white leaf stage is very similar to a stage in Leaf Scald known as the chronic stage.

Gumming is transmitted in the following ways:—

By plants.—A plant from a gummed field must be presumed to be gummed, and will probably show the disease sooner or later. In some cases weather conditions inhibit the disease, and it may not show up for several generations.

By knife infection.—Cutting diseased cane will infect the knife, and as the bacteria are so minute, it becomes easy to carry them on dirty knives to clean fields. Knives should therefore be disinfected after cutting diseased cane. Farm implements and horses can also carry the disease if they pick up the juice of a gummed stool.

Mr. North, of the Colonial Sugar Refining Company, puts forth the theory that the disease can be transmitted by windblown rain, and by insects which suck cane leaves on which the gum is exuding with wet weather. By sucking injured portions of healthy plants they can, he thinks, carry the disease.

This probably accounts for the fact that the disease usually occurs during a dry spell following wet weather. The wet would be necessary for the transmission of the disease through the field, and the drought be necessary for the bacteria to obtain ascendancy over the plant.

The control of the disease where it is bad is based on resistant varieties, as owing to the elusive nature of the disease rogueing is of little importance in epidemics. With these varieties seed selection should be practised, and the plants sweated under a bag overnight, and the gummed ones discarded before planting. Of the resistant canes, Q. 813 is a known resister in Queensland, and Uba also seems resistant. B. 147 and H. 227 are thought to be resistant, but very susceptible to Mosaic, and the former cane, at any rate, to Leaf Stripe. On the Herbert River the resisters are Q. 813, Korpi, Oramboo, and Nanemo or "Bogela"—these last two being considered identical. These canes have been introduced into Bundaberg together with some South Johnstone seedlings for trial, and S.C. 12 (4), a cane which is reputed resistant. The Coimbatore seedlings are also to be tried out for resistance. Two show some promise. In the southern areas Badila, M. 1900 Seedling, D. 1135, M. 189 (Black Innis), H. 109, and Q. 970 are very susceptible, and in the North H.Q. 426 is worst infected, while Badila shows some measure of resistance. This is a peculiarity of varietal resistance to disease, which is not easily understood. It seems that locality has a big bearing on this factor. M. 55 has been suggested as resistant in Childers, but confirmation of this is required.

Much research work has been carried out on gumming, but only lately have we had any light thrown on the problem, and the control measures are comparatively new. It is suspected that varietal resistance declines after a cane has been in contact with the disease for some time. I do not know any variety which could be classed as immune to gum—even cow cane suffers.

Extent of the Disease.

The trouble is very prevalent in the southern districts, but was seen to a very limited extent in Mackay, on one farm in H. 109 at Aloomba (Cairns district), and on the Herbert River. This latter district was very badly gummed some years ago, but little was seen during my visit. Weather conditions may have a bearing on this, but the rigid control measures of the C.S.R. Field staff have had a big effect. These are of a drastic nature, and H.Q. 426 is penalised heavily, and has almost disappeared.

In the Bundaberg district in 1927, the crushing rate of the mills was reduced by over 25 per cent., and this has meant a serious loss to both farmers and millers. Crops have been light, the amount of dead cane high, and the results of crushing bad, all due to Gumming. At present the position is not good. Q. 813 is recommended as a late maturing cane, but in the south cannot be cut before the middle of September, or it will not ratoon. As an earlier cane H. 227 is recommended, and B. 147 might also be tried. This variety could be obtained from the Mulgrave area (Cairns district). Other resistant canes are being fostered at the Bundaberg Station, and it is hoped to prove their worth in the near future.

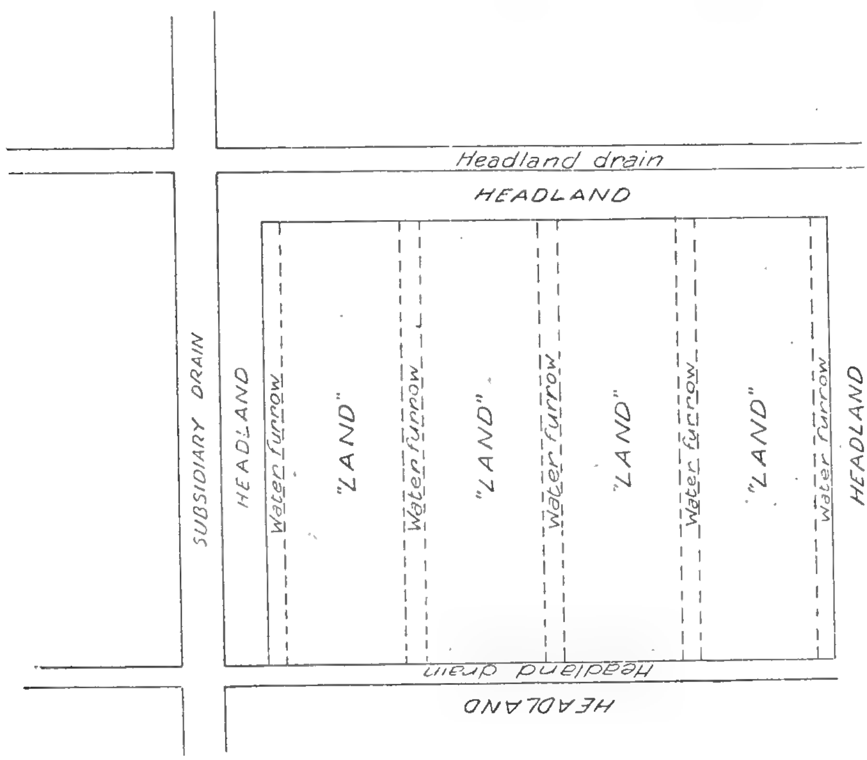
Gum was also showing up in Maryborough in February, in M. 1900 Seedling, D. 1135, Meera, &c., and the farmers there should take note of it, and have Q. 813 on their farms in case of an epidemic.

Nambour.—The position is regarded as serious, for gum is showing up badly, and has been all through the year. It only requires a season such as has been experienced at Bundaberg last year to cause an epidemic in the D. 1135, which is grown far too widely at Nambour. The badly-drained flats along the Maroochy River and at Coolum are worst infected. Q. 813 is proving its worth as a resister there, amongst those farms in which it is grown. It is the only resistant cane at present grown in the area, except Uba.

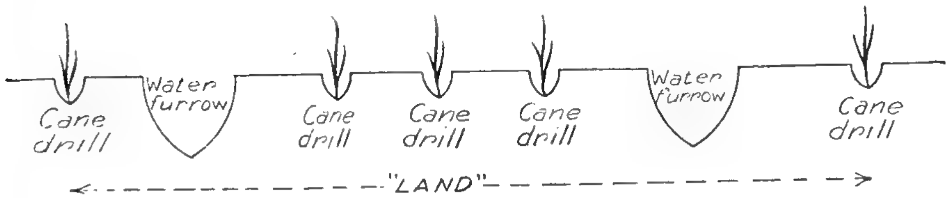
Beenleigh.—Here gum was observed widespread at the beginning of the year, but the substitution of Q. 813 for D. 1135 owing to Fiji disease, will, it is hoped, tend to decrease the infection.

Efficient drainage was found to be of great benefit to farms affected with Gumming on the Richmond River, and this is a feature seldom met with in Queensland. I suggest that an adequate system of main drains should be installed in gummed areas, wide enough to carry off the water that is drowning the farms, and that the farmers should endeavour to put in good subsidiary drains from each field. The method of draining the field is not expensive. The field on its last ploughing could be divided into lands by deep drills made at intervals of, say, a chain (or nearer if the soil is clayey or sour) by a swing plough with raised mouldboards. These lands between the water furrows would be planted in the ordinary way. Better still would be the ploughing into lands during the last ploughing, by a swing plough or disc starting from the centre of the land and working out to what is to be the water furrow, ploughing in a spiral or rather a series of spirals to give a series of lands. A series of field drains could be ploughed by the same means along the headlands at right angles to the lands, to take the water to the subsidiary drains. The size of the drains and their frequency would depend on the water to be removed, the fall of the land, &c., and would have to be determined by the farmer himself.

Tile drains are used on larger estates, but would be too expensive for the average farmer, and the land system forms a good substitute. The lands must be remodelled every time the field is ploughed and planted.



SECTION OF FIELD PLANTED IN "LANDS."



PLAN OF A DRAINED FIELD.

This would be modified, if necessary, to suit local conditions.

LEAF SCALD.

This is, in Queensland, essentially a disease of the tropical sugar areas, though it has been seen in Mahona in the Nambour district. It occurs again to a serious extent on the Northern Rivers of New South Wales.

It is, like Gumming, a bacterial disease, but unlike the former trouble, it does not depend to nearly the same extent on the weather, though it has a latent period, which makes detailed surveys on infected areas very difficult.

Symptoms.

The disease is, at times, very difficult to identify. Most characteristic are the leaf symptoms. The leaf in typical cases shows a white pencil line running obliquely from the midrib to the leaf edge. The line is of constant thickness, and at a later stage turns pinkish. It also spreads, and forms a white irregular streak, finally giving a chlorotic appearance similar to one stage of gumming, where the leaf is white for a good part of its length. The leaves, however, usually curl inwards at the top, and it is this peculiar curling which serves to reveal the disease to the practised eye. Sometimes the leaves appear scorched instead of white.

These white leaves indicate the chronic stage of the disease, and are, if the cane is large enough, accompanied by sideshooting from every joint. The side shoots bear the leaf symptoms.

In the acute stage, the cane dies without any symptoms other than the scorching and curling of the leaves. The side shoots may sprout and die immediately, and the only means of obtaining a definite identification is to search for suckers bearing the white pencil line. This phase is characteristic of H.Q. 426; Badila and Goru have both phases. Usually the fibres of the cane are tinged with crimson, especially at the nodes or joints and in the buds, but this feature may be absent in the acute phase.

The plants, on their emergence, may often be detected through the white leaves.

The control of the disease rests on the elimination of the most susceptible canes, H.Q. 426, Gorus, and Pompey (7 R. 428), and the careful selection and subsequent digging out of diseased stools in the plant and ratoon crops, in the young stages. D. 1135 and Q. 813 seem resistant in the North, and Badila and Nanemo seem rather susceptible. Badila seems susceptible but tolerant. Babinda, Innisfail, Tully, and Cairns are hot-beds of the disease, and few farms in this area could be declared clean. Badila is affected all over the country, and the only stocks of clean seed seem to be on the Atherton Tableland, where the Kairi State Farm, and the seed plot being planted by the Cairns Canegrowers' Association are among the places recommended for seed in the future.

The transmission of the disease occurs in several ways, as in Gumming:—

By Plants.—The disease is easier to identify, so that plant selection is also easier. The existence of a latent period is a difficulty.

By Cane Knives.—This is important in carrying the disease to new fields, and the knives need frequent disinfection.

The insect transmission has never been worked out, but the distribution seems certain, though not so important in North Queensland as is the case with gumming. The Linear Bug is here suggested as a possible carrier of the disease, and should be watched.

All types of soil seem to be affected alike, and the prevalence of the disease seems to depend on the resistance of the varieties grown, and the care of the farmer.

Districts Affected.

Proserpine.—Two farms were seen to show the disease at Conway, in Badila and H.Q. 426. The trouble was slight. Another farm at Proserpine itself was reported affected, but the block (Goru) had been ploughed out.

Mossman.—The disease here is serious in parts, especially the Saltwater and Whyanbeel ends, and around the Mossman and Little Mossman Rivers. The Mowbray area was, as far as could be seen, free from the disease, though Spindle Top is present on some farms. Badila, H.Q. 426, and, above all, Goru, are affected, and Pompey is affected where grown. Goru should not be planted in this area.

Cairns and Mulgrave.—This district, especially the Hambledon-Freshwater area, is badly affected. Badila is largely grown, and practically every field of this variety is diseased to some extent. Only on a few farms at Hambledon itself is there Badila that could be regarded as possibly safe to plant.

The Sawmill Pocket, Wright's Creek, Green Hills, and Highleigh areas are freest from the disease.

Babinda.—Every farm visited in this area, except one, had Leaf Scald in every field examined, and some fields were seriously affected, especially in the East Russell and Palma areas, and also in the Cucania-Harvey's Creek section. The losses here were considerable, and difficult to estimate. Exceedingly bad infection was observed in the Deeral-Fishery Creek section, in one case about 40 per cent.; and the loss through death of stools, &c., must have been nearly 25 per cent. of the crop. The difficulty is to get varieties to replace H.Q. 426, and Q. 813 is suggested, for it seems to do well if planted late.

Innisfail.—The position at Goondi is better than that at Mourilyan or at South Johnstone, though it is by no means good. Pompey does not seem a favourable cane to replace H.Q. 426 where Leaf Scald is present, as I can see little difference in their susceptibility. Daradgee, Garradunga, and Eubenangee are affected, and all the farms on the Johnstone River, especially the Innisfail Estate.

At Mourilyan, the whole area is affected, though the situation at Liverpool Creek seems better than it was a year ago, according to Mr. Kelly's reports and those of the farmers and cane inspectors. Seed selection has been practised with good results, and the cleaning of this area should be easy from now on.

South Johnstone is the worst affected area, and the disease is bad in all the sections examined. The Silkwood and Jeppoon branches are especially heavily infected. Badila, Pompey, Goru, and H.Q. 426 are all affected. Several badly diseased plant blocks were seen. This sort of thing is due to nothing but sheer negligence on the part of the farmers, most of whom do not seem to realise the seriousness of the trouble.

The infection extends through Jaffa, El Arish, and Maadi, to

The Tully Area.—Here the infection is widespread, though in most cases not so severe as that in the other districts. On several farms, however, the heaviest infection was seen. The main centre is at Midgenoo, and smaller centres are at Euramo, Lower Tully, the Leasehold areas, and at Feluga. It is reported that Midgenoo was the original source of the infected plant. The disease here is not so serious as in the areas farther north, and farmers have been urged to do all in their power to get rid of the disease.

Clean plants can be obtained, and with rigid selection and subsequent cleaning of fields the problem does not appear difficult.

FIJI DISEASE.

This serious cane disease has not long been discovered in Queensland, and areas are still being found infected. The symptoms are characteristic, and consist of leaf galls which run along the back of the leaf, and are invariably on a vein, and running parallel with the midrib. They do not show on the front surface of the leaf, and thus differ from the crinkles caused by damage to the tops which are so often seen in canefields. They may vary from one-eighth of an inch to about 1½ inches in length, and from one-thirty-secondth to one-sixteenth of an inch in diameter, and are light green or brown. They may be on the midrib or on the blade of the leaf, and are the one sure characteristic of the disease.

The stem is very stunted, though in the case of secondary infection the cane previously formed will mark the stage of infection. Infection always inhibits the growth very soon after the galls first appear. In secondary infection, the subsequent ratoons will be stunted and will die out. The leaves are dark-green in appearance and curl inwards much after the manner of Leaf Scald, though they are much deformed and stunted.

Methods of transmission have not been thoroughly worked out, but it is an invariable rule that a diseased cutting produces a diseased plant. Neither soil nor knives have been found to have any effect on the distribution.

Insects are thought to play a part, but our knowledge on this point is limited. The transmission seems possible over fairly large distances.

The control is based on plant selection, and in badly affected areas on resistant varieties. Digging out diseased stools is essential in lightly infected fields.

Distribution of the Disease.

Bundaberg.—The disease was only reported from here in December, and an investigation points to the fact that it is as yet light, and can be controlled by rogueing or digging out. Those concerned were warned of the seriousness of the disease, and have organised a campaign which should prove efficacious without more drastic measures. The infected cane was brought from the Northern Rivers—some before the war, and some in 1922. Field evidence points to the fact that the disease was introduced in the last batch of canes, and has spread to two other varieties, within recent times—soon after the importation.

Maryborough.—In this area the disease is severe in some sections, as was outlined in a report published earlier in the year, which it is unnecessary to recapitulate. The district was placed under strict quarantine, and all precautions taken to keep the disease within present limits. Control measures were outlined to the farmers, by circular, and the digging out of infected fields was suggested in severe cases; this was done on the worst affected farms, and Q. 813 and H.Q. 285 are being tried as resistant varieties. It is hoped in the near future to plant out some disease resistance trials.

The area affected is restricted to Maryborough, and, as far as is known, does not extend to Pialba or Yerra. Even in the infected area itself there are sections which are apparently clean.

Beenleigh.—Infection here is widespread, and practically every farm shows the disease. D. 1135 and M. 1900 Seedling are the principal varieties affected, but Q. 813 and H.Q. 285 are practically clean. For this reason they have been recommended to the farmers. The area was thoroughly inspected by Mr. W. Cottrell-Dormer and myself in the early part of the year, and Mr. Dormer published a full account of his investigation.

In the case of farmers suspecting the disease, it is very necessary that they should inform the Bureau as soon as possible, so that measures can be taken to prevent the disease from infecting other fields, for once it is established the disease spreads rapidly.

LEAF STRIPE.

A disease of fungal origin, this trouble is of a serious nature, though at present its distribution is restricted to a few farms, except in the case of the Mossman and Burdekin and Houghton Rivers, where the infection is general.

The symptoms are very similar to those of Mosaic to the casual observer, but they differ in the fact that the leaf stripes are more definite in outline, and correspond well to the description of the name. The stripes, too, are often yellowish, and they differ from Mosaic in the fact that they turn brown and bear on the back of the leaf a whitish down. This gives rise to the alternative name of Downy Mildew, bestowed on this disease. The white down is the fruiting portion of the casual fungus, and the fruits or spores as they are called are blown to other canes by the wind. At certain times of the year the stripes are not well defined, and the disease is easily mistaken for Mosaic unless the white down can be seen.

Sticks are affected by being elongated, and stand well above the surrounding healthy cane, this phase being sometimes known as "Jump Up." In these cases the leaves are sparse and narrow, and they often become shredded in severe cases.

Transmission occurs by means of plants from infected stools and by the wind-blown spores. Since these latter are very numerous on the backs of the leaves, and are very minute, they travel in a short time all over an infected block, and the infection spreads rapidly. Means of transmission by insects have been suggested by field observers, but their theories have not yet been tried out in Queensland. It is very easy, too, to carry the spores on tools and wearing apparel.

Control is effected by means of plant selection, and subsequent digging out, removing, and burning the diseased stools. Their destruction is essential, as the spores are outside the leaf and are not destroyed by the mere digging out of the stools.

The susceptible varieties include B. 208, B. 147, Q. 855, M. 189, D. 1135, 7 R. 428 (Pompey), Garvan's Black, Yellow Caledonia, H.Q. 274, and to a lesser extent Q. 813. Badila, Goru, and H.Q. 426 appear resistant on field evidence.

Distribution.

Bundaberg.—The disease has been observed in the Bingera area in Garvan's Black, M. 189, Yellow Caledonia, and H.Q. 274. It was seen also in plant cane, but is not at present causing serious damage, though it should not be disregarded. It is also on one farm on the Woongarra.

Mackay.—A few farms affected in this area require attention, and on one the infection is serious. Pompey, Cheribon, and D. 1135 are affected. Seriously affected fields should be ploughed out after cutting, and lighter infections rogued.

Mossman.—The Saltwater area and the Mossman River area are the main sources of the trouble, and B. 147, Q. 855, and D. 1135 are the principal canes affected. The introduction of Pompey into this area is dangerous owing to its susceptibility to the disease. The fields badly infected should be ploughed out, and B. 147 should be temporarily discarded in the affected area. Digging out should be practised in the farms where the infection is light.

Cairns.—Slight infection occurs at Sawmill Pocket on a few farms, and the varieties infected are D. 1135 and Pompey (7 R. 428). The farmers are planting up with clean H.Q. 426. Fortunately, the B. 147, which is a favourite variety in this area, does not seem to be affected so far.

Giru and the Burdekin River.—The infection here is of a serious order, and a majority of the farms visited were heavily infected. A great deal of B. 208 is grown, and this variety is one of the most susceptible to this disease. Few farms growing this cane are apparently clean, and in many cases the losses in this variety are severe. As this cane has elsewhere been wiped out through disease, there seems little hope of cleaning it up, so it appears essential that the cane should be replaced by less susceptible canes. Badila, H.Q. 426, and Goru do not show the infection to any extent; and their planting is advised. The trouble is that B. 208 is a cane with the highest c.c.s., and farmers are loth to realise that the fact that it is diseased and will not ratoon makes it really a more expensive variety to grow than the other canes such as Badila, and Clark's Seedling. I observed this factor in the Houghton area, and my idea was confirmed by a cane inspector.

One factor seems to be of importance in the Mossman district in restricting the distribution of the disease, and that is the fact that well over 99 per cent. of the cane sent to the mill is burnt. The fact that the disease does not spread as rapidly as we should expect from its mode of distribution is probably due to this fact. Not that I suggest the burning of trash as a control measure, for I believe that the other measures are sufficient in themselves.

RED ROT.

This disease has usually a minor importance, but which can, under certain conditions, be of the greatest importance. It is caused by a fungus (*Colletotrichum falcatum*) which is normally a very weak parasite, and lives on trash and decaying vegetable matter in the soil. At times, however, when soil conditions are poor and the climate is favourable, the disease assumes a virulent form, and can cause heavy losses to the crop in the district affected. It appears to be a difficult disease to eradicate, and our effective knowledge of it is very limited. Only extensive field experiment will give us the data we require to put forward adequate control measures. The first noticeable symptom is the dying-off of the top, very much as in the case of grub attack, though all the sticks in the stool do not necessarily die. Examination of the stem in severe cases will show that it is withered, especially at the base.

Internal Symptoms.

By cutting the stem lengthwise it is seen that the whole mass is reddish and fermented, but there are definite white pithy areas in the stem, surrounded by a darker red area. There are also greyish patches at the nodes. The white areas are the diagnostic character of the disease.

The fungus (*Colletotrichum falcatum*) is a weak parasite, and usually lives on the organic matter in the soil. It passes into the stem through injured parts, especially skin cracks. Inversion of the sugars takes place, the cane becomes light, the c.c.s. falls, and the juice is refractory. Many sticks die and so considerable losses in crop result, in severe attacks. The disease is usually in patches, and these are shown by a very fluctuating c.c.s.

Transmission.

The fungus is carried on trash, old cane, stools, &c., from crop to crop, and by plants from field to field.

Control.

No evidence concerning resistant varieties is available. Seed selection is necessary, but the main factor is the fallowing, fertilising, and cultivating of the infected fields, without which selection is useless.

Distribution.

The disease occurs slightly in many places, where it attracts little notice. In Mackay, especially at Sarina, the trouble has assumed epidemic proportions. Practically all the Sarina area is more or less affected with the disease, which attacks M. 189 (Black Innis), M. 1900 Seedling, H.Q. 426 (Clark's Seedling), E.K. 28, &c.

At Proserpine the disease occurs at Waterson and Glen Isla, and seems to be inclined to assume epidemic proportions. The soils should be analysed, and green manures planted wherever the disease is occurring.

A special report was published in July concerning Red Rot at Sarina, and suggested methods of control. They were summarised as follow:—

A. Never plant from any field which has suffered from Red Rot; and never allow anyone else to plant from your infected field.

B. (1) All trash and rubbish should be burnt, and the stools broken up.

(2) The addition of lime to the soil, preferably burnt lime, in order that the soil reaction may be upset with the hope that the fungus growth will be inhibited.

(3) The draining of low-lying pockets.

(4) The planting of green manure crops in order to add nitrogen and other elements to the soil, to smother weeds, and to assist the degradation of the old stools.

(5) The anlysis of the soil in order to find out what is lacking, and the restoration of the deficient elements to the soil in the shape of a correct fertiliser.

(6) The interval before replanting a diseased field should be as long as possible. If you have enough ground it will be well to let an infected field go out for some years. Plant your clean field with clean seed or you might as well leave it alone.

TOP ROT.

This disease is of a very insidious nature, thought by Mr. Tryon to be caused by a root fungus, and by Mr. Dormer to be caused by bacteria. I myself have isolated bacteria (not in pure culture) from the leaf streaks, but have not had time to confirm Mr. Dormer's innoculation experiments.

Symptoms.

The lower leaves of the young cane show a series of watery stripes which become chocolate or red in colour, and which run along the leaf parallel with the veinlets, usually from the leaf sheath up for about 6 to 8 inches or less. They occur on each side of the midrib, and are about one-eighth of an inch in breadth, though several stripes may fuse along their sides.

Later the cane may recover, and grow on as though nothing had happened, or the top may forthwith rot, and smell abominably.

On the Burdekin River Badila with four feet of cane is attacked, but the rot does not extend far down the stick below the joint attacked by the bacteria.

The disease occurs between the months of October and March, as a rule. In 1927 it occurred in the Red Streak stage in the Freshwater area in the middle of October—not before then. Many Burdekin farmers believe that it occurs after wet following a drought, and evidence there seemed to point in that diection, but it showed up in Freshwater in the young plant and ratoons during a very dry period, so that a modification of the idea is needed. The humidity of the atmosphere is greater in the Freshwater area than on the Burdekin, and humidity may be one of the controlling factors.

Badila is the principal cane affected, though the disease has been seen in M. 1900 Seedling, E.K. 28, Q. 813, B. 208, S.J.Q. 4, and slightly in Goru and H.Q. 426.

Distribution.

Beenleigh.—The disease was seen here in January, in D.1135, and the cane was recovering.

Nambour.—Suspicious streaks were observed in one or two stools of Q. 813. The identity of the disease in this case is doubtful.

Bundaberg.—Top Rot was seen in one stool of S.J.Q. 4 from Mackay. As Top Rot has not been noticed at Mackay for many years, this fact is interesting, but confirmation of data is required.

Burdekin River.—Here the infection of Badila is very bad, especially on both banks of the river. Much death and even 50 per cent. crop losses have been recorded. M. 1900 Seedling, E.K. 28, B. 208, and Q.813 have been affected, and to a less extent H.Q. 426 and the Gorus.

Herbert River.—Results of Top Rot were hard to distinguish from those of the flood damage this year, and no adequate idea of the infection was gained. The same applies to Giru, though a few cases of undoubted Top Rot were established.

Cairns.—Freshwater and Smithfield are the two areas worst affected, and the river farms are showing most. Badila is the one variety which the disease seems to attack, and the red streaks were plentiful on nearly every farm, in plants and ratoons. Even the red soil hillside farms were affected at Redlynch and the Gap. Wright's Creek, Hambledon, Highleigh, and Little Mulgrave, and all the areas down to Deeral showed the disease to some extent. It was more prevalent, however, on the alluvial flats than on the hillsides.

It must be confessed that the Top Rot problem is baffling at present, and there seems to be no relation between the infected plants and the spread of the disease, so that seed selection appears to be useless. Outbreaks in other areas seem to show that the bacteria are present in most sugar areas, and require merely certain conditions to develop.

SPINDLE TOP, NEEDLE TOP, OR PINK SCLEROTIAL LEAF SHEATH DISEASE.

This complaint has caused heavy damage round Innisfail, Tully, Babinda, and Cairns districts. It is caused by a weak parasitic fungus (*Sclerotium* sp.), which binds the leaf sheaths and strangles the top. Canes often recover from the trouble, but at times it causes loss. Seasonal conditions seem to play a big part in the destructiveness of the disease, and the fungus is probably incapable of causing damage without favourable conditions for development. Mr. A. P. Gibson, Northern Field Assistant, first drew my attention to the trouble, and I found it to be causing many dead sticks in the stools, and also in a few cases dead patches, where all the stools had died out.

Symptoms.

The first noticeable symptom is the pinkish tinge of the leaves near the leaf sheaths, to about 3 inches from the base, and the fact that the trash is clinging, round the spindle. The leaves appear choked, and the leaf sheaths become bright red and rather slimy. Dark spots appear on the red, which are the sclerotia of the fungus, and aid in its transmission. Finally, in severe cases the top dies and the cane affected decays. In Badila—the main variety affected—the sticks, instead of appearing a glossy black, are rather pale red and unhealthy looking. Usually not every stick in a stool is affected.

Farmers often put the trouble down to overcrowding, and there is probably some truth in this, for in most cases Badila is planted too close and there is not sufficient room for the proper development of the stools. There are other factors, however, which require investigation, and the fungus has not yet been identified with certainty. It bears some resemblance to *S. rolfsii*, but is probably not this species.

Transmission.

The disease is probably carried in the trash, and can live on this decaying organic matter for some time. It can then reappear in the ensuing crop.

Control.

This has not been properly worked out, but it seems rather obvious that the burning of trash in heavy infestations would tend to minimise the chances of infection.

The better spacing of plants needs to be considered, and also the bettering of the soil conditions. I noticed that on one farm which made free use of green manures, and spaced wide apart, that infection seemed very light.

Distribution.

Bundaberg.—The disease was seen in an isolated case in N.G. 16 plant in December, 1927.

Giru.—Spindle Top was causing some damage in B. 208, and was noted also in cane that had been flooded. Top Rot and Spindle Top were flourishing side by side in Badila.

Tully.—In the Lower Tully end the disease was causing some damage, in Badila. Top Rot was also present. Only isolated sticks in stools were dead, but the disease seemed to need attention.

Innisfail.—Throughout this area the disease was rampant, especially on Innisfail Estates, Queensland Estate, and Darradgee. The worst infestation was on two farms in Upper Darradgee on red soil. Here all stages of the disease were encountered, and from the percentage of dead cane, the losses must have been considerable.

Babinda.—Practically every farm here was infected, but the damage was not as great as at Innisfail. On the south bank of the Russell River the worst infection was observed.

Cairns.—The disease was bad all along the Mulgrave River, especially the Upper Mulgrave section. Much of the cane at Freshwater and the Hambledon area was more or less infected. The disease was confined to Badila.

Mossman.—Here the trouble was not seen except on the Mowbray River, where it was quite prevalent.

The Innisfail and Babinda areas were by far the worst affected, and it would be difficult to find a clean farm. Several of my reports dealt with this disease, and these may be referred to.

BANDED SCLEROTIAL DISEASE.

This trouble, which is caused by a fungus of similar type to that causing Spindle Top, was not evident during my visit to the North (from August to the middle of November), and only one or two isolated cases were met with. As no idea was obtained of the prevalence of the disease, nor of the damage that it causes, I shall say nothing concerning it.

ILIAU.

This disease, which also occurs in Hawaii and Louisiana, is caused by a fungus with two stages which are known as *Gnomonia* and *Melanconium iliau.* Only the latter stage has been observed in Queensland. It attacks the young plant or ratoon cane and the fungus binds the leaf sheaths closely, strangling the growing point of the young cane. This endeavours to free itself, and often bends double, and may emerge from the side of the cane through the leaf sheaths. In this case it continues to grow, but may again be strangled. In this way considerable losses are caused in plant cane. A black fruiting body bursts through the leaf sheath, and this is about one-eighth of an inch in circumference.

Evidence of the twisting of the cane shoots can be seen in cane long after it has grown away from the disease.

The fruits of the fungus live over from crop to crop in the soil, and are killed by sunlight, so that efficient tillage is the most efficient method of controlling the disease.

Distribution.

At present the disease is of minor importance, and only occurs on a limited number of farms in the Childers and Bundaberg districts.

At Childers I observed the disease on several farms in plant and ratoon M. 1900 Seedling, and on one farm at Booyal in D. 1135.

In Bundaberg, the disease seems confined to the Bingera area, and is slight in M. 189, H.Q. 274, and M. 1900 Seedling.

PEG LEG OR FOOT ROT.

This trouble is characterised by the base of the cane stalks becoming thin and tapering, so that the stick bends over, and can easily be swayed from side to side, the main cause of damage is that the cane lodges, and the c.c.s. usually drops in fallen cane.

It is worst at Childers in M. 1900 Seedling and D. 1135, but has been seen in other places, notably Bauple, Maryborough, Mackay, and Bundaberg. It is caused by a fungus, of a weak parasitic type, and soil poverty is one of the main factors.

MARASMIUS ROOT DISEASE.

This is also due to a weak parasite, the development of which is due usually to depletion of the plant foods in the soil. It binds the bases of the leaf sheaths together, and the trash sticks to the cane. In this disease the leaves show dark brown spots and subsequently die in severe cases. The fructifications of the fungus were identified by me as *Marasmius* sp., but I had not the time to work out the species. It causes some damage in plant and ratoon cane of all ages in the Bundaberg district, and on the old lands in the South Isis (Childers). Its occurrence on old land seems to suggest that an addition of potash or phosphate to the red soils would tend to check the disease. Badila, N.G. 16, D. 1135, and M. 1900 Seedling have been seen to be affected.

BROWN ROT.

This was only seen in the new scrub lands in North Queensland, and appears to be confined to a few stools in stump country. It occurs at Tully, Innisfail, Babinda, and Cairns, but does not cause appreciable damage. It appears to be fungal in origin, and the cane merely dies, and is found to be pithy and brown at the base of the stick. A fungus is evident, and it is thought that it is a secondary parasite which comes from an old stump or some such thing.

"X" DISEASE.

This is a trouble which was very evident at Childers in the early part of 1927. Affected sticks grow long and lank, and were chlorotic with yellow leaves. D. 1135 and M. 1900 Seedling were seen to be affected, but infection was reported in M. 55 and Q. 813. The disease seemed to be confined to patches where it occurred year after year, and was not seen except on old farms in the Childers and South Isis areas. This and the nature of the trouble lead to the idea that soil deficiency was the cause, and several manurial trials were instituted. Weather conditions were unfavourable, and little information was gained from them. By sending diseased plants to Rockhampton, however, healthy plants were obtained, and this experiment seems to corroborate the theory. It will need confirmation, however, before it can be vouched for. The soil is known to be lacking in potash and phosphate, and the application of these may help to get rid of the trouble.

CANE-KILLING WEED, WITCH WEED, STRIGA.

This is a weed with a purple flower, and a fleshy leaf which parasitises the cane roots and kills the cane in patches. It is about 18 inches high, and appears rather insignificant. Occurrences were noticed near the Elliott River, Bundaberg; Kelsey Creek, Proserpine; and to a greater extent at Carmila, and at other places in the Mackay district. It is not very widespread in Queensland.

SECTIONAL CHLOROSIS, OR BUTTERFLY.

This is a physiological disease caused by water held in the spindle of the cane becoming chilled overnight and rapidly heated in the morning sun. The result is a band devoid of chlorophyll on each leaf, and these bands are originally opposite, but become alternate by the differential rate of the growth of the leaves. The result is a series of white bands across the leaves which are often mistaken for other diseases. They sometimes ribbon and die, while the rest of the leaf keeps green. As one journeys north they become infrequent, and frosty weather in the sub-tropical districts is the time when the affection is most apparent. D. 1135 and M. 1900 Seedling are the main canes affected, but all varieties can show the affection which has been seen by the writer in Q. 813, Badila, H.Q. 426, Goru, B. 208, M. 189, H. 109, B. 147, &c.

LEAF CRINKLE.

Known among some Bundaberg farmers as "The Disease."

This is a puckering of the leaves, which occurs mainly in young cane, but which also occurs in older canes of the soft-leaved varieties, such as M. 1900 Seedling. Some authorities put it down to the damaging of the leaves by the wind, and this is possibly a factor, though it is not sufficient to explain the trouble adequately. I have made observations on this trouble in the Bundaberg district during the month of December, and I find that it is practically confined to cane which is still being cultivated. Also at this stage, every plant affected has had the older leaves bent over with some implement, and it appears reasonable to suppose that the younger leaves growing against the folded older leaf become compressed, and are thrown into folds as they grow. In all cases examined, where the leaves had been folded; the crinkles were developing in the young tissues just above the growing point. The theory that I should like to advance then is that the trouble is mainly due in young cane to mechanical injury. Soft-leaved canes like M. 1900 Seedling are the principal ones affected, and Q. 813, with a harder leaf, is rarely troubled.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received from Mr. E. Jarvis, Entomologist at Meringa, the following report in connection with the investigation of certain orthopterous insects attacking sugar-cane (December to January, 1927-1928):—

Some Grasshoppers Injurious to Sugar-cane.

Although many species of Acridiidæ are known to frequent canefields in the Cairns district, where they doubtless effect damage of a more or less serious nature to the leaves, comparatively few of these have ever been noticed by the average cane farmer. The so-called "Yellow-winged Locust" and the "Australian Locust" (*Locusta danica* Lin. and *L. australis* Brunner), vast numbers of which occasionally swarm over restricted areas of cane land, are naturally better known than our species of *Cyrtacanthacris*, which are not pre-eminently gregarious; or those belonging to such genera as *Atractomorpha* or *Oxya*, some of which instead of taking to wing when disturbed, remain motionless on leaves or stems, seeking rather to escape notice by trusting in their protective coloration.

Species of the former genus (*Atractomorpha*) have been recorded as destructive to leaves of sugar beet, tobacco, mulberry, sugar-cane, and various succulent plants in the Malay Peninsula, Japan, Hawaii, Java, Russia, India, Africa, and Australia.

Atractomorpha crenaticeps, Blanch.

Which was briefly described as a cane pest in Queensland during the year 1916 (Bull. No. 3, Div. of Ent. Bureau Sugar Expt. Stations) is about 1½ inches long with a wing expanse exceeding 2 inches; the male being much the smaller sex. Its tegmina are brown or grass-green, usually harmonising in shade of colour with that of the plant on which it happens to be feeding or resting. The wings are clear, with the nervures bright pink except on apical portion of costal margin, where—together with a narrow strip of membrane against edge of costa—they are pale greenish-yellow.

This grasshopper is destructive to sugar-cane in Java, Australia, and Hawaii.

In Southern India the following poison-bait has been used with great success against *Atractomorpha crenulata* Fab., which sometimes attacks cocoanut seedlings and is a common pest of tobacco:—

Paris green, 1 lb.: palm sugar, 6-10 lb.; bran, 25 lb.

The sugar is first dissolved in water, to which is added the Paris green and bran, previously mixed very thoroughly together, the whole being then mixed until half solid. To this is added one grape fruit to every 3 lb. of bait.

Atractomorpha aberrans Karsch destroys the leaves of tobacco in W. Africa; while *A. bedeli* Bolio attacks those of sugar beet and other economic plants.

Oxya velox, Fab.

This acridiid was recorded as being a minor pest of cane in Queensland in Bulletin No. 3 of this office (Bur. of Sugar Expt. Stations, 1916, pp. 20, 21).

The adult female insect measures about 1½ inches in length by 2 inches across the extended tegmina, which are pale brownish-green, broader on basal than central portions, and rather suddenly expanded on the costa near the base. Wings clear; head, sides of thorax, and femora of legs greenish-yellow; tibiæ and tarsi bluish. Antennæ pale pinkish-brown, darkening towards tips.

This species, together with two others of the same genus, viz., *Oxya bidentata* and *O. multidentata*, have been recorded as injurious to sugar-cane, rice, &c., in parts of India.

The life-cycle stages of *Oxya velox* have been studied at Madras, where this insect feeds commonly on grasses, cotton, pulses, &c. The young hoppers and nymphas forms often attack the leaves of paddy (rice in the husk), the adults being able to effect considerable damage by biting the base of maturing earheads, thus causing them to dry up.

According to Prof. Ramachandra, this grasshopper lays its eggs in masses of ten to twenty-nine among stems and grass clumps in marshy situations, where they are protected from damage by possible submersion by being covered with a reddish-brown gummy substance.

The male of this species moults six times, while about 50 per cent. of females undergo seven moults. The wing pads are noticeable even in the first instar, and in early moults these rudimentary wings overlap the sides of the thorax, becoming turned back after the fourth or fifth moult. This insect breeds in Calcutta throughout the year.

It is interesting to note that in the Malayan region the larvæ of *O. velox* are said to be semi-aquatic, and have been recorded as destructive to rice, sugar-cane, and coffee.

This acridiid has been known to attack cane in Java for the last twenty-five years.

Natural Enemies.

The chief predatory enemies of *O. velox* in India are believed to be birds and frogs. In the grasshopper form they are parasitised by a carcophagid fly, while their egg masses are destroyed by two chalcid parasites—viz., *Fumidiscapus oophagus* Gir., and *Anastatus coimbalorensis* Gir.—as well as by a proctotrypid parasite, *Scelio oxyæ* Gir.

In the Cairns district, *O. velox* appears to be effectively kept in check by such predaceous and parasitic insect and other enemies as those alluded to above. Although more or less sparingly distributed through much of our cangrowing area, this species probably occurs freely on low-lying country that during the wet season is liable to become flooded or submerged.

Emergence of Greyback Cockchafers

Owing to continued drought conditions, *Lepidoderma albohirtum* made a somewhat belated emergence this season, few specimens being observed on the wing until 20th December.

During the five days immediately preceding flight of the beetles (15th to 19th inst.) only 2.14 inches of rain were recorded at Meringa Laboratory, an additional 1.45 inches being obtained from 21st to 31st December; while the precipitation for the entire month was 4.31 inches (3.29 inches below the average). Owing to the adverse weather conditions, coupled with a fall of only 10.51 inches for the period July to December (7.95 inches less than the average), greyback cane beetles are not likely to cause extensive damage to cane during the present season.

At Highleigh, Greenhills, Gordonvale, and elsewhere no heavy flights have been noticed up to the present (10th January), although a fair number of beetles can be found as usual on favourite feeding trees.

Beetles chancing to have pupated at a depth not reached by the showers already experienced will, for the most part, perish in the soil, or be too weakened to emerge later on.

Experiments conducted with two light-traps on 21st December—which resulted in the capture of 177 greyback cockchafers in about half an hour—demonstrated that strongly marked phototropic reaction of a positive nature can be induced in this cane beetle (*L. albohirtum*) by means of an acetylene or powerful oil lamp. Splendid results were obtained by fixing a white sheet, measuring about 8 by 4 feet, behind the light, and about a foot from the lamp, thus illuminating a large glowing area, standing out in sharp contrast with the surrounding blackness of the night.

CANE PESTS AND DISEASES.

Mr. R. W. Mungomery, Assistant Entomologist at the Sugar Experiment Station, Bundaberg, has submitted the following report of investigations for the month of January-February, 1928, *to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—*

Influence of the Weather on the Emergence of Greyback Beetles and its Relationship to Subsequent Grub Infestation.

It is a well-known fact that the emergence of "greyback" cane beetles (*L. albohirtum*) from the soil is, to a large extent, governed by the advent of good soaking rains during the months of November and December. Moreover, the time during which, and the manner in which, this rainfall is received are factors which exercise a profound influence on the grub infestation following on the emergence, and in this way weather conditions become of no small value in helping the farmer, or in directing him in his own efforts to keep this pest in subjection.

In the first place, when rain following a droughty spring has long been delayed into the month of January, beetles have often been found dead in their underground pupal cells, being imprisoned by the hard walls compacted by the grub prior to pupation. The remaining living ones represent those with greater powers of resistance, or those that assumed the adult stage at a later date than the others and did not suffer such great privations. Thus when rain ultimately comes only a small flight eventuates with a correspondingly smaller grub infestation in the succeeding months.

If, however, rain falls in the early part of this vital period (November-December), those beetles which have changed early into the adult stage emerge and commence feeding. Those beetles which have only recently changed from the pupal condition will possess a very soft integument, and, naturally, will remain for some little time longer within their pupal cells. Later, as their body parts harden, and rain follows on, they, too, will emerge. Thus we get a complete emergence with little mortality amongst the beetles, constituting what may be termed a straggling emergence, for at any given time there are always a fair number of beetles to be found on the feeding trees, whilst at the same time they do not appear to be present in exceptionally large numbers. The result is that after a few weeks collecting, and meeting with little encouragement in visiting trees which yield only a few beetles, collectors become apathetic, and disinclined to visit those trees, but seek out those from which they obtain the greatest remuneration for their labours. It is in this that one of the weaknesses of the system lies. Those beetles which have been disregarded or overlooked, then escape to deposit their eggs in the cultivation and destruction ensues unless fumigation be resorted to.

Now, fumigation under these conditions presents problems which, unless understood and tackled by the farmer in an intelligent manner, may bring about inefficiency and a low mortality, with a consequent condemnation of the system or, at least, a subjecting of it to adverse criticism. In the case of an area where beetles have been on the wing for a couple of months, the farmer is confronted with grubs differing in ages from a month to six weeks or more. If he fumigates to kill the oldest of these, the youngest, by then, will not all have migrated to the stools and some will most likely escape the toxic properties of the fumigant. These grubs will later progress towards the stools and attack the cane roots after the fumes have been dispelled, thus conveying to the farmer a wrong impression that the fumigant has been of little value and causing him to lose faith in the process. In such a case it would be wise to delay fumigation with carbon bisulphide as long as possible, say until the oldest was on the point of assuming the third stage, and one fumigation would then suffice to kill a very high percentage of those grubs which were present in the field.

Again, when grubs hatch out early they consequently enter into their third stage at an early date also, and as this represents their very destructive period, the cane becomes damaged much earlier in the year and has a much longer time to remain root-eaten before being harvested. Therefore it is more liable to deterioration through dry weather, fungi, &c. Thus from most points of view an early emergence of beetles is not a happy augury for crops in the following year.

Where rain delays until towards the middle of December, usually only one big emergence of the beetles takes place. Collecting is entered into with great enthusiasm, and great numbers are destroyed. This apparently is what took place this year at West Plane Creek, where over 30 inches of rain were recorded for December. The thorough collection of beetles, as well as the systematic destruction by some growers of feeding trees adjacent to their canefields have both been really honest attempts made to reduce the pest this year, and judging by some of the farms recently inspected, a reduction in grub infestation has certainly taken place.

It now remains for them to make a survey of their farms for grubs, and where these are found in alarming numbers the judicious use of soil fumigants will be a wise and effective means of insuring their crops.

(*N.B.*—The collection of "greyback" cane beetles *L. albohirtum* here commended should not be confused with previous recommendations made by the writer to discontinue the collection of the Southern cane beetles *P. furfuracea.*)

Weedy Ground Tends Indirectly to Impair Fumigation Work.

In well-kept cane farms "greyback" beetles when about to oviposit tend to dig in under those stools to which they have flown and deposit their batch of eggs at depths of about 8 to 10 inches. The grubs, then, on hatching out find themselves in proximity to a copious food supply and usually remain within the cane stools. If, by any chance, the egg chamber is placed in the interspace the young grubs soon migrate towards the cane roots, and, finally, when they have concentrated in the cane rows, they can be readily destroyed by means of soil fumigants.

Canefields, in which weeds are allowed to grow in great profusion during the flight of the beetles, are more likely to suffer damage than cleaner fields. Beetles alighting in a mass of cane, grass, and weeds burrow at random into the soil and lay their eggs, so that little distinction occurs between the degree of infestation of the rows and that of the interspaces, since the grubs are able to feed equally well at the grass roots as at the cane roots. In an actual count made by digging in a grubby zone and trenching on both sides of this stool, we found twenty-eight grubs underneath the stool and another sixteen and fourteen underneath the weeds and grasses on each half side of the interspaces adjacent to this stool. Provided this area were fumigated, the twenty-eight grubs underneath the stool would be accounted for, if conditions were favourable for fumigation; but what of the other thirty grubs on the sides of the stool? They would not come within the destructive radius of the deadly fumes, and later, as described in a previous paragraph in the case of younger grubs, they would gradually work inwards towards the rows, lay waste the crop, and completely negative fumigation work; and so, as a preliminary precaution when aiming at grub control, growers would be well advised to adopt the golden rule of keeping their cane reasonably free from weed growth.

A CANE GRUB SURVEY.

Mr. A. N. Burns, the Assistant Entomologist at Mackay, has forwarded the following report for the period 23rd January, 1928, to 11th February, 1928, to the Director of Sugar Experiment Stations (Mr. H. T. Easterby):—

In company with Mr. Mungomery a grub survey was carried out on farms that were usually subjected to greyback (*Lepidoderma albohirtum* Waterh.) grub injury. On one farm thirty very young first-stage grubs were unearthed from under one stool, and a similar number from the two interspaces on either side of the same plant. Other stools in the same "patch" gave numbers varying from two up to nine; there were also many grubs in the interspaces between the rows. As these latter were feeding on the grass roots, it was considered undesirable to fumigate the cane stools there at that time, as only the grubs at the cane roots would be affected; those between the rows could later, after the fumigant had exhausted its qualities, and the grubs their supply of grass roots, direct their attentions to the cane stools.

It was therefore decided to wait for a few days before making another inspection of this field. Several other farms inspected gave from their affected areas an average of from two to seven grubs per stool, and in each case the grubs were very young first-stage. Later, on finding eggs beneath one plant, it was decided on account of the apparent scarcity of grubs, that it would be wise to wait for a few days in order that eggs deposited by the latest emerged beetles should hatch and the young grubs have commenced feeding. The eggs found were taken to the Laboratory, where the young grubs hatched out two days later.

At the time of carrying out this inspection, a good many greyback beetles were observed on the feeding trees; they were, however, mostly in a "wasted" condition. Several specimens of the Christmas Beetle (*Anoplognathus boisduvali* Boisd.) were collected from the young foliage of a eucalyptus tree. At the time of writing a few greyback beetles may still be collected from feeding trees in the vicinity of the Experiment Station; and a few days ago a number were observed on feeding trees adjoining a cane field on the Farleigh road.

Beetles Collection.

Growers at West Plane Creek who usually suffer damage from grubs of the greyback (*L. albohirtum* Waterh.) have been judiciously co-operating in collecting the beetles, especially during the last flighting season. Much attention also has been given to the cutting down of feeding trees, consideration having specially been given to the position of these trees in relation to the affected cane, and direction of the prevailing winds. Several growers state that they feel assured that through this practice they have considerably reduced their percentage of grub attack.

Occurrence of "*frenchi*" Grubs. (*Lepidiota frenchi*, Blackb.)

Damage by grubs of this species is showing up in one or two places on the Experiment Station, also in isolated patches on several farms near Racecourse Mill. Examination of affected stools at the Station gave an average of three third-stage grubs per stool. First-stage grubs were also present, but not in any number. As soon as the weather takes up again (the precipitation during the last four days has been 6 inches) and the soil is dry enough for fumigation, a couple of plots will be laid down at the Station.

Occurrence of Other Grubs.

Whilst digging for greyback grubs in sandy loam soil on a creek flat at West Plane Creek, a newly changed third-stage grub, presumably that of the "Anomala" beetle (*Anomala australasiæ* Blackb.) was found amongst cane roots. The soil in this field was rich in silt and organic matter, which components are much favoured by grubs of that species.

A good number of the same species of grub have also been unearthed during scarifying operations on the headlands of some of the blocks of cane at the Experiment Station. They appear to be feeding on grass roots only, so far none have been detected actually amongst the cane roots. The soil in this instance also is a heavy loam with a fairly high percentage of organic matter, which again seems to indicate that they may be "Anomala" grubs. These grubs are very active, and move on their ventral surface, a characteristic of *A. australasiæ*. Specimens are being bred through in cages at the Laboratory.

Condition of Cane.

The cane in Plane Creek Mill area, as well as round the Experiment Station and Racecourse Mill, at present looks particularly well, due, no doubt, to the beneficial falls of rain combined with warm temperatures, thus producing ideal conditions for growth. In one instance only was a field of cane observed to be poor, then it was due to much of the cane (plant) having been partially submerged by water during the recent heavy rains.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JANUARY, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1928.	Jan., 1927.
North Coast.	In.		In.	In.
Atherton	11·52	26	7·73	13·28
Cairns	16·17	45	5·84	18·78
Cardwell	16·18	55	5·18	31·75
Cooktown	14·35	51	2·08	10·07
Herberton	9·52	40	5·31	13·39
Ingham	15·32	35	7·29	31·11
Innisfail	19·86	46	14·80	17·31
Mossman	14·24	14	8·81	12·19
Townsville	11·14	56	7·41	18·63
Central Coast.				
Ayr	11·17	40	3·82	16·04
Bowen	9·83	56	4·38	13·46
Charters Towers ...	5·68	45	1·54	5·88
Mackay	14·41	56	4·41	11·00
Proserpine	15·48	24	7·31	17·42
St. Lawrence ...	9·67	56	8·64	9·46
South Coast.				
Biggenden	5·30	28	4·04	8·49
Bundaberg	8·93	44	2·77	25·80
Brisbane	6·50	77	6·15	22·43
Caboolture	7·39	40	6·26	25·76
Childers	7·53	32	4·45	6·24
Crohamhurst ...	12·70	35	10.59	34·77
Esk	5·52	40	4·53	14·99
Gayndah	4·64	56	3·25	13·92
Gympie	6·63	57	3·50	14·21
Kilkivan	5·44	48	5·64	7·58
Maryborough ...	7·45	55	6·41	17·18
South Coast—continued:	In.		In.	In.
Nambour	9·26	31	8·21	32·38
Nanango	4·54	45	4·33	10·04
Rockhampton ...	8·55	40	3·40	9·56
Woodford ...	7·28	40	5·19	22·19
Darling Downs.				
Dalby	3·36	57	0·73	4·19
Emu Vale ...	3·22	31	2·90	7·61
Jimbour	3·74	39	1·49	4·14
Miles	3·85	42	1·46	5·96
Stanthorpe ...	3·62	54	3·95	4·91
Toowoomba ...	4·89	55	4·15	13·74
Warwick	3·59	62	2·76	4·40
Maranoa.				
Roma	3·31	53	1·79	4·42
State Farms, &c.				
Bungeworgorai ...	2·25	12	0·92	1·59
Gatton College ...	4·07	27	3·52	9·39
Gindie	3·91	27	4·34	1·61
Hermitage ...	3·11	20	3·18	4·80
Kairi	7·24	12	4·33	6·42
Sugar Experiment Station, Mackay	15·22	29	3·48	8·32
Warren	5·46	12	2·74	6·91

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

CUTWORMS AND ARMY WORMS.

By ROBERT VEITCH, B.Sc., Chief Entomologist.

The larvæ of many moths belonging to the family Noctuidæ have long been known as very destructive enemies of a wide range of economic plants. The feeding habits of certain of these larvæ or caterpillars have earned for their species the name of cutworms, on account of their habit of feeding on the stems of their host plants at or near ground level, and thus severing the above-ground portion of the plant from its root system. Other closely allied species of Noctuidæ have acquired in a most marked degree the habit of frequently migrating in great numbers in their larval stages from field to field, and when that is the case they are commonly referred to as army worms.

Important Queensland Species of Cutworms and Army Worms.

Among the more important species that may be worthy of mention in these notes, is the cutworm that was so destructive in the spring of 1926—namely, *Euxoa radians* Guer. In its life history and feeding habits it may be regarded as a typical cutworm, and it has accordingly been selected for brief description as a representative of this class of pest.

Euxoa radians was responsible for nearly all the losses sustained in the spring epidemic of 1926; fortunately, losses in 1927 were very slight.

The army worms are well represented in Queensland by such species as *Cirphis unipuncta* Haw. and *Cirphis loreyi* Dup., both of which have developed very pronounced army worm habits.

Life History and Feeding Habits of *Euxoa radians*.

Comparatively few details have been published with respect to the life history and feeding habits of this species. It is, however, at present the subject of an intensive investigation by an officer of this Department, and it is hoped that much additional information thereon will shortly be available. In the meantime, the following brief outline will probably suffice.

The small, circular, pearly-white eggs have been found in moist soil under low-growing weeds. They hatch after a brief incubation period, and the observations to date indicate that the young larvæ hatching from these eggs, generally but not invariably, feed on the delicate foliage of the weeds under which the eggs were laid—e.g., pigweed and bullhead. As the larvæ grow older they turn their attention to economic plants, and these are frequently destroyed or seriously injured in large numbers.

The larvæ of cutworm moths generally shelter in the soil during the day at a depth of 1 to 2 inches, and in this respect *Euxoa radians* is typical. The cutworms come out to feed shortly after or about sunset, and in the case of well-grown plants they will climb up into the foliage and, if unchecked and in large numbers, the cutworms may completely defoliate the plants on which they are feeding. When young plants or seedlings are attacked the base of the stem is a favourite point of attack, and it is frequently nibbled through or ring-barked, thus causing the seedlings to topple over or wither off.

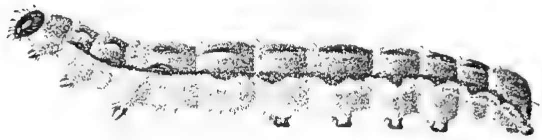


Fig 1 × 1½

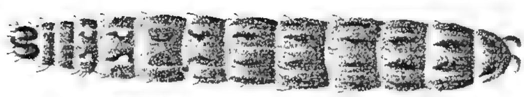


Fig 2 × 1½

Fig 3 × 1½

Fig 4 × 1½

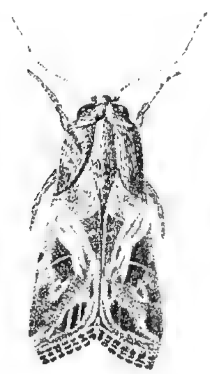


Fig 6 × 1½

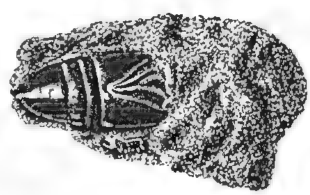


Fig 5 × 1½

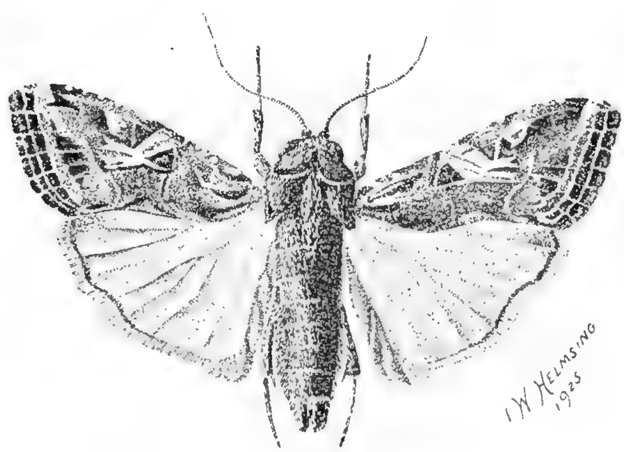


Fig 7 × 2

PLATE 59.

Prodenia litura F.

Fig. 1. Larva, lateral view x 1½. Fig. 2. Larva, dorsal view x 1½. Fig. 3. Pupa, ventral view x 1½. Fig. 4. Pupa, lateral view x 1½. Fig. 5. Pupa within earthen cocoon x 1½. Fig. 6. Imago, wings closed x 1½. Fig. 7. Imago, wings expanded x 2.

The nocturnal feeding habits of these cutworms frequently lead to failure to detect the cause of the loss just described. Hence, whenever seedlings are falling over in the manner mentioned or extensive defoliation of plants is taking place without any ostensible reason, it is well to scratch away the soil at the base of the attacked plants to see if the presence of cutworms is the explanation.

The cutworms attain full size in about four weeks during the late spring and early summer months, and in the process of growth they moult several times. The full-grown cutworms of this species are about 1½ inches in length and are stout, fleshy grubs that are only very sparsely clad with extremely small hairs. When dug out of the soil their colour varies to some considerable extent, for while some specimens may be aptly described as being of a dirty grey-green colour, others might more appropriately be called dirty brown suffused with pink. The cutworms possess eight pairs of legs, three of which are jointed legs on the thoracic segments, the other five pairs being fleshy unjointed legs that are situated on the abdomen.

Having attained full size the cutworms now form earthen cells in the soil at a depth of 1 or 2 inches below the surface, and in these cells they transform to pupæ. The pupæ, which are about three-quarters of an inch in length, are light-brown in colour when first formed, but there is a very appreciable darkening as the pupal period advances. The duration of the pupal period is about a fortnight during the late spring and summer months. No feeding takes place during this stage, and it functions entirely for the reorganisation of the internal tissues, as a result of which reorganisation the moth, which is the reproductive stage in the insect's life cycle, is produced.

The moth is a stout-bodied, unattractive looking insect with a wing spread of 1½ inches, the body length being about two-thirds of an inch. The fore wings are brown with conspicuous darker brown or blackish brown spots and streaks, while the hind wings are much lighter in colour, being almost white except for a small brownish marginal area.

It is believed that the life cycle of *Euxoa radians*—i.e., from the laying of the egg to the emergence of the moth—occupies about seven weeks in the summer months. The number of generations that may occur each year in Queensland has not been ascertained, but it would appear that the spring generation is the one most to be feared.

The life cycles of the army worm species, *Cirphis unipuncta* Haw. and *Cirphis loreyi* Dup., are somewhat similar in their fundamental details.

Illustrations of the various life history stages of *Euxoa radians* are not yet available. On plate 59, however, the larva, pupa, pupal cell, and moth of an allied leaf-eating species, *Prodenia litura* F., are figured, and from these figures the reader can form some rough idea of the general appearance of the life cycle stages of Noctuid moths.

Plants Attacked.

An extremely large range of plants are subject to attack by cutworms and army worms, and it may be said that hardly any cultivated crop escapes an attack of some varying degree of severity at least in certain seasons.

In Departmental records of cutworm and army worm attack, mention is made of the following cultivated host plants:—Cabbage, cotton, grape vine, grasses in general, lucerne, maize, millet, oats, onions, potato, tomato, strawberry, sugar-cane, and wheat.

Control Measures.

When an outbreak commences it is well to take immediate steps to deal therewith, because very heavy losses may be sustained in a comparatively brief space of time.

Fortunately, there are distinctly effective means available for handling these cutworm pests, perhaps the most satisfactory of which is the use of poison bran baits.

Poison baits may be prepared in accordance with the following formula:—

Bran	25 lb.
Paris Green	1 lb.
Molasses	1 quart
Oranges	2 fruits
Water	2 gallons (about)

The Paris green and bran should first of all be mixed together in a thorough manner and while still dry. The molasses and the finely chopped up fruit and its juice should then be added to some of the water. The water containing the molasses and fruit should next be mixed with the bran and Paris green and the whole should then be well stirred up, enough water being added to produce the right consistency.

It is highly desirable that the poison bait should be of the right consistency, and only sufficient water should be added to permit of it being in a crumbly state and thus capable of being easily scattered broadcast on the ground. It should at the same time be sufficiently moist to permit of each flake of bran taking up its quota of the Paris green and molasses.

Neither the fruit juice nor the molasses are essential in this bait although they are usually considered desirable. Horse dung and sawdust have been substituted for the bran in certain formulæ and smaller percentages of Paris green have also been used, but it is desirable to adhere to the formula given until such time as experiments have demonstrated the equal efficiency of the cheaper formulæ when used in this State.

The bait prepared in the manner described is best applied late in the afternoon so that it may be fresh and palatable when the cutworms come out to feed at night. The bait may be broadcasted over the infested area, or it may be applied by dropping about half a teaspoonful of the mixture near to but not touching each plant to be protected. The amount of bait to be used per acre will vary to some extent with the degree of infestation and also with respect to the number of plants to be protected per acre, but generally some 40 or 50 lb. of the bait will suffice for the treatment of one acre if broadcasted.

It should hardly be necessary to emphasise the fact that caution should be exercised in the application of the bait, because the Paris green contained therein is a very poisonous substance. Before it is applied steps should be taken to ensure that no domestic animals, e.g., poultry can obtain access to the bait.

As an alternative to the use of poison bran baits, attacked plants may be sprayed with arsenate of lead, but the former method is more satisfactory as it kills the cutworms without sacrificing some of the plant tissue in doing so. When spraying is adopted, a certain proportion of the plants may be destroyed before the cutworms are poisoned, and furthermore, it is not safe to spray attacked plants which may shortly be used for foodstuffs.

If these pests are on the march in army worm fashion, and are moving from one cultivated area to another, it will generally be found that poison bran bait scattered a few yards in front of the line of advance will be effective in checking the migration.

A further measure that is frequently adopted when these pests are on the move is to plough a furrow a short distance in front of the line of advance, the steep straight side of the furrow being the one that is most distant from the marching army worms. A little poison bran bait is scattered in the foot of the furrow, or in some cases small holes are dug in the bottom of the furrow at intervals of 10 or 12 feet. The advancing caterpillars will fall into this furrow, feed on the poison bran bait and die or, where bait is not used, they will wander up and down the furrow in search of a means of escape and fall into the small holes where they can be killed either mechanically or by the use of a little kerosene. It is obviously essential that the furrow should be so prepared that there is no chance of the caterpillars crossing it.

Natural Enemies.

A number of natural enemies of the cutworm *Euxoa radians* have been recorded in Queensland, these being a very small wasp parasitic on the eggs, namely, *Schedius euxoæ* Gir., a Braconid wasp parasitic on the caterpillars themselves, a predatory Sphegid wasp, *Ammophila suspiciosa* Sm., also attacking the caterpillars, and finally a Tachinid fly parasitic on the larvæ. Birds also doubtless take a heavy toll of these pests.

OBITUARY—HON. W. N. GILLIES.

END OF A NOTABLE CAREER.

With the death of Mr. W. N. Gillies, formerly Premier of Queensland, and member of the Board of Trade and Arbitration, on 9th February, a distinguished and very busy life ended with tragic suddenness. Mr. Gillies was only in his sixtieth year, and the news of his collapse and sudden death at his home at Toowong occasioned widespread regret and deep sense of a great community loss. As Minister for Agriculture and Stock for just on five years of the immediate post-war period, when primary industry was confronted with all the perplexing phenomena arising from a lack of a complete system of ordered marketing and organised distribution, no other leader, with the exception, perhaps, of the late Hon. A. J. Thynne, left a deeper impress on the fortunes of agriculture in this State. A farmer himself, and the son of a farmer, he brought to his office a sound practical training in land matters, an abiding comradeship with the primary producer, a deep sympathy with him in his economic problems, and a wide, wise, and comprehending vision. Added to this was a tremendous earnestness of purpose, an intense devotion to duty, and untiring industry in carrying it faithfully out.

A pioneer son of pioneer parents, and in every sense a big Australian, was the first farmer Premier of Queensland, William Neale Gillies. Coming from Scotland his parents settled on the land in the Hunter River district of New South Wales, and it was there that Mr. Gillies was born. When a lad of thirteen his parents trekked northward to the Richmond River, and soon after the resourceful young Australian, who was destined to achieve distinction in the service of the people, started farming for himself. At sixteen he was managing a local creamery and, later, filling the role of postmaster. Sticking to the land he engaged in sugar-growing. It was the day of indentured coloured labour from the South Seas, and from his father, who was the originator of the Anti-Alien League of New South Wales, which had for its aim the abolition of kanaka labour in the sugar industry, young Gillies absorbed his democratic ideas and faith in the national ideal of White Australia. Following a strong paternal lead Mr. Gillies became, later, president of the New South Wales Sugar Defence League, an outgrowth of the earlier successful organisation founded by his father, a position which he retained until 1911.

The present generation has, perhaps, very little appreciation of the strenuous efforts of the farmers of that time to make and maintain sugar-growing as a white man's industry. The fine national spirit, strength of character, and foresight of

PLATE 60.—THE LATE HON. W. N. GILLIES.

"He was one of those who cannot but be in earnest; whom Nature herself has appointed to be sincere."—*Carlyle.*

these hard-fighting farmers on the Northern Rivers were big factors in forcing a general acceptance of the Australian Monroe Doctrine, which, to-day, is the nation's slogan.

Attracted to the new and fertile lands of the North, Mr. Gillies came to Queensland in 1911 and settled on virgin scrub country on the Atherton Tableland, a region rivalling in richness the Big Scrub of his native State. As a leader among the new settlers and workers his worth was quickly recognised and, within a year of his driving in his tent pegs on his new selection, they sent him down to Brisbane to represent them in the Parliament of the State. In 1916 the Public Works Commission was appointed, with Mr. Gillies as its first chairman. The Brisbane-Kyogle Railway proposal, the building of which Mr. Gillies advocated on both sides of the border, was the subject of the Commission's first inquiry. In 1918 Mr. Gillies entered the State Cabinet as Assistant Minister for Justice, and in the following year attained full Ministerial rank as holder of that portfolio. When the Hon. William Lennon was appointed Lieutenant-Governor, Mr. Gillies succeeded him as Minister for Agriculture and Stock. In 1921 he was chosen by his colleagues to fill the chair of Deputy Premier when Mr. E. G. Theodore assumed the Premiership in succession to the late Mr. T. J. Ryan, K.C.

Agriculture is still Australia's basic industry and rural prosperity is of vital importance to the country and it was with these ideas in view that Mr. Gillies, both as Deputy Premier and Minister for Agriculture and Stock, performed notable service to the industry both in State and Federal Councils. And these ideas were crystallised in measures introduced and piloted through Parliament by Mr. Gillies in the course of a record term as Minister for Agriculture and Stock, a period of legislative and administrative activity and achievement that in Australia, it may be fairly said, has no parallel.

On his entry into the Agriculture Office Mr. Gillies found twenty-two Acts of Parliament to administer. In the course of his Ministerial term he had seven of these amended or consolidated and added fourteen new agricultural and related measures. The whole period was marked by phenomenal departmental activity.

The establishment of the cotton industry, stabilisation of the sugar and other farming industries, systematic agricultural organisation, formation of wheat and other pools, the placing of the farmers' co-operative movement on a sound basis, the protection of banana-growing and its preservation as a white man's industry, the Sugar Agreement with the Commonwealth—all required special legislation or regulation, and in these enactments the general benefit of agriculture, and therefore of the nation, was the basic idea. The administrative acts of Mr. Gillies during this period also covered a very wide field. Among other practical measures the system of advances to settlers was liberalised, schemes for grain and fodder conservation were initiated, native birds and animals were protected more closely, the scientific services of the department were extended, and publicity in respect to rural enterprises, conditions, and problems by motion pictures and otherwise was greatly improved. Behind it all Mr. Gillies was a driving force. In 1925, Mr. Gillies resigned the Premiership of Queensland, and later accepted a seat on the Board of Trade and Arbitration.

TRIBUTES.

Many tributes were paid to the late Mr. Gillies' life, character, and great public service by every section of the Press and leading citizens representative of every phase of our community life. The deep respect in which he was held was manifested in immense crowds that gathered in the streets during the passage of the cortege through the city. There was another large gathering at the graveside in Toowong Cemetery. In performing the last sad rites the Rev. Norman Millar, B.A., of St. Andrew's Presbyterian Church, said—"We are gathered to pay our last tribute of respect and honour to one who, as head of the State Government and occupant of important and arduous offices, brought to each position he occupied a certain real competence and a certain real integrity of soul that won for him not only the real friendship of a wide circle of admirers, but also the respect of many of those who differed most widely in opinion. We gather round the grave to pay our last respect to his memory, his service, and his character. We are reminded how unseemly it is that one who has given pleasure and service to the State and displayed affection and friendship to his dear ones should pass away so tragically. I take the opportunity in the name of those present to convey their sincerest and profoundest sympathy to the wife and members of the bereaved family."

Every section of the community was represented, including His Excellency the Governor (Lieutenant-General Sir John Goodwin), the Lieutenant-Governor (Hon. William Lennon), the Premier (Hon. W. McCormack), the Speaker and Members of the Legislature, the Judiciary, the Chancellor, Senate, and Faculties of the Queensland University, State and Federal Public Services, Naval and Military Forces, Foreign Consular bodies, City Council, Public bodies, and National Societies, and Professions and Commerce.

PIG RAISING—SCHOOL OF INSTRUCTION.

Arrangements have been made to hold a school of instruction in pig raising at the Queensland Agricultural High School and College, Gatton, over the period Monday, 11th June, to Saturday, 23rd June (inclusive), 1928.

Applications are now being invited from farmers, their sons, and daughters who are anxious to improve their knowledge of the subject of pig raising, for at this school both practical and theoretical instruction will be given; the practical work including a study of breeding, cross breeding, feeding, marketing, judging, diseases, care and management.

Lectures will be given on all these subjects as well as on others associated with the handling of several classes of pigs, while it is proposed, if possible, to arrange for visits to bacon factories during the progress of this school in order that students would have the opportunity of studying the various processes consequent upon the treatment of bacon pigs of varying ages and weights.

The college fees for the complete course, including board, lodging, and tuition, will be £2 13s. 6d. each student.

It is intended that the school should be open both to men and women.

In holding the school officers of the Department of Agriculture and Stock will co-operate with the Principal of the College and officers of the Department of Public Instruction.

Applications from those desirous of attending should be made to the Principal of the Queensland Agricultural High School and College, T.P.O., South Queensland, as early as convenient so that arrangements may be made for accommodation for the period of the school.

It is anticipated that the holding of the school will be highly appreciated by many engaged in the pig-raising industry, for the school will be thoroughly practical and should prove interesting and instructive to all who are able to attend.

Further particulars in connection with the school and with accommodation, &c., may be had on application to the Principal.

The Instructor in Pig Raising, Mr. Shelton, will be in attendance throughout the school, and will be included in the list of lecturers dealing with both practical and theoretical sides of the business.

It is advised that those who would like to attend should make early application for information or for accommodation, for already quite a number of inquiries have been received indicating that the school is creating a keen interest among the farming community.

There will be some slight additional expense associated with the visits to the bacon factories, details of which can be had on application to the Principal at the time other information is being sought.

FARM TRACTORS—CORRECT COUPLINGS.

Driving Small Machines.

It is not always possible to follow the suggestion I made recently—namely, that all of the small stationary machines should be driven off a main shaft. When it is found that this cannot be done, the question arises as to how it is possible to regulate the speed at which the driven machine is made to revolve. The solution of the difficulty that I have found most satisfactory is to employ a set of pulley wheels, one wheel of the correct size for each stationary machine. The exact size for each wheel must be worked out carefully—a simple sum in arithmetic—in accordance with the type of machine to be operated and the size of its pulley wheel. Such wheels can generally be obtained from the local stores. Remember, though, that a pulley wheel must have a slightly crowned face. A pulley wheel can be changed very quickly, since, as a rule, it is merely keyed to the shaft.

Weight Distribution.

A well-balanced tractor gives very much better results than one that is badly balanced. The whole question of the correct distribution of the weight of the tractor has been thoroughly considered, and many experiments have been conducted to determine the right solution. The weight of the tractor is brought together into one point. This point is termed the "weight centre." If this weight centre is too much in front of the rear axle the front wheels will be carrying too much weight; on the other hand, if it lies too close to rear axle the work of steering is rendered very difficult. It has been determined that the best distribution is to have the weight centre one-third of the distance between the rear and the front axles. This gives sufficient weight on the rear wheels for conserving the power and sufficient on the front wheels to make steering easy.

Tractor Hitches.

A number of tractor operators appear to be under the impression that, given an efficient tractor and a suitable implement, it makes no appreciable difference how the two are coupled together. An improperly regulated hitch, or a hitch of bad design, means that considerably more power is used up for propelling the whole outfit. The result of this is that inferior work is performed and the speed is reduced. A hitch causing unnecessary side draft will greatly increase the load, and to such an extent is this noticeable at times that at least one-third more power is required than would otherwise be the case. In addition to loss of power, ragged furrows, faulty pulverisation, and poor furrow slice are also the direct result. Manufacturers of both tractors and implements have studied this question in all its bearings, and therefore the sensible operator employs a coupling recommended by one or the other.—E. T. Brown, in "The Farmer and Settler."

ON THE OPEN ROAD.

The Downhill Drive.

Motorists have often been warned against attempting to overtake other cars without being able to see clearly that this can be done with safety and without inconveniencing any motorist or other person that may happen to be coming in the opposite direction. Evidence is, however, daily accumulating that such warnings are still necessary. Now, it is not possible to see what may be approaching on a blind corner or at cross roads or on steep humpbacked bridges. A sudden, steep fall of gradient may also prove to be dangerous for the unskilled driver.

Dash Through the Creek.

We recall having a nasty experience about a year or two ago when motoring to Newcastle, simply because we took too much for granted and anticipated good roads all the way, because they had been excellent up to Wiseman's Ferry. It was after leaving St. Albans and making over very rough and hilly country for Wollombi that we finally struck a nice patch of road and immediately got up a solid speed. We must have been doing 40 miles an hour, as there was no traffic or very little of it, when, without warning, we ran into a deep creek in the road. By the speedy application of brakes we averted an accident, as the culvert must have been 2 or 3 feet deep. As it was, we had a thorough drenching and threw out a sheet of water such as one would expect when a whale does its spouting at sea. The incident we experienced, though it happily turned out all right, might have been serious, and goes to show that all motorists should be specially careful when touring over roads on which they have never previously travelled.

When the Brakes Failed.

A friend of ours once had a curious experience when touring one of the mountain roads. He was not an experienced driver, though he had learned the lesson "get into second" when negotiating a very stiff gradient in case the brakes do not hold properly. Well, he had never been over this particular country and was climbing up a not-too-steep gradient "all out," when, without warning, in taking a turning, he found himself going down a very steep gradient. So far as he could see, the road ahead was straight. That was one good thing, he thought, as he applied his brakes, but found that they only partially held the car. At the rate he was travelling he had no idea how to get into second gear, so, with the "safety first" idea in his head, he began looking ahead to see if there was anything soft about into which he could bump. Not a thing could be seen but the road and the hedges or fences each side. By the time he had been careering like this for a minute or two he came to the conclusion that this particular road was "all" down gradient, and then, like a flash, he dashed through a wide gateway that fortunately was open and entered a paddock on two wheels. By the greatest good luck he kept his seat, though the pace still held as the paddock sloped just as much as the road. Still looking for something soft into which he could fall he spotted a hayrick right in the extreme corner. Straight for this he made like a cat after a mouse, and Don Quixote's charge on the windmill was nothing to the light brigade charge he made on that stack of hay. He hit it with such force that some local wits said it swung backwards and forwards like a pendulum for a week, while the motorist in the recoil went back about 10 yards after very nearly doing a double somersault. Needless to say, my friend went carefully ever afterwards on strange roads, and before doing any touring saw to it that the brakes would hold the car, even if it were going down the side of a cliff.—"Magneto," in "The Farmer and Settler."

FARM TRACTORS AND THEIR MANAGEMENT.

THE GEARING OF THE MACHINE.

By E. T. BROWN.*

Many present-day tractors are fitted with either two or three forward speeds, thus giving varying rates of travelling. When ploughing on heavy land it is better, as a general rule, to run the outfit on low gear, but when the tractor is performing other work, such as harrowing, discing, rolling, &c., a higher gear can be used advantageously. The third gear, when such is fitted, is but seldom employed on the land; its use is for road haulage, since the possible speed with this gear may be from 4 miles to 6 miles an hour. When starting away from rest, the clutch must be disengaged and held in this position until the pinion wheels in the transmission have come to rest, when the gear lever should be pushed or drawn into the correct position for the intermeshing of the first speed pinions. The clutch is then allowed to engage slowly. To change from low to second gear a different set of gear wheels must be brought into mesh, and this change must be effected when both the first and second shafts are in motion. Declutching is first of all necessary, then the gear lever is brought into neutral position, held there a moment, then placed into the second speed position. The exact actions to be taken to obtain a silent change varies with different makes of machine. In some the change should be made quickly; in others a pause in neutral for some few moments may be necessary. Practice alone will indicate the correct method. For changing down—that is, from a higher to a lower gear—the change is carried out in exactly the same manner. To engage the reverse gear the machine must be brought to a standstill before the reverse pinions are brought into action.

Retard when Starting Up.

Whenever you are going to start up your tractor make certain that the ignition is retarded. If you fail to do so there is every likelihood that the engine will "kick," with serious results to your wrist. When the engine is running normally in advanced ignition the spark occurs in the cylinder a fraction of a second before the piston has reached the end of the compression stroke. The reason for this timing is that the explosion does not take place instantaneously, and therefore the full force of the explosion does not strike the piston head until it is ready for the downward movement. When the engine is being rotated slowly, however, as it is when it is turned over by hand, the piston head would be subjected to the blow resulting from the explosion while still on the upward stroke. This tends to make the engine work the reverse way. Safety lies in retarding the spark so that all danger of "kicking" is obviated.

When Starting the Engine.

It is not altogether an easy thing to start up a large tractor at any time, but the job is rendered more laborious when the weather is cold. The majority of tractors, however, are fitted with some device to make starting up easier, such as an impulse starter or a decompressor. There is a lot, though, in knowing how to swing the engine properly. As a rule, with kerosene-burning engines a second tank is provided for petrol, on which liquid the tractor is started. The reason, of course, is that petrol is a much more volatile liquid than kerosene, and therefore vaporises more readily. As has been explained before, the spark must be retarded, since otherwise the engine may backfire with serious results to the operator. In this connection reference may be made to a new safety device that has recently been introduced. It is constructed so that in the event of a backfire the tendency of the starting handle to rotate in the opposite direction is checked.

Priming and Swinging.

It is a usual practice to inject a little petrol into the cylinders by means of the compression taps on the cylinder heads. This ensures the cylinders receiving a charge of explosive mixture. Only a small quantity of petrol should be used for priming, and it is an excellent plan to inject this spirit into the cylinders some minutes before starting up. The amount of swinging that is required depends on two things—namely, the efficiency of the engine, and the way the engine is turned over. The former, of course, is dependent on the nicety of adjustment of the various parts. The first action should be to turn the engine over twice slowly, since in this way one cylinder will be filled with compressed gas and be ready for firing. Then a sudden jerk upwards of the handle or a rapid swing will start the engine. Run on petrol for a few minutes—until the engine gets warm—before turning on the kerosene fuel.

* In the "Farmer and Settler" (Sydney).

LUPIN AS A FODDER IN WESTERN AUSTRALIA.

By "SUB-CLOVER."*

The blue flowering lupin has firmly established itself in the coastal regions of the northern agricultural areas of Western Australia in recent years, and has proved of inestimable feeding value during the dry pinch in the summer months from February to the end of April, when the natural feed is as a rule scanty.

So well do conditions suit this plant on the light lands at the top end of the Midland line, Geraldton, Mullewa, and Northampton districts that it is only a matter of a few years ago that farmers became alarmed at the rapid rate at which the plant had spread, and it was feared that it would have to be declared a noxious weed.

However, the fear that the growth of the lupin would interfere with harvesting operations no longer exists, as it took but a short time to discover that the plant was very easily eradicated by cultivation and heavy stocking. In the very young stages sheep will eat the plant and thus its spread is under control, but once the plant becomes well rooted it seems to become unpalatable to stock, which will not touch it unless starved to it. At this time of the year, however, there is an abundance of natural feed, clovers and the like, so that the lupin remains untouched and goes to seed. Thus, although stock may be running in the paddock all the time, a splendid supply of nutritious feed is being conserved for the scanty period. Further, the vigorous growth made by the plants provides a considerable amount of vegetable matter, which, when trampled down, naturally increases the quantity of organic matter in the soil, while, the lupin being a leguminous plant, nitrogen also is added.

The quantity of vegetable matter grown in a lupin field can be realised by those who have had no experience of the legume when I state that last year I saw a paddock of lupins on Mr. A. E. Grant's property, Yanget, where the average height was quite 5 feet 6 inches, whilst in many places 6 feet was more than reached. This was in August, and, as the growing period extends from May to October, I was not at all surprised to hear later that in places the plants grew to a height of nearly 8 feet. However, 1927 was a particularly good year in those parts, and really this abnormal growth is not at all desirable, as the lupin seems to carry a considerably heavier harvest of pods, with more nutriment in the seeds, when the growth of the plant is normal, ranging, say, from 3 feet to 4 feet 6 inches.

The fact that leguminous plants and sheep are destined to play an important part in the improvement of the lighter lands, of which there are such vast areas in Western Australia, is apparent. On these lands the dry summer months are the great disadvantage, and here lupins must play an important part. A good lupin field, having shed its seeds, will fatten up to as many as six sheep to the acre in the driest months, and this statement is backed by the experiences of leading growers in Western Australia, prominent amongst whom are Messrs. A. E. Grant, of Yanget, Geraldton; C. H. Rowan, of Wooree, Geraldton; C. C. Maley, M.L.A., of Parakalia, Three Springs; the Chapman Experimental Farm, and others too numerous to mention.

So readily had the lupin adapted itself to light lands that it was decided by the Department of Agriculture to conduct a series of experiments in order to ascertain which of modern farming methods was likely to prove most beneficial in the successful production of this plant. Of the three experiments conducted, the first was designed to ascertain the most satisfactory depth for planting. The tests were carried out, sowing at depths of 3 inches, 1 inch, and finally on the surface with a bare covering of soil. Germination was most disappointing in the case of the deepest sowing, but an improvement was noticeable in the second plot, whilst the surface sowing was by far the most successful of the three.

The second experiment was intended to ascertain the effects of potash or lime, in addition to the customary dressing of superphosphates. The result was decidedly in favour of the more economical method of sowing, as neither the potash nor the lime made any visible difference either to the germination or to the subsequent growth.

The final experiment was designed to ascertain whether the local soil contained the necessary bacteria for successful germination. In conducting this test some of the plots were liberally inoculated with soil obtained from an old lupin bed. Again the result was most satisfactory, as apparently the inoculated soil produced no better results than the other, showing that our light lands contain the necessary bacteria.

In all three experiments early sowing produced the best results. Perhaps the most important point discovered was that of shallow sowing, as this has an important bearing on farm practice, indicating, as it does, that the seed may be sown in stubble

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* In "The Pastoral Review" for February.

paddocks during the summer months, when the surface is too hard for the drill to penetrate. Also, it shows that good results will be obtained from the natural spreading of the seeds. As a matter of fact, more recently this has proved a most successful way to spread the lupin. In a lupin field, when the pods are shedding the seed, there is a continuous series of sharp explosions as the pods open and fling the seeds for several yards all round.

In the summer months, when sheep are running in the paddock, they gather up a large quantity of the seed, but at the same time a large proportion is trampled under foot into the ground, where it remains to seed the next crop. From experiments made and the experience of reliable men, it would appear that the lupin does best when sown shallowly with a normal dressing of superphosphate on light, friable soil. Heavy sowing is not recommended, and the best results have been obtained by sowing at the rate of 10/12 up to 15 lb. to the acre. It is concluded that better results would be obtained from specially prepared land, but so good have been the results otherwise that this additional labour and expense are not warranted. Should it be desired to plant lupins with crops it is better that oats should be sown, as the feeders on the drill are bigger, and so less damage is done to the seed than with wheat.

The necessary rainfall for a successful germination and growth has not yet really been ascertained. It is generally known that the best results have been obtained in the Geraldton, Nabawa, and Northampton districts. Here the rainfalls average from 17 to 20 inches annually, with from 15 to 18 inches falling from May to October, which is the growing period. Lupins have also thrived in the light sandy soil of the heavily watered metropolitan area, so that apparently it can stand a great deal of moisture. On the other hand, at the Merredin Experimental Farm, with an average rainfall of some 12½ inches, with only 8½ inches during the growing period, results have been most disappointing. Here, in addition to the lighter rainfall, the soil is heavier and harder, but apparently the lupin favours a heavier rainfall and lighter soil.

WHEAT CULTURE IN QUEENSLAND.

By J. C. BRUNNICH.

Wheat is one of the most important crops of the world, and is the principal foodstuff of the white race. From the figures published in the official year books we learn that in 1925 the world produced and consumed 165,000,000 tons of potatoes, 113,000,000 tons of maize, 104,000,000 tons of wheat, and 90,000,000 tons of rice.

In Australia wheat is the principal crop raised, as in the year 1925-26 of a total cultivated area of 16,793,600 acres, 10,250,000 acres, or 60¾ per cent. of the cultivated area, were under wheat.

In Queensland, in the same year, we find that, of the total cultivated area amounting to a little over 1,000,000 acres, 166,000 acres were under wheat (16 per cent. of area); 154,000 acres were under maize (14.9 per cent.); 247,000 acres were under green fodder crops (23.9 per cent.); 190,000 acres were under sugar-cane (18.4 per cent.); and 40,000 acres were under cotton (3.9 per cent of area).

In the world's production of wheat, Australia's crop of wheat plays a very insignificant part, being only about 3 per cent. of the total crop in 1925, and only 2½ per cent. in 1913, as seen in the following table, which gives the world's production for the year 1925 as compared with the pre-war period 1912-13.

Although the actual percentage of our wheat crop as compared with the world's production is so small, it is, however, of the greatest importance to us, as our export of wheat amounted to 125,000,000 bushels in 1924-25, and 78,250,000 bushels in 1925-26, the latter export valued at £24,500,000 sterling.

We are able to export this large amount of wheat because our production per head of population is fairly high, and only exceeded by Canada and Argentine. The amount of wheat available to export depends on the difference between the consumption of wheat and the amount of wheat produced per head of population. In Australia the consumption of wheat for human food amounts to a little over 5 bushels per head, the average for ten years ending 1925-26 being 5.16 bushels, while the minimum amount was 4.8 bushels in 1919-20 and the maximum 5.78 bushels in 1917-18. Including the amount of wheat used as poultry food and other stock and required for seed purposes, the total consumption of wheat in Australia is about 7½ bushels per head.

It is interesting to note the influence of the great war on the consumption, and we find the following consumption of wheat per head of population in:—

	1913. Bushels.		1922. Bushels.
France	9.5		6.9
Italy	8.0		6.6
Canada	7.6		5.4
U.S. America	6.6		6.1
Australia (average of 9 years)	5.58	(10-year average)	5.16
United Kingdom	6.0		5.7
Russia (European)	5.1		1.4
Germany	3.6		2.0
India	1.6		0.9

The United Kingdom is the chief importer of wheat in Europe, as it produces only 1.2 bushels per head and consumes 5¾ bushels. From all parts of the world a stream of wheat flows to England, and Australia contributes about one-third of the United Kingdom's requirements by sending 40 per cent. of its export wheat to England.

India, although its production per head is so small—only 1.3 bushels—is able to export large quantities, because wheat plays only a minor part as a food of the natives, who consume only about nine-tenths of a bushel of wheat per head.

World's Production of Wheat.

	1912-13.			1925.		
	Millions of—		Bushels per Acre.	Millions of Bushels Produced.	Bushels per—	
	Bushels Produced.	Acres Cultivated.			Acre.	Head of Population.
United States	708·0	45·8	15·5	666·5	12·8	5·7
Russia, Europe, and Asia	779·0	78·0	10·3	661·1	12·4	5·0
Canada	199·2	9·8	20·4	411·4	18·7	43·3
India	358·4	29·4	12·1	324·9	10·2	1·3
France	325·1	16·2	20·0	330·8	23·9	8·1
Argentine	198·4	17·1	11·6	191·1	10·0	19·3
Italy	165·7	13·2	14·1	240·8	20·6	5·9
Spain	109·8	9·6	11·4	162·6	15·2	7·4
Australia	92·0	7·3	12·5	114·5	11·2	18·8
Germany	160·2	4·8	33·7	118·2	30·8	1·9
Roumania	86·2	5·1	16·9	104·7	12·8	6·0
United Kingdom	57·4	1·9	29·1	52·9	34·1	1·2
Hungary	184·6	9·5	19·3	71·6	23·3	8·6
Servia	15·3	0·9	16·0	..	..	..
Jugo-Slavia	..	..	..	78·6	17·9	6·5
Poland	..	..	..	57·9	21·4	2·0
Egypt	30·9	1·4	21·7	36·2	26·3	2·6
Czecho-Slovakia	..	..	..	39·3	25·8	2·7
Bulgaria	63·7	2·8	23·0	49·6	19·6	9·0
Japan	25·7	1·2	21·1	29·5	25·7	0·3
Chili	..	..	..	27·6	18·4	7·0
Algeria	27·2	3·6	7·5	32·7	..	5·9
French Morocco	..	..	..	23·9	9·1	4·5
Belguim	15·3	0·4	38·7	14·5	36·7	1·9
Greece	..	..	..	11·2	12·5	1·8
Mexico	..	..	..	9·4	..	0·7
Portugal	11·8	1·2	9·8	11·5	9·1	1·9
Uruguay	8·8	0·8	11·0	9·6	9·5	5·7
Sweden	7·6	0·2	32·5	13·8	38·0	2·3
Korea	..	..	..	10·5	11·9	..
Austria	67·6	3·1	21·7	10·7	22·0	1·6
Denmark	3·5	0·13	26·9	9·7	49·3	2·8
Syria	..	..	..	7·5	..	2·5
Union of South Africa	..	..	..	8·3	7·9	1·2
Tunis	3·6	1·5	2·4	11·8	..	5·5
New Zealand	5·2	0·17	30·1	4·6	28·8	3·2
Netherlands	5·5	0·14	38·6	5·6	42·2	0·8
Total for World	3,676	..	..	3,891	..	..

Other countries producing less than five million bushels are not listed.

The actual production of wheat per acre is also of interest, but it must not be overlooked, however, that the figures given are not in all cases strictly comparable, as the yield may actually represent two seasons, if the wheat crop follows a bare fallow as practised in dry areas. The average yield of wheat in the world is 14 bushels per acre. varying from about 8 bushels produced in the Union of South Africa to over 49 bushels harvested in Denmark. Great fluctuations in the yield will be found in most countries according to seasons, and the yields are very erratic in Argentine and Soviet Russia.

In a ten-years period ending 1916, we find the recorded yields of a few countries as follows:—

—	Average.	Maximum.	Minimum.
Canada	19·5	23·7	15·2
United States	16·4	16·6	12·4
India	12·6	12·8	9·7
Australia	11·5	13·8	8·2
Argentine	10·4	13·5	7·0
Russia	10·0	13·5	7·0

In India, where a large proportion of the wheat is grown under irrigation, the variation of the yield is less marked. Very remarkable are the high yields obtained in Denmark, Netherlands, Belgium, and Sweden. In most European countries the yield increased during the last sixty or seventy years, and we find, for instance, the yield in Netherlands to be, in bushels per acre, as follows:—

1851-60	1891-1900.	1906-1908.	1912-13.	1925.
21.5	27.7	36.0	38.6	42.2

In the United Kingdom the variation in the yield is much smaller than out here in Australia, as we find an average yield of 31.5 bushels in the ten years ending 1913, with a maximum of 34.8 bushels and a minimum of 26.3 bushels per acre, as compared with the yield of 34.1 bushels in 1925. Scotland's average yield is 41.2 bushels, varying between 36 and 42½ bushels.

We will now look at some of our Australian records, and we find for the ten years 1916-1926 the following results in the various States:—

—	New South Wales.	Victoria.	Queensland.	South Australia.	West. Australia.	Tasmania.	Australia.
Bushels per acre	11·8	14·4	13·3	12·4	10·1	18·1	12·4
Maximum and minimum	17·8–3·0	17·5–7·8	20·9–4·8	16·5–7·8	12·8–7·4	22·6–11·6	16·1–7·2
Bushels per head	16·7	23·6	2·3 (?)	59·8	43·9	17·2	21·6
Maximum and minimum	26·5–2·1	28·6–9·9	4·9–0·1	103·5–31·1	65·6–28·6	2·7–0·9	31·0–8·7

The low yields in bushels per acre were obtained in the disastrous years 1918-1919 and part of 1919-1920. The phenomenal yield of 103.5 bushels per head in South Australia was obtained in 1916-1917, and the high yield of 65.6 bushels per head in Western Australia in the year 1924-1925. A record yield in our State was obtained last year (1927) with a yield of 66⅔ bushels per acre at Massie, Darling Downs.

In the year 1915-1916 the highest production of wheat with 179,000,000 bushels was recorded, and the annual average production for the ten years ending 1926 was 117,750,000 bushels. The great improvement noticed during the last years in getting a succession of good yields is largely due to improved methods of cultivation, bare fallowing, and application of fertilisers.

The keeping up of the yield and the increase of the acres under wheat are of the utmost importance, as already at the present time the world's consumption of wheat is barely covered by the production, a fact which was already predicted years ago by Professor Sylvanus P. Thompson. When production and consumption are so closely balanced, it follows that failure of crop in one or more of the exporting countries must have a serious effect and raise the price of the wheat in the world's market, whereas over-production must naturally lower it. The price of wheat in the British market is a fair index of the world's supply, and these prices are of the greatest importance to our wheatgrowers.

AVERAGE PRICES PER IMPERIAL QUARTER OF WHEAT IN THE UNITED KINGDOM FOR BRITISH-GROWN WHEAT.

Year.	s. d.	Year.	s. d.
1861	55 4	1919	72 11
1871	56 8	1920	80 10
1881	45 4	1921	71 6
1891	37 0	1922	47 10
1901	26 9	1923	42 2
1911	31 8	1924	49 3
1913	31 8	1925	52 2
1917	75 9	1926	53 3
1918	72 10		

The effects and after effects of the great war are clearly shown, and only in 1922 prices became more or less normal again. The average prices of wheat per bushel in the Australian market were 1921-22, 5s. 9d.; 1923-24, 4s. 8d.; 1925-26, 6s. 4d.; 1926-27, 5s. 7d. The price of wheat appears to be now fairly stable, and should keep within the limits of the prices realised the last five or six years.

The Agricultural Experiment Station of the University of Illinois addressed some years ago a circular letter to the leading agricultural investigators of Europe to ascertain the causes of the large and steady increase in the yield of wheat and other cereal crops during the past century, and more particularly the relative proportion of the increase attributed to each of the following four factors:—

(1) To the use of improved seed;

(2) To the use of plant food in commercial fertilisers and stable and green manure;

(3) To better rotation of crops;

(4) To more thorough tillage.

The answers to this circular were fairly unanimous, and may be summarised as follows:—

To the improvement of seed an increase of 10 to 15 per cent. may be attributed.

The largest part of the increase, estimated from 50 to 70 per cent., is due to the proper use of artificial fertilisers.

Thorough tillage and particularly deep cultivation are estimated to increase the yield from 15 to 30 per cent.

Rotation of crops, in connection with throwing out of cultivation lands unsuitable for wheat culture, may be the cause of an increase from 10 to 12 per cent. in the average yield.

The increase in the actual yield, which amounts in many of the countries to an actual doubling of the crop, is therefore due to factors well known and as old as agriculture itself. The lessons learned from these facts should be extensively applied to our local conditions, and should help to arouse the interest of our wheat-growers to strive for a larger yield, general improvements in cultural methods, and lead to a considerable increase of the areas under cultivation.

In accordance with our own experiences we could amplify or add to these factors the following:—

(*a*) Practising a system of cultivation which retains and conserves soil moisture.

(*b*) Breeding and selection of varieties of wheat to suit the soil and environments found in different localities.

With regard to the system of cultivation to conserve moisture, good results have been obtained by bare fallowing, which will be referred to later on.

The breeding of rust-resistant and early maturing rust-escaping varieties of wheat, for Queensland conditions, possessing improved field characteristics, has been successfully carried on for a number of years at the Roma State Farm by the Manager, Mr. R. E. Soutter. Our Director of Agriculture, Mr. H. C. Quodling, reports that several excellent varieties are now in general cultivation, and a marked improvement in the crop yield was in evidence in the 1927 harvest. It is interesting to notice that the wheat breeder referred to has combined the two important factors —rust resistant and prolificness—in one of his new varieties, "Three Seas." Grown as a summer crop it resisted black rust (*Puccinia graminis*) and gave a return of 24 bushels per acre of medium hard, round, plump grains of good milling quality. The same variety gave the rather exceptional yield of 50 bushels per acre at Allora in November, 1927. An accomplishment of this character is full of significance, and serves to demonstrate the value of plant-breeding work as an economic factor in production.

In order to get some understanding of the bearing of the various factors on wheat culture, I shall now proceed to give a short outline of the composition of a wheat plant, and describe briefly "How a Wheat Crop Grows":—

A wheat plant consists of complex organic matter, which may be destroyed by burning, and of mineral matter left after burning in the form of an ash. Of the eighty odd elements, which are known to exist in Nature, only a small number—some twelve or fourteen—are found in a plant.

In the formation of organic or combustible matter, the elements carbon, oxygen, hydrogen, nitrogen, and traces of sulphur and phosphorus take part.

In the ash we find, besides small amounts of the last two elements already mentioned, other non-metallic elements silicon, chlorine, and the metallic elements potassium, sodium, calcium (lime), magnesium, iron, and aluminium.

The green wheat plant will contain from three-fourths to four-fifths of its weight of water, which in wheat straw amounts only to about one-seventh. Now, in the actual dry matter remaining, carbon forms about one-half by weight; oxygen, a little more than a third; nitrogen in the straw from ½ to 1 per cent., and in the grain from 2 to 3 per cent.; the ash in the straw amounting to about 5 to 6 per cent., and in the seed about 2 per cent. The composition of the ash of the straw and of the seed is totally different, the former containing about 70 per cent. of silica, the latter only about 2 to 5 per cent; we find only about 15 per cent. of potash in the ash of the straw, and about 30 per cent. in the ash of the seeds.

Now, let us ask,—Where does all the building material required in the growth come from?

The carbon, the principal constituent, is entirely obtained from the minute quantities found in our atmosphere. The air contains only about 3 parts of carbonic acid in 10,000 parts; or in a cubic yard of air, which weighs about 2¼ lb., we find only 7 grains of carbonic acid. All the absorption of the carbonic acid, and subsequent transformatiaon into sugars and starch and tissue, is carried out by the leaves; and we can form some idea of the immensity of the work done when we consider that a crop of wheat collects during its growth in three or four months on an acre of ground over 2 tons of carbon from over 7 tons of carbonic acid.

The air enters into the leaves through the very small openings (stomata) found on the surface, and the actual change is carried on by the aid of sunlight absorbed by the green colouring matter (chlorophyll) in the leaf cells. The actual work done by the sun in the production of our crops is enormously large, and is estimated to be at least 3,000-horse power per day per acre, corresponding to the work of 15,000 men. During this assimilation free oxygen is given off by the leaves. The leaf openings also serve for transpiration or evaporation of part of the water absorbed by the roots and carried through the stem to the leaves. If the transpiration is too quick, the plant wilts; but the plant is able to control this evaporation to a large extent by a more or less closing of these openings.

The products of the carbon assimilation are the carbohydrates—compounds formed, as the name implies, from carbon and water. Well-known carbohydrates thus formed at various periods of growth are—sugars, starch, and cellulose. The carbohydrates, when consumed as foods by men or animals, produce heat.

Of great importance are the organic nitrogen compounds—proteins or albuminoids—to which the wheat grain owes its value as one of the most nutritious cereals, and makes it particularly suited for the manufacture of bread.

An inexhaustible supply of nitrogen exists in the atmosphere, four-fifths being pure nitrogen; but it has always been accepted as a law that this atmospheric nitrogen is not directly available to higher plant life. Small amounts of nitrogen combine with the oxygen under the influence of electric discharges, and the compounds formed are collected by the rain water. The amount of nitrogen in form of soluble compounds thus collected in the soil amounts to 3 to 4 lb. per acre annually—a quantity quite insufficient to supply the needs of a wheat crop.

The soil, however, in each of its smallest particles, is alive with millions of bacteria; and some of these have the power to utilise and assimilate the atmospheric nitrogen, which then indirectly becomes available to the higher plants.

The mineral constituents found in the wheat plant are all derived from the soil, and the amounts removed are very considerable. The most important of these plant foods are potash and phosphoric acid, and also lime; and it is the duty of every farmer to guard against the exhaustion of these compounds in their lands under cultivation.

Each constituent plays its own important part in plant nutrition; and if one is missing, even an abundance of the others would not produce a vigorous and healthy plant. This fact was first made known by Baron von Liebig, who formulated it as his Law of Minimum, in which he states that the quality and quantity of a crop rise and fall according to the quantity of an essential factor of plant growth, which is available in a minimum amount. This law has been modified in modern time, and Wollny adds that also an excess of any constituent must be taken into consideration, and each factor of plant growth plays an important part in accordance with being present in mimimum, optimum, or maximum amounts.

Nolte, in his recent work, states that for plant growth not the actual quantity of any nutrient is the deciding factor, but rather that all the factors necessary for plant growth must be available in amounts in a natural harmonic proportion to each other.

The small amount of available mineral plant foods in the soil are absorbed by the aid of the fine feeding roots and utilised by the plant in the production of various organic compounds in the leaves. Some years ago it was shown by Prof. Wilfarth that the amounts of mineral foods varied at different periods of growth, and that certain amounts of these substances were returned to the ground as the plants reached maturity. A heavy crop of wheat, grown at the Experimental Station at Bernburg, was cut at four different periods, on the 22nd June, 14th July, 5th August, and 28th August, when the crop was 8½, 11½, 15, and 18 weeks old, after the first appearance of leaves above the ground, with the following composition:—

	Pounds per Acre.					
	Dry Substance.	Starch.	Nitrogen.	Phosphoric Acid.	Potash.	Soda.
			N.	P_2O_5.	K_2O.	Na_2O.
First cut	2,618	92	79·9	19·5	88·6	16·3
Second cut	6,860	661	87·4	31·5	123·5	27·7
Third cut	8,983	1,058	114·3	42·1	122·2	18·6
Fourth cut	9,274	2,018	92·4	43·6	72·7	12·8

The amount of potash reached its maximum at the second stage, with 123.5 lb. per acre, and at the time of absolute ripeness of the grain, at the fourth cut, only 72.7 lb. were found in the plant, so that 50 lb. were returned to the soil, after having done their share of work in the building up of organic substances.

In the case of phosphoric acid there was no decrease, and of the 43.6 lb. of phosphoric acid in the plant about 30 lb. were found in the grain.

From actual experiments carried out on our State farms we found that a 15 bushel per acre crop of wheat removed from the soil 25 lb. nitrogen, 12 lb. phosphoric acid, and 15 lb. potash. These amounts appear very small, but it will be a surprise to learn that a 2,000,000 bushel wheat crop in Queensland removes from the ground 1,500 tons of nitrogen, 720 tons of phosphoric acid, and 900 tons of potash, which, if they had to be supplied by artificial fertilisers, would cost £200,000.

Nitrogen is supplied by the soil, and potash also is generally found in sufficient amounts, but phosphoric acid is frequently deficient, and this important fertilising constituent must be supplied to ensure good wheat crops. Unfortunately we pay too high a price for our superphosphate, and the cost of superphosphate alone, if it had to be purchased, for this 2,000,000 bushel crop comes to about £20,000.

But not only the mineral plant foods are factors of growth, but of equal importance are light, heat, and moisture. The importance of moisture is well known to our wheatgrowers, and the result of droughts is clearly indicated by poor crops; but the necessity of water will become more apparent when I state that for the production of every pound of dry substance in a crop from 300 to 400 lb. of water have to circulate through the plant, and that for the production of a wheat crop at least 1,000 tons of water, corresponding to 10 inches of rain, are required.

The conservation of rain water lies again largely in the hand of the farmer. A series of experiments, in which the amount of moisture in soil was determined at various depths and with various methods of cultivation, were carried out at the Roma State Farm for several years, and showed clearly how the system of bare fallowing not only leads to a quicker absorption of any falling rain but almost completely prevents any loss by evaporation, provided the surface is tilled as soon as it is dry enough for the purpose. The results of these experiments are of such value that a summary of the results published in the annual reports is here repeated.

SOIL MOISTURES AT ROMA STATE FARM.

Averages for Twelve Months.

—	1910-11.				1911-12.				1912-13.			
	Per Cent. Moisture at the Depth of—				Per Cent. Moisture at the Depth of—				Per Cent. Moisture at the Depth of—			
	6″	1′ 6″	2′ 6″	3′ 6″	6″	1′ 6″	2′ 6″	3′ 6″	6″	1′ 6″	2′ 6″	3′ 6″
Uncultivated ..	7·52	11·28	10·72	9·98	4·79	6·57	7·24	7·89	7·37	8·30	8·08	8·30
Cultivated ..	7·36	14·44	12·04	12·57	6·41	10·67	10·35	10·56	7·31	9·18	8·26	9·48
Bare fallow ..	11·42	12·97	12·79	13·86	9·08	12·43	11·88	13·76	9·24	12·56	11·15	12·93
Rainfall—Inches	28·26				20·97				21·63			

This brings us to the importance of thorough cultivation, the want of which is largely the cause of small yields on some of our farms. Deep cultivation is also a necessity, and allows the roots to get deeper into the ground and draw on fresh supplies of mineral plant foods. Deep cultivation does not by any means necessitate the turning up of the soil and bringing the subsoil to the top, which in most cases would ruin any farm, but rather a stirring up of the subsoil and the breaking up of any pan which may form if the ground is always ploughed to the same depth for years.* The continual breaking up of the surface soil, as long as the crop permits such working, will keep the soil cool, allows free entrance of air, prevents evaporation, hinders the growth of weeds, and will minimise the effects of adverse dry seasons.

There is, however, one serious drawback with the system of bare fallow cultivation—that it leads to a considerable loss of humus in the soil, which can only be remedied by ploughing in a green manure crop from time to time.

Wheat can be grown on a wide range of soil types, but as a rule silty and clayey loams, with a light clayey porous subsoil, are best suited to wheat culture. Sandy soils are not so satisfactory, as they generally lack in plant foods; again, stiff clayey soils are not suitable. Wheat is grown in almost all countries, but does best in temperate, warm, and rather dry climates. The climate, again, has an important influence on the quality of the wheat grain. There can be no doubt that most of the land at present under wheat in Queensland is eminently suitable for wheat culture, and that very large areas quite as good are still available and will be utilised later on as our population increases.

Professor Shelton, the first Principal of the Gatton Agricultural College, with his world-wide experience on wheat culture, estimated years ago the area of land in Queensland suitable for wheat at about 50,000,000 acres. In 1925-26, out of an area of 1,033,765 acres of cultivated land, only 166,000 acres were under wheat, and, in consequence, Queensland, in spite of its huge area of good agricultural land, does not produce enough breadstuff for its own requirements, and even this year's exceptionally good crop of nearly 4,000,000 bushels will leave us 2,500,000 bushels short for our own requirement for food and seed.

Although a large majority of the soils of the huge area of agricultural land in Queensland are fit for wheat culture, our climatic conditions are such that an exclusive growing of wheat, as practised extensively in South Australia and Western Australia, is not advisable here in Queensland. Experienced wheatgrowers from other States who have settled in Queensland, attracted by the good soils and promising conditions, found out that their expectations in regard to wheat were not always realised, as the variation in climatic conditions had to be provided for and their usual system of cultivation required some modifications.

There is no doubt that a possible increase of wheat culture in Queensland lies in a carefully planned system of mixed farming. Attempts of such have already been made, on the lines of combining wheatgrowing with dairying, with more or less success, but it may be safely stated that much better results can be expected by combining wheat culture with sheep breeding and lamb raising, and this system is

* This, of course, does not necessarily apply to the heavy black soils common to many districts of the Darling Downs, where shallow, thorough cultivation has proved the more dependable practice.—Ed. Q.A.J.

now gradually extending. Large numbers of sheep are already kept on many wheat farms in New South Wales, and wheat crops are frequently planted early, to be fed off two or more times by sheep before being allowed to mature. Of course, such feeding off may lower the yield of grain, unless judgment is used.

Sheep grazing on wheat lands improves the condition of the soil, and a large percentage of the food consumed is returned as fertiliser to the ground. The farmer gets a good return from the sheep, even if the wheat crop should fail. The raising of fat lambs is probably the best paying proposition for wheatgrowers, but it is necessary to have always an ample supply of food, and fodder crops must be grown in addition to wheat, and rotation of crops should be practised.

With regard to application of fertiliser to increase the wheat crop, we have to be guided largely by the experiences gained elsewhere.

In the celebrated English Experiment Station on Rothamsted tests have been carried out continuously for sixty-five years, and in a block which has been kept permanently unmanured the average yield for forty years was 14 bushels per acre, showing, however, a steady decline from year to year. Particularly remarkable are the results with continuous application of farmyard manure—14 tons per acre annually—the block yielding, as an average of thirty-two years, 33½ bushels of dressed grain. An almost equally good result was obtained with a complete artificial fertiliser, supplying every year 140 lb. of phosphate of lime, 100 lb. of potash, and 86 lb. of nitrogen in the form of ammonia salts; this plot yielding, as an average of thirty-two years, 32¾ bushels per acre.

The effects of nitrogenous manures are particularly striking, and nitrogen in the form of nitrates produced slightly more growth than when supplied in the form of ammonia salt.

As a rule, it is a well-known fact that wheat in general requires a nitrogenous manure to stimulate its growth, and that the plant is then quite able to get a sufficiency of phosphoric acid and potash. These laws apply unquestionably to wheat-growing in colder climates; but, with us, our climatic conditions modify them to some extent. Experience gained in our Sister States, Victoria and South Australia, and extending now over a good number of years, show clearly that our wheat crops require generally a small application of phosphoric acid in a water soluble form. and slight dressings with, say, 30 to 60 lb. of superphosphate per acre in the plant drills may be justified, even if the soil in itself does not appear to be deficient in phosphoric acid. The small amount of phosphoric acid appears to stimulate an early and vigorous growth of the roots of the young seedling plants, so that they are enabled to reach quickly the cooler and moister layers of subsoil.

This improvement in the root system of wheat plants grown with superphosphate application persists throughout the life of the plants, and in the mature plants roots down to 4 and more feet have been found, fully 1 foot longer than the roots of wheat plants grown on unfertilised soil.

The application of superphosphate to wheat is quite general in our principal wheat-growing States; in Victoria 97.5 per cent. of the cultivated area is fertilised, South Australia 89.4 per cent., Western Australia 98.6 per cent, and in Queensland only 6.6 per cent. of the cultivated area is fertilised, which is chiefly sugar land. Victoria used, in 1925-26, 195,000 tons of artificial fertiliser and Western Australia 130,000 tons, and the phenomenal increase of the wheat crop in Western Australia from 13,000,000 bushels in 1921 to 30,000,000 bushels in 1926-27 is chiefly due to the use of fertilisers and highly favourable climatic conditions.

A light application of nitrogenous manure, in addition to the phosphatic fertiliser, also generally increases the yields; and in soils which have been under cultivation for a long period an addition of a small quantity of sulphate of potash may also be necessary in order to get maximum yields.

Very complete field experiments, in which the Agricultural Department co-operates with farmers, were instituted years back in Victoria by Dr. Howell, and more recently similar experiments have been started in New South Wales. In New South Wales farmers' experiment plots have been established in four divisions of the State; in each division from fifteen to twenty farmers are carrying out such trials; and in most cases the experiments are made on half-acre plots. Varieties favoured by the farmers are grown side by side with varieties supplied by the Department; and a few of the trials are manured with light dressings of superphosphate, and superphosphate in combination with sulphate of potash.

The results so far showed distinctly heavier yields of the departmental varieties as compared with the farmers' varieties; and the manured plots, with very few exceptions, gave increased yields, well paying for the increased expenditure. Finally, it may be stated that heavy applications of artificial fertilisers do not pay in wheat culture.

OVERSEA MEAT MARKET PROSPECTS.

The German Market.

Interesting information in connection with a visit to Germany in September last by Mr. Ross Grant, Commonwealth Veterinary Officer attached to the High Commissioner's Office, London, for the purpose of observing the conditions ruling and the future prospect of the frozen meat industry, is contained in a report furnished to the Minister for Markets (Mr. Paterson).

The quantity of frozen meat permitted importation duty free into Germany is about 10,000 tons per month, or 120,000 tons per annum. While the general opinion in the trade is that this quantity is insufficient, and should be increased to 200,000 tons per annum, the opposition of the agricultural interests is too powerful to permit of this being done, and it is extremely unlikely, Mr. Grant considers, that the quantity will be increased above the present limit of 120,000 tons per annum, of which about one-seventh to one-sixth (15,000 to 20,000 tons) is contributed by Australia.

As to the future prospects of the trade, Mr. Grant expressed the view that there is no chance of expansion while the present restriction of imports continues, and in addition to this it may safely be assumed that there is a definite limit to price in Continental markets; in other words, if the price of frozen beef rises above 4½d. per lb. c.i.f. Hamburg or Antwerp, there is a corresponding fall in demand and consumption.

Agricultural Conditions in Northern Germany.

While in Germany, Mr. Grant visited the provinces of East Friesland, Oldenburg, and Hanover, where the fullest courtesy and assistance were extended to him by the officials.

Mr. Grant found that the black and white Friesian type of cattle is the almost universal breed in this part of Germany, and while it is, of course, a dairy breed, and efforts are mainly directed towards increased milk production, yet it also provides a considerable amount of the home-produced meat supply.

A very considerable degree of general excellence has been obtained by the establishment of Herd Book Societies throughout the country. To these societies stock raisers, both large and small, belong, and all animals must qualify by pedigree and individual performance in order to be admitted to the district herd book. Inspection and approval of animals for admission to the herd book is carried out by specially qualified officials, the majority of whom hold University degrees in agriculture. All animals are subjected to the tuberculin test twice yearly, and Mr. Grant was very much impressed by the general high standard of health of all the herds inspected.

Serradella—A Useful Catch and Green-Manuring Crop.

A point which may be of use to Australian agriculture is the wide use which is made in Germany of Serradella (*Ornithopus sativus*) as a catch crop for feeding purposes and for ploughing-in to improve the percentage of humus and nitrogen content of light, sandy soils.

This plant (Serradella) should succeed in the cooler districts of Australia, especially on sandy soils, and if found suitable to the climatic conditions of the Commonwealth may prove of considerable value in increasing fertility by the addition of organic matter and nitrogen to the poorer classes of land, as well as for feeding purposes.

Frozen Lamb.

In his report Mr. Ross Grant stated that there had been a general setback in the United Kingdom in the demand and price for plain quality frozen lamb, due to heavy supplies of this class of lamb by Scotland, the Argentine, and Australia.

Frozen Beef.

That the demand for Australian frozen beef in the United Kingdom is practically non-existent is not surprising when it is considered that for the first ten months of 1927 the importations of South American chilled beef into that country exceeded those for the corresponding period of 1926 by approximately 820,000 quarters. The total quantity of frozen beef exported to the United Kingdom by Australia during the same period of 1927 was 301,290 quarters. In the circumstances it is not a matter for wonder that frozen beef is practically forced off the market; and in addition to this the British farmer is finding the fattening of cattle an unprofitable business.

With regard to the settlement of the "Meat War" between South American firms, Mr. Grant remarks that the effects of this settlement remain to be seen. Assuming, however, that the total production of beef of chilled quality in South America is 1,750,000 head of cattle per annum, and that Great Britain is the only market for this meat—as it was in October last—then the finding of an outlet for such of this annual production as may be surplus to British requirements becomes the problem. If the surplus is frozen, then the price immediately falls to world's parity of frozen meat. Until such time as fresh markets can be found for the chilled article, or there is a reduction in the number of cattle of chilling quality produced in South America, it is difficult to see what effect the settlement of the differences among the large importing firms will produce.

Bacon and Pork.

One of the results of the embargo imposed in June, 1926, on the importation into Great Britain of fresh pork and veal from the Continent has been increased imports and lower prices for bacon in the United Kingdom. The prices ruling in October last were unremunerative, and it would not then have paid Australian farmers to export to the United Kingdom. The best Irish bacon was then realising only from 76s. to 87s., Danish 72s. to 74s., and Canadian 68s. to 72s. per cwt., with even lower prices for that from other European countries.

One very surprising feature, however, Mr. Grant states, has been the rapidity with which the shortage of fresh pork, due to the cutting off of Continental supplies, has been made up from other sources. During the few weeks preceding the date of his report, the supply of pork on Smithfield market had been more than sufficient for requirements and prices had been low. English pigs under 80 lb. weight had been worth from 6s. 4d. to 7s., and from 80 to 120 lb. 5s. to 6s. 4d. per stone.

Mr. Grant expressed the view that probably prices would improve somewhat during the winter months; but it certainly would not be profitable to forward either frozen pork or bacon from Australia while the abovementioned prices were ruling.

QUEENSLAND SHOW DATES.

The following show dates have been listed by the Queensland Chamber of Agricultural Societies for the present year:—

MARCH.	
Goombungee	23-24
Goondiwindi	21-22
Killarney	27-28
Chinchilla	27-28
Milmerran	29
APRIL.	
Pittsworth	3
Clifton	11-12
Toowoomba	16-19
Kingaroy	19-20
Dalby	26-27
Nanango	26-27
MAY.	
Beaudesert	2-5
Taroom	2
Maleny	2-3
Kalbar	2
Charleville	2-3
Wondai	3-5
Oakey	4
Mitchell	8-9
Mundubbera	9-10
Boonah	9-10
Murgon	10-12
Blackall	8-10
Roma	15-16
Gayndah	16-17
Ipswich	16-18
Springsure	16-17
Wallumbilla	22-23
Biggenden	24-25
Toogoolawah	25-26
JUNE.	
Marburg	2-4
Childers	2-6
Lowood	8-9
Bundaberg	7-9
Wowan	7-8
Miriam Vale	13-14
Gladstone	20-21
Gatton	28-29
Rockhampton	27-30
JULY.	
Mackay	3-5
Kilcoy	5-6
Esk	13-14
Townsville	10-12
Woodford	12-13
Nundah	14
Charters Towers	18-19
Caboolture	19-20
Ingham	20-21
Rosewood	20-21
Charters Towers	18-19
Laidley	25-26
AUGUST.	
Bowen	1-2
Royal National	6-11
Crow's Nest	22-23
Coorparoo	25

PLATE 61.—BRITISH BREEDS OF LIVESTOCK—AYRSHIRE.
Representing the type embodied in the aims of British breeders. (Reproduced from "Farming," an English publication.)

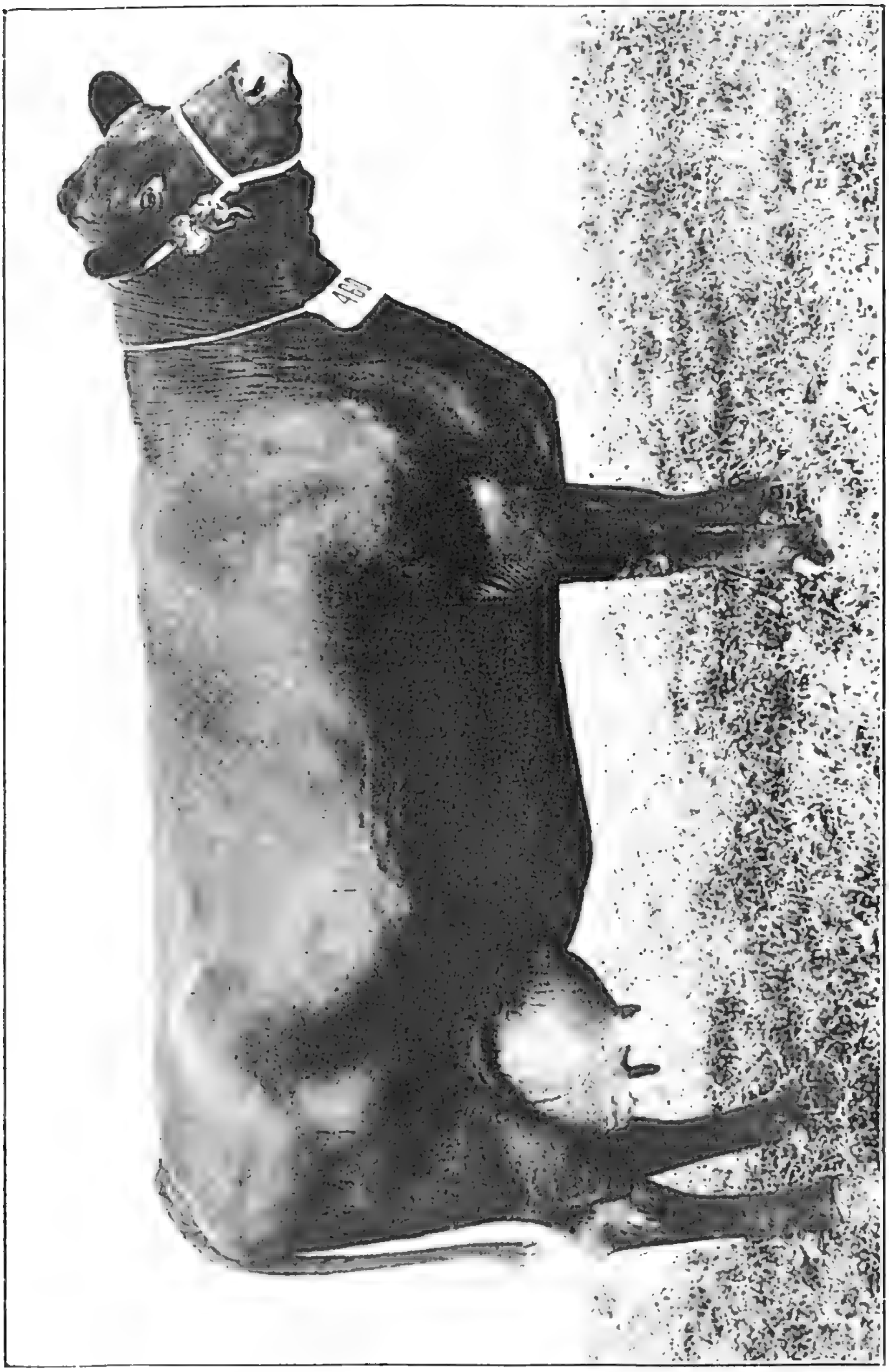

Plate 62.—British Breeds of Livestock—Red Poll Cow.

Representing the type embodied in the aims of British Breeders. (Reproduced from "Farming," an English publication.)

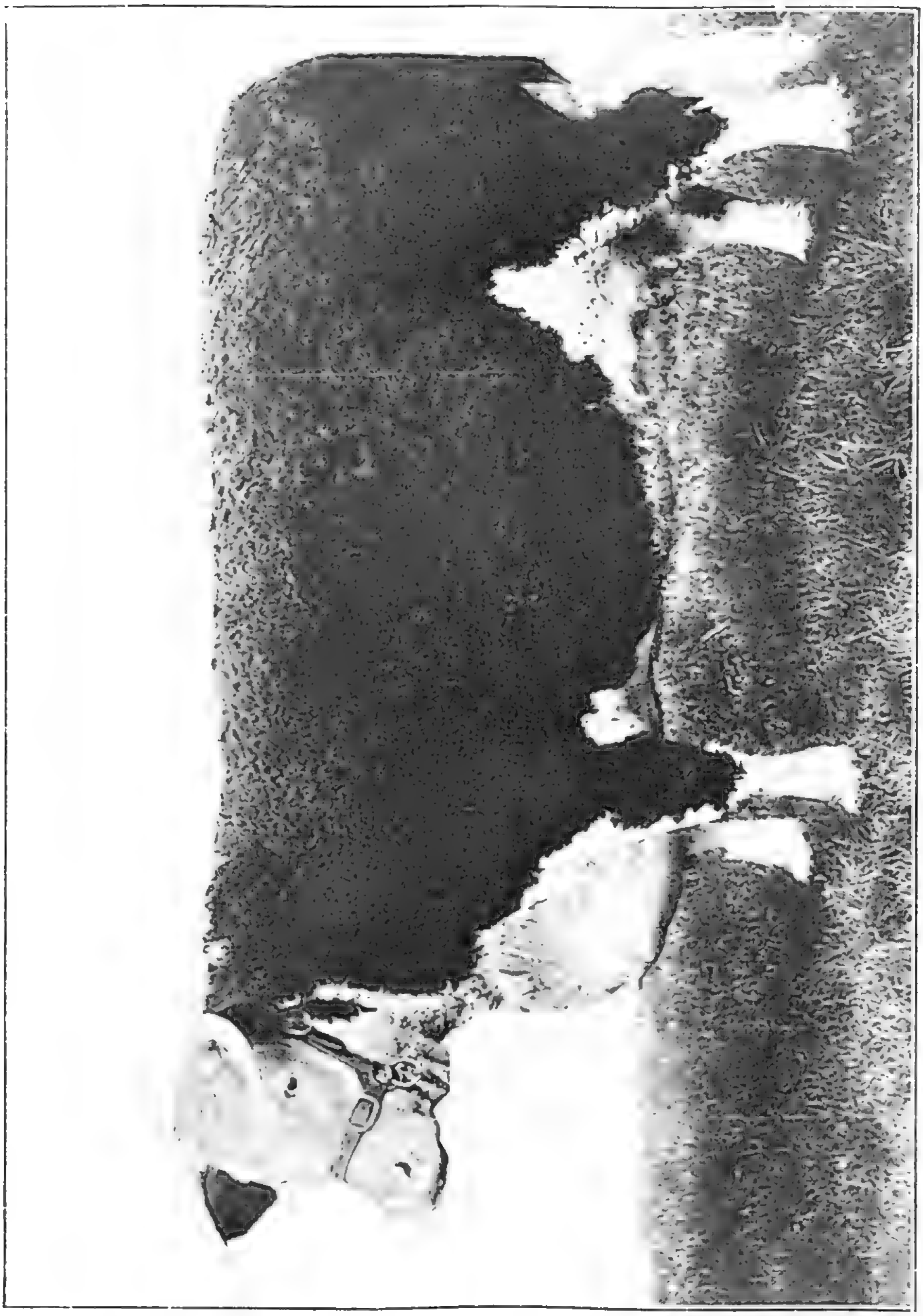

PLATE 63.—BRITISH BREEDS OF LIVESTOCK—HEREFORD COW.

Representing the type embodied in the aims of British Breeders. (Reproduced from "Farming," an English publication.)

PLATE 64.—BRITISH BREEDS OF LIVESTOCK—LINCOLN RED COW.

Representing the type embodied in the aims of British breeders (Reproduced from "Farming," an English publication.)

THE ANCIENT AND MODERN SHORTHORN.

AN INTERESTING COMPARISON.

Mr. J. L. Wilson, of Calliope, near Gladstone, has courteously supplied us with the following figures giving comparative measurements of typical specimens of the ancient and modern Shorthorn. They were originally given to him by Mr. Duthie Webster, of Collynie, probably the leading stud Shorthorn breeder of Scotland.

The photo shows "King William," 173110, the present stock bull at Collynie. He is a red roan, calved 13th November, 1921, bred by Duthie Webster, sire Balcairn White Eagle 153591; dam Eliza Lass, by Masterstroke 126820. King William was measured at Collynie in 1927, but his weight is unknown. His dam is the fine breeding red cow, dam of so many famous sires. His breeding is well represented in Messrs. Wilson and McDoual's herd on Calliope, Queensland.

"Billy," 3151, light roan, calved 12th January, 1837, was bred by Captain Barclay, sire Monarch 4495, dam Red Ears. "Billy" weighed 25 cwt. when exhibited at the Highland Show in Aberdeen in July, 1840, when the following measurements were made.

It will be noted how marked has been the improvement made as regards the highest price cuts of beef:—

DIMENSIONS.

—	Bull Billy.		King William.	
	Ft.	In.	Ft.	In.
1. From crown of head to top of shoulder	3	0	2	5
2. From top of shoulder to a point in the back in a line between the hook bones	3	2	3	6
3. From that point to tail head	1	11	1	8
4. Total length from crown of head to tail head	8	1	7	7
5. Length of tail, exclusive of tuft	2	7	2	7
6. Length of face from crown of head to point of nose ..	1	11	1	11
7. From a point in a line between the eyes to point of nose ..	1	2	1	1
8. Length of ear	0	8	0	9
9. Breadth of head between the ears	1	1	1	2
10. Breadth of face in a line across the eyes	0	10	1	2
11. Breadth across the hook bones	2	4	2	4
12. Breadth across the shoulders	1	4	1	4
13. Girth of muzzle	1	11	2	0
14. Girth of neck at onset of head	4	0	4	1
15. Girth behind the shoulders	8	4	8	8
16. Height from ground to fore elbow	1	3	1	2
17. From fore elbow to top of shoulders	3	10	4	1
18. Height of back at hooks from ground	4	11	4	9
19. Height of hind hook from ground	1	8	1	7
20. Depth from hook bone to bottom of flank	2	5	2	9
21. Depth between bottom of brisket and fore knee ..	0	3	0	1
22. Distance between the two hind feet when standing ..	0	10	1	2
23. Distance between the two fore feet when standing ..	1	0	1	3
24. Girth of bone below the knee	0	9	0	10
25. Girth before the hooks	8	6	9	1
26. Length from point of shoulder to hip	5	11	6	2
27. Length of quarter diagonally from hook bone to hip point	2	2	2	6
28. Girth of shank	1	10	2	3
29. Girth of forearm	1	8	1	11
30. Height from ground to bottom of flank	2	3	2	3
31. From ground to bottom of dewlap	1	6	1	1

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

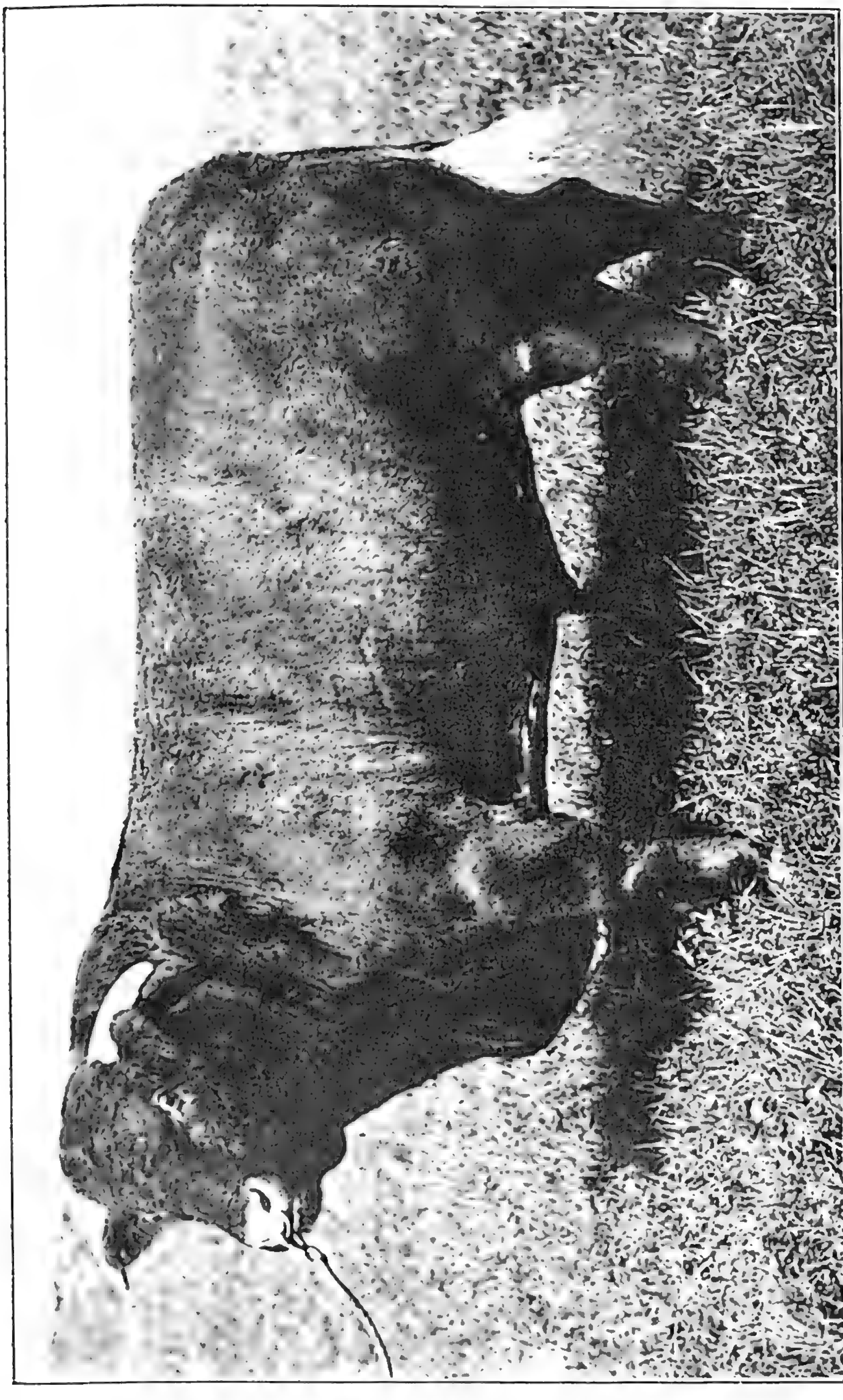

Photo. by courtesy of Mr. J. L. Wilson, Calliope.]

PLATE 65.—STUD SHORTHORN BULL "KING WILLIAM" (173110). BRED AND OWNED BY DUTHIE WEBSTER, COLLYNIE, SCOTLAND.

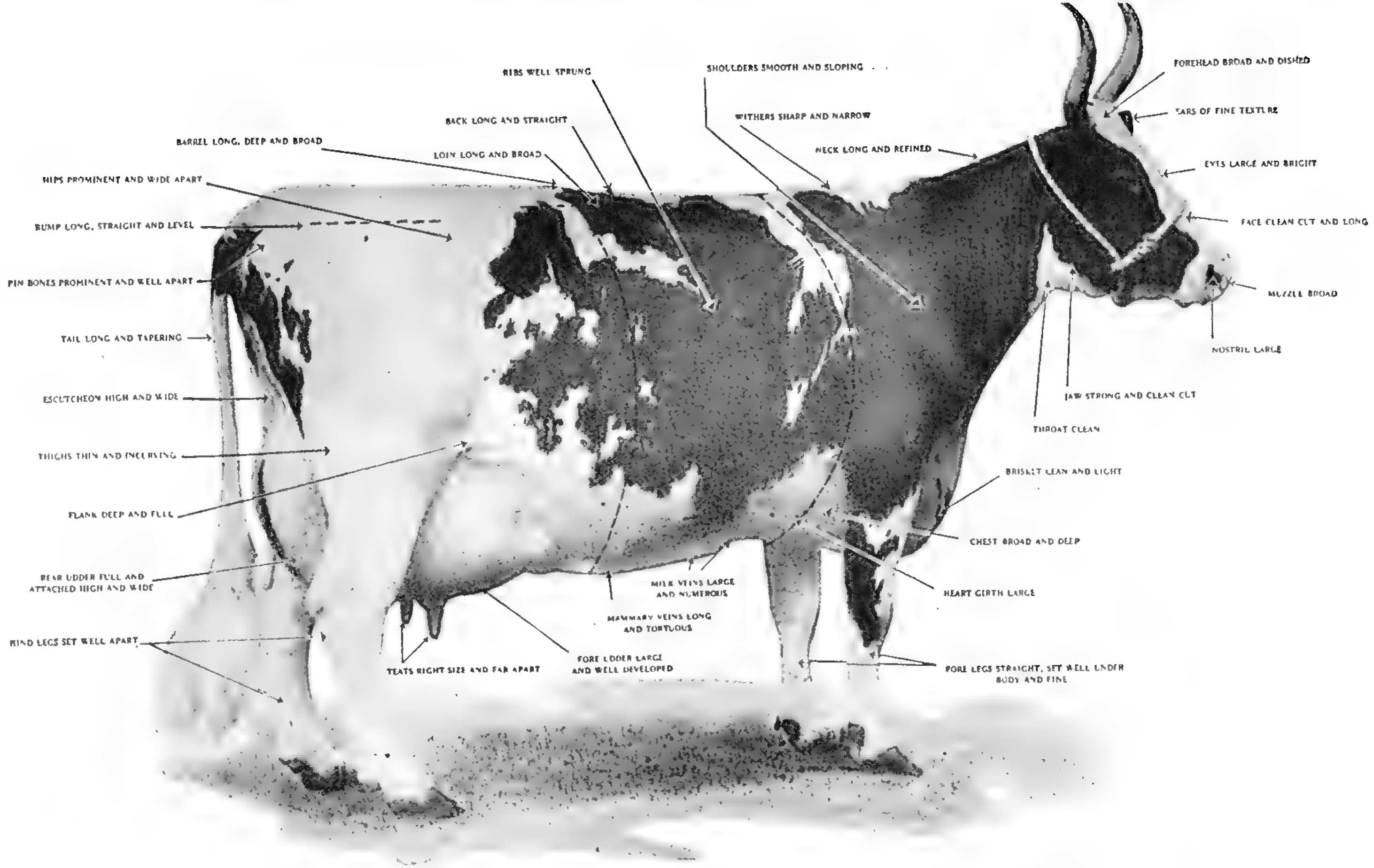

PLATE 66.—HOW TO JUDGE A DAIRY COW. (Reproduced from "Farming," an English publication.)

The above is an illustration of the points of an ideal dairy cow. As no dairy cow ever reaches the ideal it would be absurd to suggest that this cow is ideal, but she is not very far off. She is "Millantae Mayflower," the Ayrshire cow which gave 79·4 lb. of milk per day and won the Gold Medal at the Dairy Show, 1925, and gained further successes this year.

It is difficult to explain the various points verbally alone, and it is only with the help of a diagram such as this that they can really be made clear. Such expressions as "well-sprung ribs" have little meaning without a picture before one. We hope, therefore, that our diagram will be a help to our readers in obtaining a more exact idea of the points of the ideal dairy cow.

PLANT PROPAGATION.

By GEORGE WILLIAMS, Director of Fruit Culture.

Among cultivated plants, more particularly those prized for their fruit or flowers, other means than raising from seeds are employed so that an exact counterpart of the parent may be reproduced. Various methods are employed—layering, cuttings, divisions, but principally budding and grafting. The general tendency amongst plants which have been improved by cultivation and selection, particularly with hardwooded varieties, is reversion towards the original, but by adopting the usual available means improved features can be definitely perpetuated. This is particularly applicable to fruit trees, some of which produce a very limited number of seeds, whilst others are entirely seedless.

Among flowering plants the rose takes precedence, and it is invariably found that amongst the few new varieties catalogued each year that but a very small percentage show the least improvement on those previously existing, while the majority are inferior.

STOCKS.

In raising a supply of worked plants, the propagation of stocks is the first consideration. As applied to fruit trees, these are almost invariably raised from seeds of hardy kinds of the particular variety required. Exceptions are noted in grape vines and apples, though, so far as this State is concerned, it should also be rigidly applied to the latter. With roses, cuttings of various rampant growers which strike readily are utilised, attention being given almost entirely to a variety erroneously called Manetti.

The selection of stocks and their influence upon the graft or bud growth offers an extensive field for investigation. The influence of such growth upon the stock is an important aspect which has received very little consideration. It is also recognised that the influences of different soils affect very materially the development of trees and plants, and that better results may be obtained in particular soils by trees worked upon particular stocks suited to the immediate local conditions. Stocks for citrus trees has been a contentious subject for many years, various advocates favouring orange seedlings for orange and mandarin, others preferring rough lemon, sour orange, or shaddock, each advocate basing his opinion on experience, omitting, through lack of opportunity or the faculty of observation, to note results on different soils and under varied conditions. The analogy of cells between stock and scion is the basis upon which successful budding or grafting is effected and a permanent union assured. The apple and pear may coalesce for a time, but as the union is imperfect the graft will succumb within a short time. The pear on a quince stock will make further headway, but a very stunted tree will result, and usually amongst ligneous trees the diameter of the stock eventually much exceeds that of the graft, an order which can be reversed by working a vigorous grower upon a weak stock. A lemon on a seedling thorny mandarin affords a typical specimen; the cherrimoyer on sweet sop may also be cited. A dwarf peach worked on a common seedling affords the most striking influence of the scion upon the stock. The bud makes little more headway in inches than would be in feet if a bud from an ordinary type of peach had been substituted. Much has been written of bud selection; the occasion for which is obvious and the selection is a simple matter, but discrimination in stock selection has received little attention, though much is warranted.

Seedling Stocks.

In raising seedling stocks for fruit trees the first consideration is that seeds should be selected from matured fruit produced on hardy and reasonably vigorous trees, free from indications of disease and, in the case of evergreens, planted in seed-beds as early after taking from the fruit as can be managed. The resultant plants should be allowed upwards of twelve months in which to develop before planting in nursery rows. With stone fruits the seeds should be buried in slightly moist sand until the following spring, when they may be either planted direct in nursery rows or in a seed-bed and allowed to make a season's growth. Seeds of the custard apple are usually kept dry until spring and then planted; from the better quality fruits a high percentage of seeds are infertile. In growing cuttings for rose stocks hard wood is selected, and with a little shading during midsummer cuttings may be struck at any period of the year, provided the wood is sufficiently hardened. The selected canes are cut into lengths of about 12 inches, the lower leaves (if present) and thorns being removed by drawing through the hand containing a piece of coarse hessian or other suitable material; all buds (or eyes) with the exception of two or three at the top of the cutting are then cut clean out from their bases. If buds are completely removed no suckers will follow, but where partially removed growth will sooner or later make its appearance. The cuttings are then planted in position where to be budded, or very closely in a small bed to be transplanted after having made a growth into such a position. The depth to which the case of cuttings would be inserted in the soil would average 5 to 6 inches. The advantage in transplanting stocks after having become rooted is that their bases can be placed much nearer the surface, and the object in removing buds to within a short distance of their tops is that a clear stem is available for budding operation.

Budding.

Grafting is now seldom practised, and to the average propagator budding will meet all requirements. Several important features must be considered in connection with this operation, the principal being that the stock is vigorous and both it and the budwood are in a suitable stage; generally the younger the stock, within reasonable limits, the less chance of failure. As trees become older their bark thickens and their growth is made at seasonable intervals, whilst in earlier stages growth is fairly regular. On this account, deciduous trees offer the widest facilities, the growth being practically constant throughout the warmer months, and budding may be performed throughout the summer without fear of failure. Citrus stocks may be treated in early spring or autumn (for various reasons the latter is usually selected by nurserymen). Midsummer budding is also practised when weather conditions and growth are favourable. Roses may be budded at almost any time, though the heat of midsummer is often responsible for failures. Buds inserted just prior to or during the early ascent of sap have, if evenly cut and properly placed and fastened, every chance of success. During its ascent the sap traverses beneath the bark, depositing additions to the cambium layer, and it is only whilst this is in progress than an increase of the diameter of the plant is being effected. In its descent the sap flows through the previous layer (sap wood) converting this into hard wood, and, though the bark may be most readily detached from its base, there is no possibility of a union being effected during this process. The sap must be either down or in the early stages of rising. If superficial observation is insufficient, the actual position may be disclosed by raising a piece of bark and noting whether the exposed wood shows a decided green tinge; if a yellow tinge is disclosed it may be assumed that the time is not opportune. This applies not only to nursery plants but also to trees which have been headed back in the orchard for reworking.

Selection of Budwood.

The selection of budwood in deciduous trees is confined to the current year's growth, and will be gauged partly by the size of the stocks but mainly upon condition or stage of development. The bases only of suitable shoots can be used, and on no account should the softer parts extending towards terminals be used. The question of inserting the bud as cut from the stock or first removing the thin layer of wood cut with it may be a debatable one, but with deciduous trees as generally understood the removal of the wood layer is considered advisable, using what is known as a bark bud. In selecting budwood for citrus, the terminal growth is invariably omitted. Successive growths are determinable for some time by their markings, a joint apparently existing where each terminated. Soft, ill-formed shoots are discarded. Good, sound wood with prominent buds (in some varieties the prominence is less noticeable than in others) of the right size is selected. The diameter of the bud sticks may vary from three-sixteenths to a-quarter of an inch or even more, according to the variety and also the size of the stocks.

Budding Roses.

In budding roses, if fairly hard wood is used there is no occasion to remove the wood, but in some varieties it is almost indispensable to use half-matured shoots which have flowered (those with soft terminals are generally unsatisfactory), when the bark bud is much preferable. With citrus the removal from the cut bud of its layer of wood is rarely possible and in effect distinctly disadvantageous. In using wood buds, the occasion for maintaining a particularly keen edge on the knife blade is more pronounced. A thin blade of the best steel should be specially kept for the purpose. The average budding knife is almost superfluous. The material is seldom of the highest quality, and the blade, particularly in the hands of an amateur, too wide to ensure the necessary curve effected in starting and finishing the cut. The bud should be completely removed with one drawn cut, the heel of the knife being held at an angle of upwards of 45 degrees towards the operator. A highly tempered blade 2 inches or slightly less in length by ¼ inch in width, thinly ground and finished on a fine oilstone, will reasonably meet requirements on ordinary stock. For heavy stocks the reverse end of a budding knife is useful in dislodging the bark and assisting in the insertion of the bud. A detached bone substitute can readily be made if required. Where a large number of stocks are to be handled, the addition of an extra knife is an encumbrance, but its use for incising the bark of the stock, which carries small sand and earth particles, is recommended.

The pressure of the thumb against the bud, the lower end of which is inserted by raising the bark of the stock (which has previously been cut transversely and perpendicularly, forming a letter T) alternately on either side by pressure of the knife blade without its being in actual contact with the cambium, is generally sufficient to allow its being forced into position. Where a bark bud is used, it is customary to allow that part from about a-quarter to one-third of an inch above the "eye" to protrude and this cut off evenly at the transverse section of the T. Where a wood bud is used, it must be pushed well down until its upper extremity just reaches the actual position of the cross cut and not allowed to protrude. Tying is most satisfactorily managed with slightly damp rafia, commencing from the base of the inserted bud and working upwards, so that no air cavities are allowed to remain. Under a dry atmosphere in warm weather some advantage is derived from waxing over the tie completely with heated parawax. The tie is removed in from two to two and a-half weeks, by which time a junction is effected. The heading back of the stock should be effected when it is in a dormant stage; attempting it during a growing period will generally result in destroying the plants.

LEGISLATION REGULATING THE SALE OF SEEDS FOR PLANTING OR SOWING.

By F. F. COLEMAN, Officer in Charge, Seeds, Stock, Feed, and Fertiliser Investigation Branch.

Definition of Vendor.

A vendor under the Pure Seeds Acts is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds.

Invoice to be Given by Vendor.

The Acts require that on the sale of any such seed of not less than 1s. in value, the vendor shall at the time of the sale give to the buyer, or, if the buyer is not present at the time of sale, forward to him an invoice containing the statements required by the Acts.

The wording of the invoice should be to the following effect:—

> "The seeds mentioned in this invoice are for planting or sowing. Such seeds are of the kind or kinds specified, and contain no greater proportion or amount of foreign ingredients than is prescribed with respect to such seeds."

Seeds Sold in Made-up Packets to have Year of Growing Marked.

In the case of seeds in pictorial or other made-up packets, the year in which such seeds were grown must be clearly and indelibly marked upon the outside of each packet.

Definition of Foreign Ingredients.

"Foreign ingredients" shall include inert matter, seeds of weeds, and seeds of any kind other than the seeds in question; or dead, diseased, insect infested, non-germinable, or hard seeds.

"Inert matter"—Broken seeds less in size than one-half of a complete seed; or chaff, dust, stones, or any material other than seeds.

"Hard seeds"—Any seeds whose seed coats are so impervious to water as to delay germination.

Prohibited Seeds.

The following seeds are totally prohibited:—Seeds of *Cuscuta* spp. (Dodder), *Datura* spp. (Thorn Apple), *Ricinus communis* (Castor Oil plant), and diseased or insect infested seeds.

The Amount of Foreign Ingredients Allowed.

The amount of foreign ingredients allowed in the various kinds of seeds are set out in the Regulations, a copy of which can be obtained on application to the Department of Agriculture, Brisbane.

Efficient Seed-cleaning Machinery.

The Regulations do not apply to—

Seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seed for sowing.

Samples from Bulk in Sender's Possession.

The Regulations provide for the examination of samples at the Seed Laboratory, Brisbane, the cost being the nominal one of 2s. 6d. for each Certificate of Analysis. When sending such samples, it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk. The weight of each sample and marking should be as hereunder set out:—

Weight of Samples.

PRESCRIBED WEIGHT OF SAMPLES.

Kind of Seed.	Weight Required.
Barley, Beans, Cowpeas, Maize, Oats, Peas, Rice, Rye, Tares, Wheat ..	8 oz.
Canary, French Millet, Japanese Millet, Linseed, Lucerne, Prairie Grass, *Setaria Italica* (Foxtail Millet), *Sorghum Sudanense* (Sudan Grass), Sorghum, White Panicum	4 oz.
Couch, Paspalum, Rhodes	2 oz.
Beet, Cabbage, Carrot, Onion, Parsnip, Radish, Tomato, Turnip, and Vegetable Seeds of like size	½ oz.
Vegetable Seeds in Made-up Packets.	3 packets.
Agricultural and Vegetable Seeds other than those indicated above ..	2 oz.

In the case of seeds containing weed seeds or other foreign ingredients, double the weight above mentioned should be sent.

Marking of Samples.

All samples must be plainly written on in ink, giving the following particulars:—

(1) Kind of seed;
(2) Quantity the sample represents;
(3) Marks on bags or growers' name;
(4) Name and address of sender.

Fee of 2s. 6d.

Each sample, with a covering letter enclosing the prescribed fee of 2s. 6d., should be addressed to the Under Secretary, Department of Agriculture, Brisbane.

Certificates.

Unless the sender is careful to forward a truly representative sample, the certificate is valueless. Under no circumstances is it a guarantee by the Department of Agriculture as to the bulk, but a statement as to the condition of the sample at the time when such sample was examined.

Complaints.

In case of any complaint regarding purity or germination the buyer should at once send a sample of the seed together with the name and address of the person from whom the goods were purchased, together with a covering letter to the Department advising of the despatch of the sample.

Examine Goods on the Day of Delivery.

It cannot be too widely known that the Seed Laboratory at Brisbane examines, free of charge, all samples representing seeds that farmers have purchased for their own sowing. Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilisers, pest destroyers, or stock foods, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

HOUSING THE PIG.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

To be attractive and profitable, pig raising must be carried out on correct lines by people who are interested and efficient at their job, and who are prepared to provide a maximum of comfort for the animals they keep, and in this and other directions aim at keeping costs of production down to a minimum at all seasons of the year.

Climatic conditions in this State, even if they are at times somewhat unreliable and annoying, certainly favour the open-air system of stock raising such as is and has been advocated by us in our educational propaganda among those of the farming community engaged in this branch of agriculture. The open-air system of pig keeping is, however, only profitable provided sufficient and suitable paddock and pen accommodation be arranged for, so that while having plenty of fresh air and sunshine, the pigs may also have ample exercise, clean, fresh succulent pasture, and a liberal water supply.

There is no reason why the pig-sty buildings should be of an expensive or elaborate nature, though the more convenient and substantial they are the better it will be and the longer they will last.

It is far more profitable to spend money on pig fencing and the provision of suitable grazing areas (pig paddocks) than it is to spend it on elaborate sties (in the absence of paddocks), and it is far wiser to spend money in an endeavour to keep the pigs out in the open as much as is possible (consistent with keeping them warm, dry, well fed, and comfortable), than it is to attempt to coop them up in small, poky, ill-lighted pens, even if these are substantial well-built structures.

The pig is, by nature, a grazing animal, his natural habitat is in the forest adjacent to areas of swampy, well-grassed country over which he roamed and rooted by day, returning at nightfall to the higher and drier forest country from which he secured that portion of his food supply consisting of nuts, berries, fruits, and the like. To such an animal, life in a small, poky, ill-lighted, and badly ventilated enclosure is by no means a natural existence, nor can it be expected that under such conditions best results would accrue from a money-making point of view; hence, the objective is, as far as is possible, to provide the pig with conditions approaching his natural habitat whilst still being in domestication and subject to control.

After all, we keep pigs only for the purpose of profit making; anything, therefore, that will tend to enhance the profits and make the business a more payable one is certainly worthy of consideration.

The writer has discussed these matters with farmers in many parts of Australia, and has written articles on the subject matter on many occasions, and is constantly stressing the necessity of the provision of suitable accommodation.

We have, of course, met many farmers whose finances would not allow of the provision of other than very limited accommodation for their pigs, but where good, roomy pig paddocks and sties have been possible and have been arranged for, satisfactory results have been reported; nor have we yet met the farmer who has spent money in this direction who would go back to the days when his pigs were closely confined in a limited area and had not the benefit of grazing and succulent herbage. The supply of mineral matters obtainable where pigs roam over succulent pastures (and which should be supplied if the pigs are penned up) and the increased benefits resultant from exercise in the sunshine, all favour the health and well-being of the animal, and enable him to hunt up portion of his living in a perfectly natural way. Of course, it must not be forgotten that exercise and sunshine in the absence of sufficient nutritious food and good drinking water would not tend to best results, nor is there any great advantage in turning stock out on to bare, hungry ridges and foresty country on which little other than blady grass and bracken ferns grow.

Pigs must have good and abundant supplies of food and water if they are to prove as profitable as they ought to be. It is for this reason that pig-raising is scarcely a profitable undertaking away out in the western country where the sheep farmer holds sway, or where cattle-raising is the principal line of industry. This western country is naturally suited to sheep and cattle, but is quite unsuited to the pig, hence pig-raising as an industry is usually confined to dairying and mixed farming districts, which, in most instances, are situated nearer to the coastal range and to the strips of country adjacent to the seaboard.

No matter where it is attempted, pig raising must be carried out on correct lines, and in any system of pig farming, housing, and accommodation is a big and important item.

The accommodation of pigs whilst on exhibition at agricultural shows and whilst in transit to and from these places is also an important matter; while on their journeys to the pig sales or to the bacon factory or pork butcher's slaughtering establishment the pigs must be temporarily housed in convenient, clean, and roomy railway wagons or other vehicles.

While at the sales or while resting at the factories awaiting slaughter, their accommodation is an item not to be overlooked, for unless they are placed before the buyers or reach the slaughterman and the bacon curer in the very best of condition, good results cannot be expected.

Housing and accommodation, therefore, covers a wide range and includes not only pig pens and sties, but also suitable fencing, paddocks, shelter sheds, &c.

Concrete Feeding Floors and Troughs.

Visiting a large suburban piggery recently, the writer drew the attention of the owner to the necessity of constructing a concrete feeding floor on which to feed the pigs that were not kept in sties and that were fed from troughs scattered here and there through the yards. It had rained during the morning of the visit, and the mud was ankle deep in the yard where the pigs were about to be fed. As it happened it was the midday feed (a sort of light sandwich luncheon), and consisted largely of green stuff, cabbage, cauliflower, and lettuce leaves, carrot and parsnip tops, a few potato peelings, &c. The farmer simply walked about the yard emptying the contents of the pig tin on the ground on top of at least three inches of mud, and in the mad scramble that followed as soon as the sows heard the dinner bell, there were soon no green stuffs to be seen; what had not been devoured had been trampled in the mud, and of course the hungry ones were ploughing their noses through the slush and slime in search of some remnants of the midday lunch.

To say that the system was filthy and disgusting did not seem to worry our friend, for he was content to let the sows take their chance; if they survived they were "good 'uns"; if they failed to make good on the menu, well, they were simply thrown out as unprofitable, and some other poor creature got the job.

Now all this filth and stench can be avoided, and it is guaranteed that a concrete feeding floor will pay for itself in a month, and the pigs will benefit in a hundred different ways. There is not only greater gain in weight if the pigs feed on a floor where the food cannot be lost, and where accumulation of filth can easily be prevented, but there is less loss of good food, and a greater profit from that which is consumed. We must also consider sanitation if we expect our pigs to be healthy. Concrete floors are hard, easy to clean, and can be flushed or hosed over in a few minutes after use; a bucket of disinfectant sprayed or thrown across the floor will keep it clean for next feed. The labour of feeding and keeping the yards in order is also considerably reduced, and this is a proposition that must be faced.

The size of the floor will, of course, depend on the number of pigs to be fed, hence no standard size can be recommended. In shape, the floor may be oblong or square. The latter is preferable. Make it big enough to accommodate about thirty sows or fewer than this if need be. Use a 1-2-3 or a 1-2-4 mixture in making the concrete, and in thickness have the floor laid on a good solid foundation, allowing a clear 4 inches of concrete for the floor. The sides should be protected and this is best done by excavating the soil for a depth of, say, 8 inches all round, and about 4 inches wide, and making a shallow foundation and protecting wall all round; this might be levelled off on the surface or formed into a shallow half-round drain. The object of this outside wall is to prevent the pigs from rooting under the floor and heaving it up, as they are liable to if it is left unprotected. The floor should have a fall from the centre to the outside of, say, half an inch per foot. The gutter round the outside could be connected with a drain to carry away the washings and thus enable the whole to be kept clean. If the yards are large enough it is an advantage to fence the feeding floor off; the food can then be scattered over the floor and be all ready for the pigs when the gate is opened, and the meal begins. These concrete feeding floors are a necessity on every pig farm, and their cost is a mere detail when compared with the advantages they offer.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

THE CULT OF THE COLT.

By "U 9 L."*

The First Handling.

If you'll take it for granted the youngster is in the yard waiting to be caught, and if you'll also bear with me for a minute or two, I'd like to deliver a little homily on the mental complex of equine psychology.

You'll understand that all horses have an inherent fear of man. Up to the age of about ten days that fear doesn't manifest itself in any way at all. In fact, a youngster of that age would as soon follow a moving man as its mother, and with all the confidence in the world will approach him and nuzzle him. When the little thing's brain begins to function then the instinct handed down by ten thousand times ten thousand generations asserts itself and it looks on man, if not as an enemy, at least as something to be avoided.

At that baby age, if the thing is taken in hand, it may be trained in the ways of man and never learn fear of him. But these youngsters which we are to handle haven't been reared in a creche or trained in a kindergarten. We're starting off scratch with them. In fact, we're commencing from several bits behind scratch. All those youngsters know of man is the inherent fear of him which is theirs, and their experience amounts to painful episodes associated with him. He it is who has inflicted the pain of the knife and the searing brand, and to him may be attributed the unpleasant process of weaning. The colt's mind is a virgin page on which we write his destiny, but as a preface to that volume there are a couple of pages limned with dark blots against us.

Also, and I may be wrong in this, I have an idea when breaking in that it's advisable to cram the colt with as many experiences as you may possibly inflict upon him. When he's meeting new ideas his brain opens, as it were, and it's receptive. It's then out to assimilate new notions, and though the impressions we write on that blank record may not be deep, they're indelible. For instance, though the youngster may never be needed for the buggy, if you put a pair of winkers on him and drive him round during his breaking process he'll never forget that experience. While he's being trained is the time to accustom him to the whip, to a water-bag round his neck, and to a dozen other items. An impression formed while the colt's brain is absorbing experience lasts longer, making a deeper impression in less time than the same lessons repeated a dozen times at later periods in his life when he's set and accustomed to a definite routine of work. I have finished, even though I may have expressed myself imperfectly, and that is my belief.

In the Round Yard.

Our colt is waiting for us in the round yard, and we go to him. If we have a good old breaking-in horse it may make our work easier. But though breaking-in horses may be plentiful, good old ones are so rare that we might as well dispense with the idea. In any case, though the breaking-in horse will shoulder the youngster over and perhaps hold him on the fence while we lean over and handle him, the thing has to be accustomed to us on our own some time, and he may as well begin his lesson now. The only good I could ever see in that traitor to his breed which is known as the breaking-in horse is that it gives confidence. It makes the youngster feel that things aren't too bad when there's another old stager in the yard with it, and it feels a greater reliance and less fearful of man. That, certainly, is a big thing, but it's not everything. Let's gird up our loins, shed the extra sweat which the old coacher would save us, knowing that the added work on the colt will bear its own interest and complete a better job.

Roping-pole, lassoo, or will we catch him with a stick, which? We'll use a stick and then the lassoo. As the colt runs the circle of the round yard you'll stand in the middle of it, facing him all the time as he swings round, and gradually accustom him to your presence. In your hand you've a light stick of the necessary length. The round yard, by the way, should be 21 feet in diameter. When the colt slackens his trotting round—you're talking to him the whole time, of course—you'll reach out with the stick and rest it lightly on him. It doesn't matter where—wither, back, rump, or arch of the neck. It's all the same. As soon as that stick touches him he's off for the lick of his life again, snorting madly and with perhaps an excited plunge and a wild kick as he starts.

Steady, the boy. Steady, there, the old man. Whoa, the boy, w-h-o-a. It's right, old fellow, the stick isn't going to hurt you. See, here, I'll run it right along your back, up along the crest of your neck a bit—that makes you prick your ears, eh!—and then let it slide over your rump. Whoa, the boy. Steady, the little beauty.

* In "The Pastoral Review" for February.

In less than no time at all the colt is used to that stick playing over him, and though he mightn't regard it as harmless, he's got an idea that it doesn't bite without provocation. After a bit, and a very short bit at that, he'll stand still at one spot in the yard while the stick advances to him. He'll shiver just a trifle when it touches him, and perhaps he'll make as though to bound. But he gets used to it, and then he'll permit the thing to rub him all over. By the way, you'll notice, particularly if you've a youngster with any character, that it will select one spot in the yard where it prefers to suffer advances more than at any other place, and if a man's the brains of a black ant he'll take advantage of that knowledge and only attempt to catch the colt there. It saves time, labour, and possible injury to the youngster.

The Laying on of Hands.

After you've reached the stage of being very familiar with the stick, and when the colt has advanced in his education almost to the extent of ignoring it, is the time to think of the laying on of hands. Some people, and some very good breakers at that, too, work along the stick hand over hand, getting nearer and nearer, till they may rub the colt with their hands. It seems a good idea, and it has the advantage of not breaking down the little confidence which you've already built in the animal since it came to the yard. But I never did fancy that idea. You see, it's possible to teach the thing very bad manners in that way. And of all bad manners in a horse which I detest, I especially abhor that of a horse which pulls away just as I'm about to slip the bridle on him. See? We'll use the rope on this fellow. That might startle him a bit when first it sneaks round his neck, but he'll get used to it in less than no time. Anyway, apart from everything else, this colt has to learn that there's a heap of wonderful experiences coming to him, and one more in a multitude doesn't matter much.

We sling the loop of the lassoo over the colt's head and encircle his neck. If we miss our throw a couple of times it really doesn't matter. Of course, we all like to do clean work and capture our objective first time. But we're not all perfect. If we do achieve our purpose, it's so much the better, and if we don't, the mere fact of the rope sliding over him and round him helps to add to the colt's education. Then, with that rope in our hands, when we make our friendly approaches we've something which will aid us to make the colt face towards us and pay attention.

Let me digress a moment, will you, and point out that the human hand, and specially the palm of it, is a wonderful bit of work from a telepathic point of view? With it a man may convey messages in an abstract way, and certainly, though the colt hasn't the least doubt about a man's presence in the yard with him, when that man first lays the palm of his hand on that colt's shoulder or neck in a caressing touch, then does the colt realise positively a man is there and what his intentions are. While the man is rubbing with the back of his hand the colt will suffer that attention, but as soon as the full palm embraces him he's off. That's where the rope comes to our assistance. We snig him round with a run, make him face us, and with our hand extended while we croon lovingly to him we come again. Almost fearfully the youngster extends his nostrils and, sniffing mightily, tastes of the aroma of that hand advanced in friendship.

When He Smells.

When he smells it he may do one of several things. Timidly, shivering with apprehension, he may suffer our further approach. This fellow we take gently, treading gingerly and consolidating every inch of our advance before going further, and with all that in us is we try to make that colt know our intentions are friendly and that, really, there's no need to be afraid. Another joker might take one sniff, proclaim with a loud snort that the odour is distasteful to him, and swing away. This fellow we snap to face us again, and by the familiarity of custom do we overcome his fears. Another dear little thing may smell once tentatively, twice with confidence, and then she may commence to play with the outstretched hand by nibbling at it with her lips. Look, I tell you, when you meet a filly of that sort, then does your heart respond to her, a great feeling of gladness mixed with pride wells up inside you, and verily you believe that life's worth living. And lastly we come to the fellow who takes one sniff, lops his ears, rolls the whites of his eyes, and——Whiff! Bang! Both front feet smite the ground with mighty thuds in an attempt to strike the hand of the master. Steady a second, now. That animosity is prompted by fear more than by anything else. We've got to use tact in unlimited quantities with this fellow else we ruin him. Once we'll allow him to strike at the outstretched hand without taking too much notice of it—that is, always provided he doesn't follow it up with greater violence attempted. We'll tolerate a second smack at us, and if he does it a third time we'll let him know who's boss.

Moral Suasion a Winner Every Time.

After a third shot at us, and with an unabated violence showing in his methods, is the time when we have to rise to the occasion. Moral suasion's a winner every time—it carries further than a stick, and the effect isn't so disastrous. This is the time when we have to carry the white man's prestige, and when we rise in our might and quell insubordination by will alone. Almost you'll feel yourself swelling physically as the power of your will expands and encompasses the colt, and almost you feel a monarch among men as that dumb brute beast of the field wilts before you and acknowledges your superiority. Your crooning lullaby takes a ringing note of passion, your soothing words are a torrent of blasphemy, and you snap that colt to his bearings with a run. If you're man enough to do it, then get to it, and if you haven't the stuff inside you the best thing is to vacate the throne you should never have occupied and leave the round yard.

Once the colt is accustomed to your handling, the rest is easy. The first touch is the only difficult one. After that you keep advancing your approaches till you're handling the thing all over and where you will, and he's yours in readiness for further education.

CANE PRICES BOARDS.

Department of Agriculture and Stock,
Brisbane, 10th February, 1928.

His Excellency the Governor, with the advice of the Executive Council, and in pursuance of the provisions of "*The Regulation of Sugar Cane Prices Acts, 1915 to 1922*," doth, by this notice, appoint the following persons as representatives of the owner or owners of the mill, and as representatives of the canegrowers, to be Members of the respective Boards hereinafter specified, and has been pleased to appoint the person so designated as Chairman thereof, respectively:—

Cattle Creek.

Millowners' Representatives—
P. H. McLean and
C. Simonsen

Canegrowers' Representatives—
H. Wallace and
J. J. Compton

Chairman—
C. B. Buxton.

Childers.

Millowners' Representatives—
C. R. Fletcher and
R. C. McBurney

Canegrowers' Representatives—
J. Wm. Clayton and
J. Broadhurst

Chairman—
H. B. Carney.

Fairymead.

Millowners' Representatives—
W. G. B. Goodchild and
C. A. N. Young

Canegrowers' Representatives—
E. G. C. Eardley and
F. J. Wheeler

Chairman—
C. D. O'Brien.

Farleigh.

Millowners' Representatives—
G. T. Mulherin and
A. McKinnon

Canegrowers' Representatives—
H. C. J. Hansen and
J. McIntyre

Chairman—
M. Gallagher.

Hambledon.

Millowners' Representatives—
J. G. L. Gillett and
L. M. Smith

Canegrowers' Representatives—
E. A. Atherton and
F. C. P. Curlewis

Chairman—
A. H. O'Kelly.

Invicta.

Millowners' Representatives—
H. B. Burstall and
J. L. Mullins

Canegrowers' Representatives—
H. F. Hecht and
P. Hayes

Chairman—
R. A. Tait.

Maryborough.

Millowners' Representatives—
F. Kinne and
T. E. Braddock

Canegrowers' Representatives—
F. F. Bertram and
L. R. Doss

Chairman—
M. J. Bracewell.

Millaquin.

Millowners' Representatives—
G. S. Moore and
E. P. Wyllie

Canegrowers' Representatives—
G. Tesch and
T. Scotney

Chairman—
C. D. O'Brien.

CANE PRICES BOARDS—*continued.*

Moreton.

Millowners' Representatives—
W. M. Whalley and
G. Greathead

Canegrowers' Representatives—
A. E. Williams and
D. McDonald

Chairman—
S. L. Stormonth.

Mount Bauple.

Millowners' Representatives—
T. Beattie and
J. C. Flanagan

Canegrowers' Representatives—
P. B. Scougall and
A. Wm. Messer

Chairman—
M. J. Bracewell.

Mourilyan.

Millowners' Representatives—
L. J. Duffy and
H. G. Selby

Canegrowers' Representatives—
G. F. Hudson and
J. B. Valmadre

Chairman—
A. E. Aitkin.

North Eton.

Millowners' Representatives—
G. Johnson and
S. H. Scougall

Canegrowers' Representatives—
G. N. Laws and
C. H. C. Ross

Chairman—
C. B. Buxton.

Pioneer.

Millowners' Representatives—
W. B. Whitson and
B. C. J. Martin

Canegrowers' Representatives—
J. McB. Walker and
Wm. B. Smith

Chairman—
R. A. Tait.

Plane Creek.

Millowners' Representatives—
Alex. Innes and
D. Greetham

Canegrowers' Representatives—
A. I. McHardie and
H. E. Turner

Chairman—
M. Gallagher.

Pleystowe.

Millowners' Representatives—
A. A. Cook and
P. P. Smith

Canegrowers' Representatives—
M. W. R. Bowman and
C. McKinley

Chairman—
M. Gallagher.

Proserpine.

Millowners' Representatives—
M. R. Gibson and
C. C. Dodd

Canegrowers' Representatives—
H. L. Hall and
R. J. Ruge

Chairman—
C. A. K. Morrison.

Qunaba.

Millowners' Representatives—
G. S. Moore and
W. A. Shield

Canegrowers' Representatives—
A. J. Christensen and
C. F. Mittelheuser

Chairman—
C. D. O'Brien.

Racecourse.

Millowners' Representatives—
J. M. Gibson and
A. S. Hamilton

Canegrowers' Representatives—
T. J. A. Whitcomb and
A. Turner

Chairman—
C. B. Buxton.

South Johnstone.

Millowners' Representatives—
F. Gillan and
F. H. Gilmore

Canegrowers' Representatives—
G. F. Hudson and
R. J. Wright

Chairman—
A. E. Aitkin.

Tully.

Millowners' Representatives—
J. J. Cran and
G. R. Blair

Canegrowers' Representatives—
G. F. Hudson and
J. A. Winter

Chairman—
A. E. Aitken.

Victoria.

Millowners' Representatives—
E. Irving and
J. R. Kerr

Canegrowers' Representatives—
H. E. Hollins and
G. G. Venables

Chairman—
J. A. Murray.

D. A. GLEDSON.

Answers to Correspondents.

BOTANY.

The following replies have been selected from the outward mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Palms.

INQUIRER (Miriam Vale)—

Palms widely chosen for memorial avenue purposes in Queensland are—

Cocos plumosa. Cocos Palm.
Phœnix canariensis. Canary Phœnix.
Washingtonia filifera. Cotton Palm.

None of these are very fastidious as regards soil conditions, and if trees such as the Weeping Fig, Bean Tree, &c., do well, you should have no difficulty with the palms. The second one on the list does well on sandstone country.

"Sensitive Plant."

W.R.P. (Innisfail, N.Q.)—

Your specimen is *Mimosa pudica,* of the family Leguminosæ, and closely allied to the Wattles. It is widely distributed over the tropical parts of the world, and is regarded as somewhat a pest in cultivation. In spite of its prickly nature, however, it has considerable value as a tropical fodder, and is often tolerated on this account.

Nut Grass—Pennywort.

R. McH. (Toowoomba)—The specimens proved to be—

(1) *Cyperus rotundus* or Common Nut Grass. This is one of the worst weeds of cultivation we have in Queensland, though in gardens it may be kept in check by constant forking out or by constantly working the ground with a push hoe and preventing the young shoots from appearing above ground. This eventually exhausts the underground tubers.

(2) A very small specimen consisting of a few leaves only, but we take it to be *Hydrocotyle asiatica,* a species of Pennywort. This plant is a common weed of damp places and gardens, though in wet seasons such as at present it may spread further in cultivation. It is not a particularly aggressive weed, and should be easily kept in check.

When sending specimens for identification, larger specimens than those you sent would be better. For instance, in the second specimen a piece of the stem should have been sent showing the leaf attachment.

Crowsfoot Grass.

M.J.C. (Burrandowan, via Kingaroy)—

Your specimen is *Eleusine indica* or Crowsfoot Grass, a grass more or less of an annual nature often coming up very thickly after the summer rains. It is a grass with a wide distribution outside of Australia and is mostly found here in cultivation paddocks, around cow yards, or in fact anywhere where the ground has been disturbed. Like Sudan grass and some of the sorghums, it contains in its more succulent stages prussic-acid yielding glucoside, but we have never heard of it causing deaths in stock in Queensland.

An Introduced Weed *(Roubieva multifida).*

INQUIRER (Warwick)—

Your specimen has been identified as *Roubevia multifida,* a native of the warmer parts of both North and South America. It is not regarded as a bad weed in those countries, though in the United States such as in lower California it seems to occur mostly as a weed on railway lines and so forth. This is the first record of the plant in Queensland and apparently in Australia. It belongs to the family Chenopodiaceæ which contains the Salt Bush, Fat Hen, and many other plants. It is very similar to some others of the family already in Queensland and will probably become more or less of a pest.

Ringbarking.

E.R.W. (Inglewood)—

(1) There is nothing in the theory of the sap coming down on the outside of the bark. The conducting tissue of the wood transfers water and mineral solutions absorbed by the roots to the leaves; on the other hand the conducting tissue of the inner part of the bark transfers food material manufactured in the leaves to the roots or other parts of the tree which either consume it or store it up for future use. Ringbarking alone, though slower than ringbarking and sapping, should be as effective, though in actual practice this does not seem the case. In the latter case you cut through the conducting tissues of both the wood and the bark.

(2) The fact of bark peeling freely from the trunk is a good indication of the tree being in full growth and represents a good time for ringbarking and sapping.

(3) The chief reason for adding soda to the arsenical solution is to aid in dissolving the arsenic. If caustic soda is used the heat generated does away with the necessity of boiling.

Scrub or Creek Cherry.

INQUIRER (Brisbane)—

Your specimen is not *Rhodomyrtus macrocarpa* but *Eugenia australis*, the Scrub Cherry or Creek Cherry, a small or medium-sized tree fairly common along creek banks in coastal Queensland. The fruit has a pleasant acid flavour and is not known to possess any poisonous character. It and other species of Eugenia are sometimes confused with Rhodomyrtus.

Red Bloodwood—Fringe Lily.

T.G.F. (Brisbane)—

(1) *Eucalyptus corymbosa*, the Red Blood Wood. This tree is at the present time bearing an abundance of flowers and in its younger stages is very handsome.

(2) *Thysanotus tuberosus*, the Fringe Lily. This plant is also commonly known as the Fringe Violet, though it is really a member of the Lily family.

Eucalyptus and Mosquitoes.

L.F. (Pawa, Ugi, British Solomon Islands)—

The effectiveness of Eucalyptus in mosquito control is due largely to the ability of some of the species to grow in swampy land and gradually assist in drying it up, such as *Eucalyptus robusta*, sometimes called the Swamp Mahogany. This species would probably do well in the Solomons. Other species that would probably do well with you are the Flooded Gum (*E. saligna*), the Queensland Blue Gum (*E. tereticornis*) and the Citron-scented Gum (*E. citriodora*). Seeds of all of these should be obtainable from Messrs. A. Murphy and Sons, Seedsmen, Woy Woy, New South Wales. This firm makes a specialty of Australian tree seeds.

A Native Dodder.

INQUIRER (Kingaroy)—

Your specimen is *Cuscuta australia*, a native Dodder that is parasitic on a number of native herbs and weeds, and is also found on cultivated crops.

Carpet Grass.

C.H.C. (Toowong)—

Your specimen is *Paspalum platycaule*, the Carpet Grass. It has a wide distribution over the tropics of practically the whole world, and in Queensland is most abundant in the North, particularly on the coastal areas where it has some value both as a lawn grass and stock food. It is less common in the South, though well established here and there. It spreads readily by both seeds and runners. The only satisfactory method of eradication is to dig it out and plant a smothering, quick-growing grass like Blue Couch (*Panicum didactylum*) in its place. If you can get a good swarth of Blue Couch established it should keep down the Carpet Grass.

PIG RAISING.

The following replies have been selected from the outward mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Large Yorkshire.

F.H.P. (Milmerran)—

It is not possible to secure boars or sows of this breed in Queensland, though good-quality animals in either sex of the Middle (or Medium-sized) Yorkshire are available. So far the Large York has not been introduced, and as quarantine regulations at present prohibit the introduction of pigs from the Southern States (where there are several well-known breeders), you will have to be content to either try the Middle York or some other breed. In any case we doubt whether it would be wise to cross the Large Yorkshire and the Tamworth, for they are both large breeds, and we are sure better results would accrue by crossing the Middle York and the Tamworth or the Berkshire and the Tamworth, or even the Tamworth and Poland-China. The cross Tamworth and Gloucester Old Spot won second prize in the Bacon Pig Carcase contest at last Brisbane Show, but we are afraid that unless given very special care and attention they would be too large and growthy, and when ready for slaughter too heavy for our markets. We could secure really good boars three months old in the Berkshire (and up to four months), Middle Yorkshire (up to two and a-half months), Poland-China, and Duroc-Jersey breeds at about six guineas each, crated on rail at point of despatch. Of these, Berkshires would be the cheapest, though it would depend upon the quotation and from whose stud obtained as to just what price would be charged.

Care of the Sow.

E.D.L. (Maleny)—

We consider it a wise plan to give every breeding sow, prior to farrowing, a good bran mash in which is included three or four fluid ounces of castor oil. If this were done regularly, the lives of many sows would be saved, for, unfortunately, many good breeding sows are lost each year through these troubles. You may have to introduce fresh breeding stock, for it is apparent the strains you have had are running out and losing their constitutional vigour.

To Rid Pigs of Lice.

T.L. (Amamoor, Mary Valley)—

The best mixture for ridding pigs of lice and similar parasites is made up as follows:—

Benzine	½ pint
Kerosene	½ pint
Fish oil	7 pints

If fish oil is not available you could use old separator oil, cotton seed oil, or neatsfoot oil, for the oil is used to carry the benzine and kerosene and to soften the skin more than for the purpose of destroying the lice. It is necessary to have the pigs fairly clean before applying this mixture. It is also necessary to give the animals a second application about three days after the first one and to treat them periodically as the lice appear to become more plentiful. If you make up a gallon of the mixture and keep it in a tin or glass container and periodically treat the animals you will have no difficulty at all in keeping them free from lice. Lice are always more plentiful and more troublesome in a season like the present than at a normal time.

Experience Necessary for Pig Raising.

INQUIRER (Biloela)—

It is necessary to have some experience in order to make a success of pig-raising. It would be better to sell your milk to your neighbours than to go in for pigkeeping unless you understand the business. Pig paddocks are certainly necessary. Good stout posts and K-wire for fencing are quite all right, but it would not be necessary to enclose more than 2 or 3 acres in any one block—that is unless you had the area available and it was not being used for any other purpose. From a cultivation point of view it is also necessary that the paddocks should be numerous and not too large, for in this way more pigs can be fed on a given area than if they are allowed to roam over a larger area and waste a lot of food. We would be glad to answer specific questions if you care to make out a list of points on which you require advice.

Berkshire pigs or pigs of any other breed from three to four months old would cost between three and five guineas each, crated on rail at point of despatch. The rail freight would not be more than ten shillings per head, unless the animal was transported over a great distance. Sows in pig or at a serviceable age would be worth up to ten guineas each, plus expenses. We think that if you secured one boar and about six unrelated sows these should be quite sufficient for a start. Later on you could probably increase the sows to twenty or more as you had more accommodation available. Water supply, green food, and mineral matters are all necessary in addition to milk and grain. Hence you will see that it is quite a proposition to make the necessary provision for introducing this class of stock on to the farm.

Tomato Preserves.

INQUIRER (Brisbane)—

Whole Tomatoes Canning.—Select small ripe tomatoes that will go into jars. Peel and drop a few at a time into boiling salt water. Dip out when cooked and place in the jars; then fill up the jars with boiling water. Seal hot.

Tomatoe Chillie Sauce.—Take twenty-five large ripe tomatoes, four white onions, three green peppers, with seeds removed. Slice tomatoes so as to take out as many seeds as possible. Chop onions and peppers fine and mix the ingredients together. Heat three cups cider vinegar and dissolve in it two cups white sugar, two small tablespoons salt. Pour over mixture and cook slowly one hour. Seal hot.

Canning Tomatoes.—Have tomatoes of a uniform ripeness. Pour boiling water over them to remove skins. When peeled, place in a granite kettle or pan and heat slowly without adding any water. A sprinkle of salt. Boil half hour and seal hot.

Green Tomato Pickles.—Four quarts green tomatoes, four small onions, four green peppers. Slice tomatoes and onions, sprinkle with half cup salt and leave overnight in a crock. Drain off brine next morning. Put in a preserving kettle one quart vinegar, one level teaspoon each of black pepper, mustard seed, celery seed, cloves, allspice, cinnamon, and quarter cup sugar. Bring to a boil and add prepared tomatoes, onions, and peppers, cook slowly thirty minutes. Fill jars and seal hot.

Green Tomato Sauce.—Boil one and a-half hours the following:—Two dozen large tomatoes, one and a-half dozen apples, quarter lb. salt, four large green sweet peppers, one red pepper, 2 lb. brown sugar, 2 oz. mustard, two tablespoons ground ginger, two pints vinegar, six large onions. Seal hot.

Green Tomato Mince Meat.—One peck green tomatoes, one peck apples, 6 lb. brown sugar, 2 lb. currants, two teaspoons cinnamon, 2 lb. raisins, two teaspoons cloves, two teaspoons allspice. Cook three hours. Seal hot.

Tomato Sauce.—Cut tomatoes in medium size pieces. Add one large onion chopped and one cup chopped fresh pepper to each gallon tomatoes. Cook until tender, put through sieve, add one and a-half teaspoonsful of salt and three teaspoonsful sugar to each gallon of pulp. Cook until consistency of ketchup, stirring constantly. Pack, while boiling hot, into jars and process in water bath or water seal for twenty-five minutes or under 5 lb. steam pressure for fifteen minutes or under 10 lb. for ten minutes. Remove jars from canner and seal hot at once. Tin cans should be plunged immediately in cold water and cooled as quickly as possible. When cool, store in dark, dry, cool place.

Corn and Tomato.—Prepare each vegetable as for canning. Chop tomatoes in medium size pieces or heat to simmering point and put through sieve. Mix thoroughly two parts tomato to three of corn. Pack in hot glass jars or enamelled tin cans. Add one level teaspoonful of salt. Process in water bath or water seal two hours or under 10 lb. steam pressure sixty minutes. Remove jars from canner and seal hot at once. Tin cans should be plunged immediately into cold water and cooled as quickly as possible. When cool, store in a dark, dry, cool place.

General Notes.

Butter Board.

As no petition has been received for a poll on the question of the continuance of the Queensland Butter Board, it will be reconstituted accordingly, to operate as from the 1st March this year to the 30th June, 1931.

Six representatives are to be elected for the full term, and for this purpose the following nominations have been received:—

Division No. 1—
W. Scott, Peeramon;
W. J. Sloan, Malanda.

Divisions Nos. 2, 3, 4, and 5 have returned unopposed—
J. L. Wilson, Calliope;
James McRobert, Maryborough;
James Purcell, Toowoomba; and
C. H. Jamieson, Gatton.

Division No. 6—
E. Brabiner, Gympie;
T. Flood Plunkett, Beaudesert.

The date of the election for the two members to represent Divisions Nos. 1 and 6 has been fixed for the 28th February, 1928. Mr. L. R. Macgregor, Director of Marketing, will act as Government representative on the Board.

Staff Changes and Appointments.

The following Police Constables have been appointed Inspectors of Slaughter-houses as from the 26th January, 1928:—James Norman Mackay, John Lane, and Albert Edward Stevens.

Mr. H. F. Sibley, Inspector of Slaughter-houses at Charters Towers, has been appointed also an Inspector under "*The Diseases in Stock Act of* 1915."

Mr. A. S. Alexander, of Maryborough, has been appointed an Honorary Ranger under and for the purposes of "*The Animals and Birds Acts*, 1921 *to* 1924," as from the 31st January, 1928.

Constables Robert Henry Sabien (Sandgate) and James Duffiey (Chillagoe) have been appointed Inspectors of Slaughter-houses.

Mr. M. H. Campbell, of Albany Creek, Strathpine, has been appointed Chairman of the Egg Board until the 31st December, 1928.

Cane Prices Boards.

As no nominations were received for Representatives on the undermentioned Local Sugar Cane Prices Boards, the following Representatives have been appointed:—

Babinda Local Board—
Millowners' Representatives—F. A. Lamont and W. J. Ryan.

Cattle Creek Local Board (Mackay)—
Canegrowers' Representatives—H. Wallace and J. J. Compton.

Fairymead Local Board (Bundaberg)—
Millowners' Representatives—W. G. B. Goodchild and C. A. N. Young.

Racecourse Local Board (Mackay)—
Canegrowers' Representative—A. Turner.

Arrowroot Board.

An Order in Council has been approved under the Primary Producers' Organisation and Marketing Act, extending the term of office of Members of the Arrowroot Board from one to three years.

Nominations will be received until 5 p.m. on the 10th March, 1928, for election as Growers' Representatives on the Arrowroot Board. Five such representatives will be required to be elected for a term of three years by those growers who, in the 1926-27 season, supplied arrowroot bulbs grown in Queensland to any arrowroot mill in Queensland.

Each nomination is to be signed by at least ten (10) such growers. If more than five nominations are received a postal ballot will be taken.

Valedictory.

Mr. F. Bostock, Assistant Instructor in Pig Raising, has, consequent on his appointment to the position of Instructor in Pig Raising at the Hawkesbury Agricultural College, Richmond, New South Wales, severed his connection with this Department. Mr. Bostock, who is still a young man, proved himself in the Queensland service a capable and enthusiastic officer, and among farmers particularly he made many friends. Queensland is a vast State of great distances, and itineraries carried through by field officers of the Department cover in the course of the year many thousands of miles. Constantly on the job, Mr. Bostock gave good service to the farming industry, with which he maintained an active and useful association. As judge at country shows he won respect for his decisions and practical knowledge of animal husbandry. His skill as a draughtsman was also an advantage when instruction was required in modern farm building design and field lay-out. Mr. Bostock left Queensland with the sincere good wishes of his fellow officers and all engaged in the industry to which he has devoted his talents and energy, together with their belief that he will meet with a full measure of success in his new sphere of interest and action.

Mr. Bostock was Assistant Instructor in the Pig Section at the Hawkesbury College prior to coming here. His appointment to the senior position at Hawkesbury was made possible by the transfer of Mr. A. Gray to the position of Senior Instructor, with headquarters in Sydney, and with work similar to that being carried on in this State by Mr. Shelton.

Tractor School at Gatton.

The Queensland Agricultural College, in conjunction with the Council of Agriculture, will hold its Fifth Queensland Tractor School from the 3rd to the 13th April, inclusive.

The course will cover lectures, demonstrations, and practical work in the care, adjustment, repairs, and driving of many makes of tractors.

At the last school there were present four Fordsons (one crawler-fitted, one fitted with a rototiller, one fitted with a plough between front and back wheels), Case, Fitch, Hart Parr, John Deere, McCormick-Deering, and Twin City. It is expected that later models of tractors will be represented this year.

The cost to each farmer will be £3 8s. 6d., which will cover all instruction costs, board and residence, and recreation fee.

The Railway Department will grant attending farmers one-half excursion rates each way on presentation of a certificate from the College.

The College will provide power kerosene, the railage on tractors from and to Brisbane, and free board and residence for tractor mechanics.

Farmers should book to College Station and ask the guard to stop, previously advising the College of the train by which they will travel.

Farmers will need to bring blankets, sheets, mosquito net, pillowslips, towels, soap, mirror, and other toilet requisites.

No farmer will be allowed to confine his attention to a particular tractor, but must work each in turn. Should he desire more work on a particular tractor, he will have to arrange it in his spare time.

The daily time-table will be as follows:—

- Tuesday, 3rd, and Wednesday, 4th, will be devoted to lectures in the morning and practical work in the afternoon.
- Thursday, 5th—Practical work all day.
- Friday, 6th—Lectures all day.
- Saturday, 7th—The morning will be devoted to lectures while the afternoon will be reserved for sport.
- Sunday, 8th—Church service and picnic.
- Monday, 9th—Lectures all day.
- Tuesday, 10th—Practical work all day.
- Wednesday, 11th—Practical work all day.
- Thursday, 12th—Practical work all day.
- Friday morning, 13th—Practical work.

Applications from farmers wishing to attend the School will be received from now onwards; early applications will be given preference. Last year applications had to be closed long before the School opened; the attendance at the School being a record for Farmers' Classes in Queensland.

Any further particulars will be supplied on request.

Dingo Board Elections.

The following have been elected Members of the Western Downs and Kennedy Dingo Boards, respectively:—

Western Downs, Inglewood—
William James Tomkins,
George Frederick William Goodrich,
Arthur Rhodes Lomax, and
William Robert Bracker.

Kennedy, Ingham—
George Christopf Teitzel,
Henry John Atkinson,
William Stanley Collings Warren, and
Leland Edwin Challands.

The Police Magistrate, Ingham, has been appointed Government Representative on the latter Board.

Citrus and Pineapple Levy Regulations.

The period during which the Pineapple Levy Regulations, approved of on the 16th January, 1926, under the Fruitmarketing Organisation Acts, shall continue in force has been extended from the 25th January, 1928, to the 24th January, 1929. This levy is at the rate of one halfpenny per case of pineapples in containers, and, where sold loose, one halfpenny per forty-two rough or Ripley pineapples, or one halfpenny per twenty-four smooth pineapples.

Similarly, the Citrus Levy Regulations, approved of on the 13th February, 1926, have been extended from the 29th February, 1928, to the 28th February, 1929. This levy is at the rate of one penny per bushel case and one halfpenny per half-bushel case of citrus fruit marketed.

The above levies are now to be collected by means of Levy Stamps, which are obtainable at the head office of the Committee of Direction of Fruit Marketing, and which are to be affixed to Account Sales or Credit Notes, or any other document giving evidence of the sale of these fruits.

Pigs at the Ipswich Show.

The increased importance of the breeding of thoroughbred pigs, to the West Moreton area, has been recognised for some time past by the Queensland Pastoral and Agricultural Society, Ipswich, who have made a special effort with this section of their Show to be held on 16th, 17th, and 18th May next. In the first place entries for thoroughbred stock only will be accepted, as the section is conducted under the rules and regulations of the Australian Pig Breeders' Association; further, the prize money has been considerably increased and now ranks equal if not better than most shows. The accommodation has recently been entirely rebuilt on the most modern principles. A section has been added confined to members of School Pig Clubs, where the prizes are on a very liberal scale. Exhibits are carted free to and from the Ipswich Railway Station, and in the case of the latter, exhibits will be attended to by a special committee. A competition has also been provided for young judges. The society is indebted to Mr. E. J. Shelton, Instructor in Pig Raising, for valuable assistance and advice in the classification, and confidently look forward to the active support of the various School Clubs throughout the district.

Floods and Landslides.

The floods and landslides reported as a result of the heavy February rains—which, after all, are only typical of our ordinary wet season—raises the question as to the extent to which the wholesale denudation of forest and jungle from the crests and slopes of the coastal range and on watersheds generally is responsible for those phenomena. It is, of course, well known that the clearing of hillsides of moisture-retaining and soil-holding timber is followed by soil erosion and the silting-up of watercourses. Relevantly, the United States Department of Agriculture says that investigation of the seepage of soil water shows that this was most rapid on the open slopes following a rain, while the seepage was greater in quantity, steadier, and distributed throughout a longer period of time in the area covered with timber. By thus absorbing more water, by holding it longer and allowing it to seep out more gradually, areas covered with forest exert a considerable influence in the regulation of stream flow, tending to prevent high water and flooding periods of heavy rainfall on the one hand and drying up of streams during the dry season on the other.

Mr. Soutter's Work at Roma—Federal Appreciation.

After a visit to the Roma State Farm, said Mr. J. A. J. Hunter, M.H.R., recently, the Minister for Home and Territories, Mr. C. W. Marr, D.S.O., M.C., paid a great tribute to the work of Mr. R. E. Soutter, whom he described as the Luther Burbank of Australia. Mr. Soutter's work had added thousands of pounds to the agricultural wealth of Queensland, Mr. Hunter said, and the Federal Government appreciated the fact.

The Meaning of Existence.

Thus Sir Oliver Lodge:—Man is not fully-developed man as yet, when only a few out-top their fellows; the time will surely come when all will be able to realise their birthright. Much of the present unrest is a groping after higher things, a feeling that this world cannot be all, that education and leisure are objects worth struggling for; that there are prizes beyond the present scope of the average man. Terribly mistaken are some of the efforts; selfishness dogs and damages the ideals; but sooner or later all this can be rectified. Mankind is barely civilised as yet, we have much leeway to make up; but there is plenty of time. For the individual and also for the race there is a magnificent prospect ahead; and if we set our faces firmly towards the right, and seek for the guidance which is certainly forthcoming, if we try to ascertain what is really the meaning of existence, and get our wills right with that effort which seems to us divine, then beyond these voices we shall attain to peace and to the service which is perfect freedom.

The Agricultural Problem.

Secretary of Agriculture Jardine (U.S.A.) told President Coolidge that the showing for agriculture in general for 1927 has been good, but that much remains to be done before the position of the farmers will cease to be a problem. "While farmers themselves are reducing their costs of production through increased efficiency," he says, "public agencies should co-operate with them in effecting a better adjustment of production to demand. Also efforts should be made to diminish waste, to lessen margins between producers' and consumers' prices, to reduce transportation and distribution costs, and to lessen the farmers' overhead charges by lowering or redistributing tax burdens and by improving agricultural credit facilities. Farmers should be encouraged to enhance their bargaining power through co-operative marketing, and the responsibility of the public in helping to reduce price fluctuations due to unavoidable gluts and shortages of agricultural products should be recognised in a practical manner."

Pastoral Research—Weapons in the Armoury of Science.

It would seem unnecessary to argue that research should be brought to the aid of any industry, least of all that of primary production. Yet the fact remains that a large percentage of producers in Australia apparently fail to realise the true position of their industry and of themselves as units of it. The margin of profit is a narrowing one; production costs are increasing, prices are at a level that is not likely to be greatly exceeded, and competition by other countries is becoming steadily keener. There are certain costs which are beyond the power of producers to control, but there are others—on the practical side of stock raising—that offer plenty of scope for reduction. Amongst these may be mentioned the periodical heavy toll of droughts, artificial feeding, losses by pests, diseases, malnutrition, &c. Again, there are the matters of wool quality, carrying capacity, and many others associated with the revenue side of the business that are capable of betterment. It is in these spheres that research is absolutely essential if the industry is to continue and prosper, and the following extract from an article by Secretary W. M. Jardine in "The Country Gentleman" (U.S.A.) of December, 1927, is right to the point:—"Perhaps in the matter of pest prevention the failure to give adequate support to forehanded research has resulted in the most easily obvious national loss. Had we long ago secured financial support for the policy of studying foreign pests on foreign soil, the tremendous ravages which we have suffered from imported insects might to a large extent have been obviated. . . . But the necessity for forehanded research is not confined to the problem of pest prevention and pest control. To hold foreign markets for our surplus products we must meet competition from other lands. We can meet this competition only by the studied development of methods of production which will allow our growers, while still maintaining high American standards of living, to sell at a price which cannot be met by less ingenious peoples." It does not need the ability to see through a brick wall to realise the outcome of an indefinite continuation of more or less easy-going methods in the Australian pastoral industry. It uses, and uses well, what weapons it has at its command, but there are other and more powerful ones in the armoury of science.

Plant Propagation from Cuttings.

Almost any plant can be grown from a cutting if planted and treated in the correct manner. The accepted rule is that the cutting must be carefully cut; that the right portion of the plant must be taken; that it be firmly planted in the correct compost; that the compost be kept in a damp condition; and that the portion of the cutting above ground be protected from excessive evaporation until the roots are formed to supply the loss.

Cuttings may be struck in prepared beds or in pots in bush or glass houses. The soft-wooded plants are generally successful in the shaded houses, and hardy and hard-wooded plants in semi-shaded nursery beds. The starting compost must comprise a fair quantity of sand, and the top layer of soil, say half inch, should be nearly all sand, or at least three-quarters sand. At the bottom of the pots and bed a thorough drainage system is necessary, as stagnation round the end of a cutting is fatal to success.

When planting cuttings, the earth must be thoroughly compacted around the extremity of the cutting. The hole in which a cutting is to be placed must be made with a blunt, flat-ended stick, which is pressed down into the compost, and the surface sand will fall into the hole, and this ensures the drainage; the cutting is then pressed firmly into the hole, and the soil is then pressed firmly around the cutting by ramming with the stick which has been used as a dibbler.

The general rule in selecting a cutting is that it be young wood that is sufficiently matured, and the cutting should have a heel of the previous growth from which it springs. It is essential that the cut should be clean and not damaged in any way at the base. If the cutting is damaged in any way it is advisable to retrim the base with a sharp knife, remove all leaves to as deep as the cutting has to be planted, and the stripping of the leaves must be done carefully, not pulled off, but cut clean with a knife. As a general rule, the smaller the cutting the greater the chance of success.

In planting cuttings it is not of much importance at what angle the plants are inserted in the soil. Some growers claim that cuttings should be planted at an angle of about 45 degrees, and others claim that straight-up planting is the best.

Planting.

Never plant in ground which, since digging, has become dry and lumpy. Sprinkle it well with water, then break it down as finely as possible. Do not put tender seedlings out, however favourable the weather may be, without first hardening off. To harden off plants it is best to transplant the tender seedlings into starting boxes or beds with plenty of space between the plants, so that they may be lifted for transplanting into the open beds with a ball of earth attached to each mass of roots.

Give a thorough watering an hour or two before the actual time of planting, otherwise you are increasing the check to the plants. It is preferable to plant in the evenings or on a dull day, rather than during the heat of the day. It is also necessary to give temporary shade from the sun. Such shading can usually be dispensed with in a few days.

Immediately a bed or border has been transplanted do not fail to give a thorough soaking of water. This will settle the fine soil around the roots. When planting out do not overcrowd. Be careful to avoid flatness in large beds. Water the plants in the evenings as necessary until the plants show signs of having become established.

The Democracy of the Ancients.

"Equal justice; equal opportunity for the service of the State; the spirit of reverence for the laws the people enact and for the unwritten laws founded in human nature; the education that trains men to think before they act, and then to act, that teaches them to enjoy and to know what to enjoy, to love beauty without excess and wisdom without inefficiency, that gives the power to the individual to meet every aspect of life with ready grace, whether wealth or poverty, life or death; the passionate love of country that will inspire a man not only to die for his city, but to live to the utmost for it, developing every faculty nature has given him that he may consecrate all his gifts of speech and sense, taste, wisdom and the open mind, to the good of his fellow-citizens; these are no ideals of the barbarians nor of the half-civilised lands we know. Where is the motive, where the transforming power, to make of our common clay the true citizens of such a Democracy? Nowhere, I think, but in one who talked no politics and drew no Republic, but understood better than Pericles the greatness of man and better than Plato the Kingdom of God."—Mr. T. R. Glover, in "Democracy in the Ancient World."

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and, where necessary, thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

Orchard Notes for April.

THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the

Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus becomes toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Strawberries can still be planted, and the earlier plantings must be kept well worked and free from all weeds in order to get a good crop of early fruit.

Scrub land intended for bananas can be felled now, as there will be little more growth, and it will have ample time to dry off properly in time for an early spring burn. Do not rush scrub falling, as it is work that pays for extra care. Lopping will improve prospects of a successful fire.

Keep a keen lookout for fruit flies, and on no account allow any fallen fruit of any kind to lie about on the ground unless you are looking for trouble with the ripening citrus crop. Keep the fly in check, and there will not be any very serious losses; neglect it, and there will not be much fruit to market.

The advice given with respect to the handling and marketing of citrus fruit applies equally to custard apples, pineapples, bananas, and other fruits. In the case of bananas handled by the Committee of Direction of Fruit Marketing, grading is now compulsory, and it will undoubtedly tend to stabilise the market for this fruit.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Practically the whole of the fruit crop will have been gathered by the end of March, but several of the later-ripening varieties of apples grown in the Granite Belt may be kept for a considerable time, provided they are free from fly or other pests and are stored under proper conditions. Varieties such as Jonathan can be kept for some months at a temperature of 31 to 32 degrees, and later varieties, such as Granny Smith and Sturmer, can be kept till apples come again if stored at the same temperature. At the same time, although storing the fruit at this temperature under artificial conditions enables them to be kept for many months, the fruit can be kept for a considerable period, and marketed from time to time as desired, by storing it in a specially constructed apple-house in or adjacent to the orchard where grown.

Such a store can be cheaply constructed in the side of a hill out of the soil of the district and slabs of timber. The soil will make excellent pisé for walls, and the roof may be constructed of slabs covered with soil. Such a store can be kept at a very even temperature, and if the air is changed during cool nights—not frosty nights—the temperature can be reduced to a low point—low enough to keep the fruit in good condition for many weeks.

All orchards and vineyards not already cleaned up must be put in order, and all weeds destroyed. Keep the surface of the soil stirred so as to give birds and insects a chance to get at any fruit fly pupæ, as it is necessary to destroy this pest whenever there is a chance of doing so.

Land intended for planting during the coming season should be got ready in order to expose the soil to the cold of winter, thus rendering it sweeter and more friable.

If there is any slack time in the course of the month, go over all surface and cut-off drains and put them in good order. Also, if during periods of heavy rain, soft or boggy spots have made their appearance in the orchard, do what draining is necessary, as badly drained land is not profitable orchard land, and the sooner it is drained the better for the trees growing upon it. Soft or boggy spots are frequently caused by seepage of water from a higher level. In this case a cut-off drain will be all that is necessary, but where the bad drainage is due to hard pan or an impervious subsoil, then underground drains must be put in. After draining, the land should be limed. Liming can be done now and during the following three months, as autumn and winter are the best times to apply this material.

When the orchard soil is deficient in organic matter (humus) and nitrogen, try the effect of green-crop manuring, planting the grey or partridge pea and manuring the ground for this crop with a good dressing of finely ground island phosphate or basic phosphate.

Where citrus fruits are grown, they should now be ready for marketing. If the land needs it, it should be given an irrigation, but unless the trees are suffering from want of water it is better to stick to the use of the cultivator, as too much water injures the keeping and carrying qualities of the fruit.

The remarks on the handling and packing of citrus fruits in the coast districts apply to the inland districts also, but these districts have an advantage over the coast in that, owing to the drier atmosphere, the skin of the fruit is tougher and thinner, and in consequence the fruit carries better.

The Home and the Garden.

THE TENNIS COURT—CONSTRUCTION HINTS.

The tennis court is perhaps as usual to the homes in Australia to-day as in any other part of the world. Of recent years this game has become so popular that wherever the space within the building allotment is available it is almost certain that a tennis court will be found there, even at the cost of a great deal of excavating and levelling up, for a number of our sloping sites necessitate this.

In many cases our grounds are so limited that little or nothing can be done to make the court attractive. It is then little more than a flat lawn of about 100 feet long by a width of 50 feet, fenced with an ugly arrangements of posts, rails, and galvanised wire netting, but the appearance of these fixtures may be improved.

Choosing the Site.

The most practical enclosure is the wire mesh, carried on an open framing of either hardwood or water piping. Wood posts are subject to rot and to attack from white ant upon that portion which is below ground; and though this latter may be obviated to a large extent by sinking the posts in holes filled with concrete, this does not get over the trouble from rotting.

When piping is used as posts they must be buried in concrete for stalility. These should be galvanised to prevent rust, and of not less than 1½ inch in diameter, all coupled together with screwed reducing unions. Sometimes they are roughly cut to each other and the joints oxy-acetylene welded, but this method of joining is neither as neat nor as rigid as with the screwed T-pieces.

For economy, ordinary galvanised wire netting is generally used for the enclosure.

When there is sufficient area within the home allotment to allow a choice of site for the court to be made, care should be taken to select one that will enable the long axis to run north and south. With this aspect the players will be gest protected from the sun's rays when it is low in the heavens. Play is almost impossible when either side has to stand facing a setting sun.

Our private courts are generally about 50 feet wide by 110 feet long. The latter dimension gives 15 feet or 16 feet behind the back lines. For ordinary play this is quite sufficient, and provides all the run back necessary. But for first-class tennis the ideal size is 60 feet wide and 120 feet long; there is no fear then of the enclosure interfering in any way with a player having to return a fast drive on to the back line.

Having selected the position, much care should be taken in laying down the court.

Drainage.

Thorough drainage is necessary, but the character of the soil must be taken into consideration. When it is of a sandy nature to some depth, and the soakage is able to pass through and get away easily, the problem offers no difficulties. But with a clay subsoil at some 8 or 9 inches below the surface, such as we have in our western and northern suburbs, the conditions are more troublesome. It is then necessary to form some system of drainage beneath the soil to take off the soakage, which may otherwise lie in clay pockets and cause sourness.

Sometimes a reticulation of porous earthenware pipes, known as agricultural pipes, is laid in a packing of loose stone on the clay bed and given a fall to an outlet at a lower point. Sometimes a layer of loose rubble packing or clinker ashes, about 6 inches thick, is laid over the whole area with a fall to carry the moisture away. If this method of drainage is resorted to care must be taken to see that this packing is well blinded with finer stone or ashes so as to prevent the soil from falling through the crevices of the stone and later causing an undulating surface. This blinding will also tend to keep the root action of the grass near the surface, which binds the top soil and gives the necessary hard finish. For this reason, also, top-dressing of a sandy nature should not be used as it will chip up when hit with the tennis balls. A loamy soil which will bind together when watered and rolled is the ideal top-dressing, as this ensures a hard playing surface. A better grass than couch has yet to be found for tennis lawns.

KITCHEN GARDEN.

Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally, except cucumbers, marrows, and pumpkins. In connection with these crops, growers are recommended to adopt some form of seed selection for the purpose of improving the quality of vegetables grown by them. Just at present, selections should be made from all members of the cucurbitaceæ (pumpkins, cucumbers, &c.). Tomatoes should also be selected for seed. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March, 1928.		April, 1928.		MOONRISE. Mar., 1928.	MOONRISE. April, 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.47	6.23	6.4	5.49	2.40	3.52
2	5.48	6.22	6.4	5.48	3.38	4.31
3	5.48	6.21	6.5	5.47	4.30	5.2
4	5.49	6.20	6 6	5.45	5.16	5.32
5	5 49	6.19	6.6	5.44	5.54	6.2
6	5.50	6 17	6.7	5.43	6.30	6.32
7	5.50	6.16	6.7	5 42	7.2	8.2
8	5.51	6.15	6 8	5.41	7.31	7.36
9	5.51	6.14	6.8	5.40	8.0	8.11
10	5.52	6.13	6.9	5.39	8 30	8.53
11	5.52	6.12	6.9	5.38	9.4	9.40
12	5.53	6.11	6.10	5.37	9.49	10.30
13	5.54	6.10	6.10	5.36	10.15	11.26
14	5.55	6.9	6 11	5.35	10 58	...
15	5.55	6.7	6.11	5.34	11.48	a.m. 12.24
16	5.56	6 6	6.12	5.33	a.m. ...	1.25
17	5.57	6 5	6.12	5.32	12.41	2.29
18	5 57	6 4	6.13	5.31	1 39	3.33
19	5.58	6.3	6.13	5.30	2.41	4 38
20	5.58	6 2	6 14	5.29	3.45	5.45
21	5.59	6.0	6.14	5.28	4.49	6.53
22	5.59	5.59	6.15	5.27	5.55	8.4
23	6.0	5 58	6 15	5.26	6.59	9.18
24	6.0	5.57	6.16	5.25	8.6	10.20
25	6.1	5 56	6.16	5.24	9.14	11.24
26	6.1	5.55	6.17	5.23	10 24	p.m. 12.21
27	6.2	5 53	6.17	5.22	11.39	1.12
28	6.2	5.52	6.18	5.22	p.m. 12.33	1.54
29	6.3	5.51	6.18	5.21	1.32	2.32
30	6.3	5.50	6.19	5.21	2.26	3 3
31	6.4	5.49			3.13	

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

6 Mar.	○	Full Moon	9 26 p.m.
16 ,,	☽	Last Quarter	1 20 a.m.
22 ,,	●	New Moon	6 29 a.m.
28 ,,	☾	First Quarter	9 54 p.m.

Apogee 11th March, at 1 6 p.m.
Perigee 23rd March, at 8 36 p.m.

The small star Chi Sagitarii will be occulted by the Moon at the time of rising on the night of the 16th. Its reappearance on the upper edge of the Moon may be observed with telescope or binoculars on the 17th about 1 o'clock a.m.

About 4·30 a.m. on the 18th Mercury and Venus will appear to be only about the width of the Moon apart, neither planet will be at its best, Venus having less than half its greatest brilliancy, and Mercury slightly more than half. With the waning Moon high above them the scene will not be as beautiful as it might have been.

A very interesting spectacle will be afforded on the morning of the 20th about 4.30, soon after the Moon has risen. The nearness to one another of the planets Venus and Mercury, with the crescent Moon not far to the right, should be sufficiently attractive to draw many from their beds at this early hour.

The Equinox will occur this year on the 21st of March instead of the 22nd on account of February having one day more; therefore it should be noted that the Sun will rise on the 21st at a point on the horizon which may be taken as due east, and the places of setting on the 20th and 21st may be taken as due west.

On the 22nd, Mercury will be at its greatest elongation 28 degrees west of the Sun.

On the 24th the Sun will be passing Uranus, which will, of course, be unobservable.

An occultation of a small star in Taurus, about 6.30 p.m. on the 26th, will form an interesting opportunity for telescopic observation although there will be a certain amount of twilight. The Moon will be high up in the north-west, but at a fairly favourable angle for a small telescope without a diagonal.

6 April	○	Full Moon	1 38 p.m.
13 ,,	☽	Last Quarter	6 8 p.m.
20 ,,	●	New Moon	3 24 p.m.
27 ,,	☾	First Quarter	7 41 a.m.

Apogee 8th April, at 10 12 a.m.
Perigee 21st April, at 5 12 a.m.

An occultation of Kappa Virginis by the full moon will take place about 2 a.m. on the 7th. At Townsville it will last about half an hour, but only for a very short time at Warwick and Toowoomba, at which places the occultation will be very near the southern or upper edge of the Moon.

On and about the 8th, Mercury and Venus will be apparently near to one another. They will be best observable about 5 o'clock in the morning. It will be interesting to notice how quickly Mercury will move eastward from Venus and apparently increase the distance between them. The brilliance of Mercury will be only about half of what it was on 3rd February, and will be on 10th May. Venus's brilliancy also will be only about half of what it was last August and at the beginning of this year.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Plant More Trees.

A STRONG plea for the planting of more trees throughout Queensland was made by his Excellency the Governor (Sir John Goodwin) recently, when he officially opened the additions to the Morningside State School. His Excellency said that he was pleased to hear the statement of the chairman of the school committee (Mr. A. H. Wright, M.L.A.) that in working for the beautification of the grounds they were paying attention to tree-planting. One wished, said His Excellency, that it was being done more extensively in Queensland. It was a pity to think that trees were being cut down, and that hardly sufficient was being done in some parts by way of replacement.

Bringing the Home Land Nearer—Another Epic of the Air.

ALL the possible first aeroplane flights from England to Australia have now been achieved by Australians. Ross and Keith Smith pioneered the airway home over four continents. Hinkler achieved the first solo flight in fastest time, and while Australia was still cheering that epic exploit, out of the blue came another tiny plane on the last lap of a sky ride from London to Canberra and bearing a smiling little lady, a young Australian, the first woman to fly from Britain to the Commonwealth. To Captain Lancaster, the intrepid and modest young Englishman, who piloted the machine, and Mrs. Keith Miller his passenger, all honour is due for accomplishing a flight that marks yet one more stage in man's conquest of the air. The record of hard luck that prolonged their aerial voyage from England intensifies popular appreciation of the high courage, remarkable endurance, and dour determination of both, to which is added everyone's admiration for the skill and resource of the indomitable pilot. The flights of the Smiths, Parer and Mackintosh, Hinkler, and now Lancaster and Mrs. Miller have made for Australia a high reputation in the air, a reputation which, no doubt, will serve as an inspiration as well as a tradition to young Australia in her progress towards complete mastership of the skies.

The Departmental Economic Committee.

THE conditions of the dairying industry in Queensland have been reviewed fully by the Departmental Economic Committee, and the results of its work are being set out by direction of the Minister of Agriculture and Stock, Mr. W. Forgan Smith, in a series of well-printed and illustrated bulletins covering every phase of dairy farming, and of which the first is about to be issued. The initial bulletin will be in the nature of a general survey of dairy practice and the economic facts governing it; and others, which will follow at regular intervals, will deal with such subjects as herd and pasture improvement; farm management; fodder crops, their cultivation and conservation; dairy farm machinery, equipment, buildings and storing; dairy hygiene; manufacturing, marketing, and transport. The Committee entered upon its job with a full realisation of its magnitude and an ample appreciation of all its complexities. Its task was attacked from every angle, full weight being given to every practical factor. The result produced is anything but an academical treatise; it is a plain straightforward statement of facts and findings, which should commend itself to every practical dairyman. The conclusions of the Committee were arrived at after very careful investigation and deliberation, and in its inquiry it invited the association of representatives of producers, producers direct, and of manufacturers, and in this way made their task as complete as possible.

The Dairying Industry of Queensland.

THE Committee recognised that dairy farming is a complex business and that many things influence the enterprise, situation and climatic conditions being not the least important of them. Nevertheless, success in dairying, as in other businesses, depends largely on efficient management to which there are many and varying contributing factors. Industrial changes alone have brought in their train many conditions which involve to-day, even more than yesterday, the application of exact business methods. For him to attain to a full measure of success it is essential that the dairy farmer should overhaul his business methods so that he may cut out the losing sections of his enterprise and concentrate on those that fill the bucket. Searching investigation by the farmer into his management may disclose to him that it is possible to reduce sectional losses and increase profitable activities. The dairy farmer who is most likely to come out a winner is he who has a practical knowledge of agriculture; the growing and rotation of crops; the conservation of fodder; stock feeding, breeding, and management; and who makes intelligent use of that knowledge.

Maxims for Maizegrowers.

THE following points may be taken as an epitome of Departmental advice to maizegrowers:—Practise rotation, maintain the soil in a state of fertility, prepare the land early and thoroughly. Trap the rain, and retain a maximum amount in the soil and subsoil for the benefit, ultimately, of the growing crop. Choose a suitable variety for the locality, and plant selected seed true to type, of good germinable quality, and of known high productivity. Use seed of a uniform size, sow it with a suitable drill, say, 12 to 15 inches apart at a regular depth of 3 inches to 4 inches in straight rows, preferably not less than 4 feet apart. Harrow the young plants with a light "lever" harrows at right angles to the line of drills. Cultivate the crop five or six times deeply, and close to the young plants at first, then gradually shallower, and a little farther away from the plants as they develop, so as not to damage the lateral roots. Use the cultivator as soon after each downpour of rain as possible. The soundness of this advice is evidenced by the experience of the most successful of growers in Queensland and other States. The chief requirements of a soil for the successful growth of maize are sufficient moisture and plant food material, and these are considerably increased by a thorough preparation of the land. The importance of a four or five months' winter fallow, especially where the rainfall during the growing period of the crop is insufficient for its requirements, or where the rainfall cannot be depended upon, is not as fully realised by many as it should be. This frequently results in the total or partial failure of the crop in a dry season, which would not occur if the amount of moisture that can be stored during a winter fallow were better appreciated. The effect of good preparation in the "unlocking" or rendering available the large stores of plant food material that exist in most maize soils is also worth consideration. Much of this food material for the plant must be brought into a condition in which it becomes easily soluble in the soil moisture, and immediately available as plant food for the young seedlings. A good start "is half the battle" no matter what the subsequent conditions may be, and no amount of after-cultivation can make up for insufficient preparation of the land. Tests at the Grafton Experiment Farm (N.S.W.) last season showed that whereas the yield from April ploughed land was 104 bushels 44 lb. an acre, that from August ploughed land was 90 bushels 35 lb. an acre, an increase of 14 bushels 9 lb. an acre.

The Sugar Industry—Its National Value.

SPEAKING to a gathering of representative sugar producers in Brisbane recently the Premier, Mr. W. McCormack, said, in the course of a notable address, that there were very few agricultural industries in which there was such a wide distribution of the wealth produced as in the sugar industry. All sections of the community participated in the results of that great industry. It was a good wage payer. It affected transport. Of all agricultural products, sugar, though a very costly agricultural product, provided the greatest distribution of wealth in proportion to the value of the product. For that reason Queensland had very good reason to be proud of this industry. In the course of the last twelve months he had the opportunity of visiting some other sugar countries, and he found that outside of the Hawaiian Islands, the Queensland sugar industry, both on the agricultural and technical sides—particularly the latter—had very little to learn from other countries. He spent a week in Louisiana soon after the great flooding by the Mississippi, and found that if they had cane growing in Queensland under the same conditions as there, they would have much more industrial trouble than they had now. He found that there was in Australia a better control and a better organisation of this great industry from the production of cane to the selling of the sugar, than there was in any other country he had visited. They had something to be proud of in the organisation that had been created in Australia for the production, manufacture, and distribution of this commodity. The industry in Australia also served another great purpose, and that was that it helped Queensland to develop the tropical portion of the State. One of the greatest aids in maintaining a white population in the northern part of the State was the sugar industry. He had spent his early manhood in North Queensland, and he had seen the wonderful progress that had been made there as the result of the advance of the sugar industry. Outside of a small coterie of people in the South the great bulk of the population of the Commonwealth was satisfied with the propeople a first-class commodity, and the public for their part should see that the sugar growers obtained a price that would enable them to develop the northern part of the continent by white or British labour.

Sugar and Security.

CONTINUING, Mr. McCormack said that there was no doubt that in respect of the sugar embargo the placing of their case before the people of Australia required intense organisation. That job was not yet finished. He wanted to impress that fact upon them. The good work that had been done required to be followed up by more intense organisation and propaganda on behalf of the sugar industry. Their only safeguard against the withdrawal of the embargo upon foreign sugar was to spread throughout Australia knowledge about the industry. The need for the protection of the sugar industry was so apparent to people in Queensland that they were likely to forget that other people—especially those in the Southern States—did not realise the circumstances surrounding it. He took every opportunity that was presented of placing before the people in the South the need for the continued protection of the industry, and for the settlement of the northern part of Queensland. In the maintaining of settlement there was no other industry that could replace sugar growing. They had the natural conditions suitable for the production of sugar; they were paying high wages, and giving good conditions to the people engaged in the industry, and that should conduce to a healthy growth of settlement in the North. All they asked the people in the North to do was to see that the people who lived in the tropical part of Queensland received a "fair go."

Bureau of Sugar Experiment Stations.

SUGAR GROWING IN HAWAII.

Extract from Report of Mr. ARTHUR F. BELL, Travelling Research Scholar.

I arrived in Honolulu on 9th August and was met by Mr. H. Atherton Lee, the Chief Pathologist. Having previously made official arrangements with the Committee of the Experimental Station of the H.S.P.A. I was enabled to commence work immediately.

As far as possible I made myself conversant with the work of the Experimental Station as a whole, but devoted particular attention to the study of the root disease or growth failure complex. The study of root diseases has been very largely shirked during the past, but within the last three years the H.S.P.A. has instituted a co-operative study of this problem, the work being divided amongst the Departments of Chemistry, Agriculture, Entomology, and Pathology.

As a result of these combined investigations many hitherto obscure problems have been cleared up, and it has been shown that the so-called root disease consists of several quite distinct factors, any one or several of which may be dominant in any particular locality. At the present time the root disease problem in Hawaii is considered under the following headings:—(*a*) Root rots of active parasites, (*b*) root rots of weak parasites, (*c*) nematode injury, (*d*) injury by soil inhabiting animals other than nematodes, (*e*) aluminium toxicity, (*f*) unfavourable concentrations of total mineral salts in the soil solution, (*g*) an unfavourable base ratio in the soil solution, and (*h*) a chlorosis due to an absence of traces of manganese. I think I have now a quite comprehensive view of the laboratory and field work which has been done in this important division of investigations.

In addition to the study of root diseases, the Pathology Department has, during the past four years, carried out work on the problems of eye spot, tip burn, salt spray injury, red stripe, pokkah bong or twisted top, and stem gall disease. I had full access to the files containing complete details of these investigations.

Concerning field trips, I visited all five plantations on the island of Oahu several times, and also made trips to the islands of Maui, Hawaii, and Kuai. These trips were made for the purpose of seeing the field experiments in, and the control of, the various phases of the root disease complex, together with eye spot and red stripe.

I was very fortunate in being able to attend the annual meeting of the Association of Hawaiian Sugar Technologists. This meeting is held in October and lasts one week. It is attended by the technical staffs of the Experimental Station and all plantations, as well as technical advisers employed by the sugar factors and the University. Numerous papers were presented both by field and laboratory men. In November I attended the annual meeting of the Hawaiian Sugar Planters' Association, and, by request, addressed the gathering on the question of foreign diseases and quarantine.

I have devoted a very considerable amount of time to the collection and preparation of the material for a manuscript on the question of the diagnosis of sugar-cane diseases. I have constructed a key for the identification of some forty parasitic and physiological diseases, followed by descriptions of the individual diseases. These descriptions average about 500 words each, and are mainly confined to a description of the symptoms of the disease, with short notes on the known means of control. Special attention has been given to the root disease complex, and a representative bibliography of some sixty titles has been appended. I am making a collection of photographs representative of various phases of the diseases, and propose that this manuscript should be issued as a Bulletin of the Bureau of Sugar Experiment Stations, upon my return to Queensland.

Shortly after my arrival in Honolulu, I constructed a chart showing the geographical distribution of all sugar-cane diseases, the original chart being compiled on the basis of my personal experience and such publications as were in the library of the H.S.P.A. The chart was then reproduced in printed form, and the H.S.P.A. has sent copies to all known sugar-cane pathologists for their correction and additions. By this means we expect to obtain a very valuable survey of the distribution of sugar-cane diseases which will be especially useful from the standpoint of quarantine.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

The Entomologist at Meringa, near Cairns (Mr. E. Jarvis), has submitted the following report in connection with the control of various insects attacking sugar-cane—January to February, 1928—to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—

LEAF HOPPERS OF THE SUGAR-CANE.

Up to the present little or no damage to cane has been caused in the Cairns district by the various species of leaf hoppers belonging to such families as Fulgoridæ, Derbidæ, &c., which, although plentiful enough at times amongst the leaves of cane plants, appear to be effectually kept in check by their own natural enemies.

Perhaps our two best known species of leaf hoppers are *Perkinsiella saccharicida* Kirk. and *Tetigonia parthaon* Kirk., the former of which is found also in Hawaii, Fiji, and China. This rather attractive hopper (Figs. 1 to 5 on accompanying plate) occurs commonly in our canefields, where it is mainly responsible for the small red or whitish isolated blotches or scars of irregular outline noticed here and there on the stems or leaves of healthy stools. Such scars indicate the presence of eggs of this insect, which are deposited in a chamber cut by the ovipositer of the female hopper in the parenchyma or living plant tissue. (Fig. 3.)

Viewed with a pocket lens, one can sometimes plainly see the head end of these eggs showing through the epidermis of the leaf or midrib, and also notice on each two tiny red spots, the future eyes of the adult insect. (Fig. 2.) The fully grown winged hopper is able to fly well, its activities, however, being carried out during the hours of darkness.

In certain seasons a short-winged or flightless (Brachypterous) form of this insect sometimes appears, which is thought to be more prolific than the normal brood of fully-winged specimens.

We are indebted to Kirkcaldy of the Hawaiian Sugar Planters' Association for much valuable information regarding the natural control of *Perkinsiella saccharicida* in Queensland, who more than twenty years ago discovered that the eggs of this leaf hopper are destroyed by the Myrmarid and Eulophid parasites *Paranagrus optabilis* and *Ootetrastichus beatus*, respectively, while the nymphal and winged stages are parasitised by the Dryinid *Pseudogonatopus saccharetorum*, by a Dipteron, viz., *Pipunculus Juvator*, and by larvæ of the Lepidopteron *Agamopsyche Thernodes*, a species of the family Epipyropidæ. It is little wonder that the above mentioned parasites, when aided by such predaceous enemies as lady-bird beetles, ants, earwigs, jumping-spiders, syrphid flies, reduviid and pentatomid bugs, and entomogenous fungi, are able collectively to prevent the leaf hopper in question from multiplying to an injurious extent.

Another species of Fulgorpidea which has been recorded from Cairns as frequenting grasses and casually the leaves of sugar-cane, is *Phacalastor pseudomaidis*. In this hopper "the tegmina" (according to Kirkcaldy) "are strongly granulate with dark brown, and the nymphs are whitish, banded and spotted with dark brown. Frons and antennæ dark smoky brown with a double (somewhat interrupted) line across the middle of the former. Femora smoky, apically black; tibiæ pale, annulated with black. Males macropterous (long-winged), genital segment black. Females dimorphic (existing in two forms), genital segment pale, a little infuscate. The short-winged form has hyaline tegmina with a large black spot apically. Length, 3½ to 4 mill. (macropt.); 2½ mill. (brachypt.)."

A third species belonging to the same super-family is our attractive little leaf hopper *Astorga saccharicida*, which is frequently met with on cane leaves and grasses around Gordonvale and Meringa. (See Figs. 6, 11, 12, 13, on plate.)

The following brief description of this insect by Kirkcaldy will be useful to officers of the Division of Entomology of the Sugar Bureau for reference purposes:— "Brownish testaceous; head paler, abdomen mostly darker; frons laterally and dorsally marked with short brownish lines. Tegmina pale brownish-yellow, a brownish smudge on coastal membrane and coastal cell, also on apical margin (except extreme apex), with sub-parallel darker stripes, and the two longer ones near apex across tegmen, also one or two small irregular specks on disc or corium and clavus. Wings pale smoky, veins pale brown. Legs lined with brownish. Length, 7½ to 8¾ mill."

On the 27th of last month (January) specimens of an additional species of Fulgoroidea, closely related to *Perkinsiella*, were received at this Experiment Station from a grower at Mackay, where they were said to be damaging maize plants, and to have injured sugar-cane about two years ago. This leaf hopper has a wing expanse of 9 mm., the apical veins of its tegmina and portions of the adjoining cells being clouded with dark brown.

Two interesting hoppers belonging to the family Derbidæ were collected some years ago near Cairns by Kirkcaldy from leaves of sugar-cane; and as these insects have not previously been recorded by our Sugar Bureau the following brief descriptions of same will not be out of place here.

Heronax sacchivora.—This species is allied to the type (*H. parnassius*), "but the apical veins are mostly sangineous, and the tegminal pattern is pale, and more broken. Lateral margins of frons contiguous throughout, and dorsally the head is much narrower, and but narrowly excavated. Length, 3¼ mill. to apex of abdomen, 7 to apex of tegmen."

Proutista lumholtzi Kirk.—"Head and pronotum testaceous, a speck at the base of the frons, and another on the clypeus, and some suffusions apically on the pronotum blackish brown. Mesonotum castaneous; a median keel, a rough W. in the middle, and the hind margin medianly, testaceous. Metanotum dark, whitish medianly. Legs testacous; fore coxæ, apex of tibiæ, &c., blackish. Abdomen testaceous and blackish confused. Tegmina hyaline, marked with blackish-brown less closely than in *moesta*. Length, 7½, expanse of tegmen, 15 mill." (See genatalia figured on accompanying plate, Figs. 7, 8, 9.)

The Tetigoniidæ (super-family Jassoidea), include two species known to attack sugar-cane in Queensland and elsewhere, viz.:—*Tetigonia parthaon* Kirk. and *T. albida* Walk. The former insect has been alluded to in Bulletin No. 3 (second edition revised) of Bureau of Sugar Experiment Stations, Division of Entomology, while Kirkcaldy collected specimens of the latter (*T. albida*) many years ago at Cairns, Gordonvale, and Bundaberg, on grasses and sugar-cane; and has also recorded its occurrence from Ceylon, Celebes, Philippines, West and South Africa, and Madagascar.

How to Combat Leaf Hoppers.

Advice having been recently sought from this Experiment Station regarding approved methods of controlling such cane insects, opportunity has been taken in the present monthly report of dealing with this important phase of the question.

The sprays usually employed against leaf hoppers are (1) Kerosene emulsion, tobacco decoction, or soap emulsions, &c.

If using kerosene emulsion, it should not be more than a 10 per cent. strength. To make the stock solution, dissolve 1 lb. of hard soap in 2 gallons of hot, soft water; then add 2 gallons of kerosene, and agitate vigorously by pumping it back into itself until a thick creamy liquid results. Dilute this before using to 10 per cent. strength, by adding 5⅜ gallons of water to 1 gallon of the stock solution.

A good tobacco spray can be made by steeping 1 lb. of the leaves or stems in 4 gallons of hot water. This should be applied as soon as possible after preparation, and while still quite warm.

Another simple spraying solution is made from 1 lb. of whale oil soap in 5 gallons of water; or from 1 lb. of common laundry soap in about 3 gallons of water. Either of the above mentioned sprays (applied if needs be three or four times at intervals of six to eight days) have been found to destroy the nymphal forms of leaf hoppers. Such spraying should be followed up with some suitable trap of the sticky shield kind. This can be made by stretching a piece of canvas on a light frame of wood, measuring about 3 feet by 5 feet, which is painted over with tar or some other adhesive to catch the winged hoppers. A good painting mixture is made as follows:—Heat 20 oz. of resin over a gentle fire until fused, then add 5 oz. of linseed oil and 10 oz. of honey. When well mixed, remove from fire, cool, and add 20 oz. of 90 per cent. alcohol. This coating substance should be used cold, and kept out of contact with air.

Another formula is to melt together equal parts of resin, wax, and turpentine; this composition is applied hot.

These coated screens are taken along the cane rows at night time, together with a bright lamp or torch. One operator holds the screen in correct position (vertically, directly facing the cane stools on either side), while another walks slowly alongside gently beating or agitating the leaves. The adult hoppers fly hastily out, towards the lamp light, come into contact with the screen, and stick to the prepared surface in thousands.

CANE VARIETIES GROWN IN QUEENSLAND.

THEIR RESISTANCE TO DISEASE.

By E. J. FERGUSON WOOD, B.Sc.

The following notes are the result of observations made in the field during 1927, in all the sugar districts of Queensland. Farmers are continually inquiring about varieties, and this section is an endeavour to answer the question. In connection with varieties, it must be remembered that there are variations in soil, climate, &c., within a small area, which may affect the qualities of a variety of cane, and it so happens that a variety which does well in one situation may not do at all well on an adjacent farm. Another important fact that is continually cropping up in connection with disease resistance is the variation in the degree of resistance in the same cane in different districts. An example of this is shown by M.1900 Seedling and D.1135 at Childers and Bundaberg. In the former place, M.1900 Seedling is rather resistant to Gumming Disease, and D.1135 very susceptible and subject to great damage. In the latter D.1135 is on the whole rather tolerant to Gumming, and M.1900 Seedling is in many cases wiped out. Again, N.G.16 is considered on the Northern Rivers of New South Wales to be almost immune to Mosaic, while in Bundaberg it is rather susceptible to the disease. These are unaccountable phenomena, but are of the greatest importance. It is also strongly suspected that a resistant cane may, under certain conditions, lose some of its powers. A recognition of these local variations will show the farmer that data concerning resistance are not infallible, but in most cases the general position is clear, and a variety is not stated as resistant without strong evidence and the recognition of these facts.

The use of resistant canes is the easiest method of disease control, and continual experiment is necessary. On the other hand, promiscuous collections of doubtful varieties on a number of farms, such as occur in many of the areas south of Proserpine, are to be deplored. It is well for the farmer to allow the Experiment Stations to carry out the investigation of varieties, and to follow their recommendations, as it is cheaper for the farmer and better for the mill. Many farms are merely graveyards of discarded varieties, and, as such, are a curse to their owners and all connected with them. Successful canes are few and far between, as will be seen from the number of staple canes grown in Queensland when compared with the number of seedlings that have been raised, and the number of canes which have been imported from time to time.

Badila, or New Guinea 15.

This is by far the best variety grown in the North of Queensland, where it is an annual cropper, though the plant crop is usually sown before the winter. It is a good striker, excellent stooler and ratooner at almost any time. In the South it becomes a two-year cane, and for this reason does not find favour with the farmers, though it gives very good profits to the plantations around Bundaberg. One of its advantages is the fact that it covers the rows in very quickly. It needs a first class soil and a heavy rainfall, and does not do well on medium to poor land after the first few years. It gives a heavy crop with thick sticks, which are heavy and easy to cut and trash; is a favourite with the cutters, and a fair cane to mill. It has a high sugar content, though this is best between August and November. It is recommended to be planted wherever it will grow north of Townsville.

In North Queensland it is resistant to Gumming and Mosaic, rather susceptible to Leaf Scald, but tolerant (its susceptibility to this disease is probably due to deterioration of the cane stock grown at present), and very susceptible to Top Rot and Spindle Top. Grubs affect it badly at times. It resists Leaf Stripe.

In the South it has proved highly susceptible to Gumming, though on the Northern Rivers of New South Wales it is regarded as moderately resistant. It is therefore not recommended for the southern districts, except in such places as Hapsburg and Avondale, where it seems to be practically free of gum. Its reputed resistance to Fiji Disease in New South Wales would make it a useful cane at Maryborough on the river banks, if it were selected against gum.

At Tully, it forms 99 per cent. of the crop, and over 90 per cent. at Innisfail, and should form a larger part of the crop at Ingham. It often gives as heavy crops as other varieties on poorer lands, but appears lighter on account of its short thick sticks.

H.Q. 426 (Clark's Seedling).

This cane is an old favourite in the North for early cropping, but it loses its density towards the end of the year. In the beginningof the season it gives a higher density than any other cane commonly grown in Queensland except B.208. It is a fair striker and a quick-growing cane (though it needs a little nursing), and can thus be planted in August and cut the following June. On this account it is favoured for late planting. A rather lighter cropper than Badila, it is grown on second class land, where it does well. It is grown in all districts north of Bundaberg, to some extent, though it has gone out in Ingham and Goondi, owing to disease. It does not appear to grow so well south of Mackay.

Unfortunately, it is a cane very susceptible to disease, being badly attacked by Leaf Scald north of Ingham, and by Gumming in this district. At Mackay it is suffering from Red Rot, and unless care is taken will go out there also. It is moderately resistant to Mosaic, and apparently very resistant to Leaf Stripe—to judge by its appearance at Mossman and on the Burdekin. It lodges if allowed to grow too long, and the c.c.s. rapidly falls.

Q. 813.

This cane is rapidly becoming the staple variety in the Mackay district, and is coming into its own in other parts. In the tropics it is an early maturer and can be cut at any time during the season. It strikes excellently, ratoons well, and grows quickly. The Mackay climate is ideal for the cane, which grows too lank and lodges in the more nothern areas (unless planted after September). In this case it gives a good crop of high density, and its resistance to disease is a great advantage. It is used at Ingham as a Gum resister, and should be grown more exclusively wherever Leaf Scald is bad, as it possesses good powers of resistance. It requires more attention at Mossman and on the poorer soils in the Cairns district.

In the South it is a late maturer, and cannot be cut before September or it will not ratoon. It is probable that it will improve, as it has done at Mackay, for it needs acclimatisation. To ratoon well, it needs the trash burnt off early, and a lot of bad ratoons of this cane are due to neglect of this. As it is a shallow rooter it does not do well on very sandy soils nor on red soils of the Childers type. It does fairly well on the Woongarra, and gives good and payable crops at Qunaba, and on the Sugar Experiment Station at Bundaberg, where it has been grown for some years. The Station has planted it practically throughout in order to control Gumming.

Its resistance to disease is very great, and it is perhaps the most useful cane grown in Queensland from this point of view. It is, however, not immune to any of the diseases, and this fact is disappointing to many farmers. It is certainly one of our most resistant canes to Gumming, as has been shown on the Herbert, where it is rather extensively grown, and at Nambour and Bundaberg. It certainly shows the Leaf Streaks, but not to the same extent as the more susceptible varieties, but gum can rarely be got to ooze from the stick, except in severe cases. If, as is suspected, Gum is a leaf disease which affects the stem in certain conditions, this is an indication of resistance. At any rate, it gives a strike and a crop in Woongarra where M.1900 Seedling and D.1135 fail to do so. It is rather resistant to Mosaic, but not tolerant, succumbing easily when it becomes affected; appears to resist Leaf Scald, though this requires confirmation; is resistant to Fiji Disease, though this resistance does not approach immunity as nearly as was hoped from this cane. However, it is still useful, if rogued, as a variety to control Fiji Disease. It is more susceptible to Leaf Stripe and root rots than to other diseases, and shows grub attack easily owing to the fact that it is a shallow rooter. It is a cane worth a thorough trial, especially in the southern districts.

H.Q. 285.

(Milton, Early Maturer, Hambledon Seedling, Nerang, Sarina, Mackay, &c., are local names for this cane).

This variety is the staple early-maturing cane in the South of Queensland. It gives a very good c.c.s. in the early part of the season, but is usually a light cropper, and will not stand over. It ratoons and strikes well, and is at its best on alluvial and ti-tree swamp soils, such as the Burnett soils and those at Pialba and Beenleigh. It also does well in wet places at times. It is rather inclined to lodge if left to stand too long. It is not favoured in the North owing to its rank growth and light cropping, but might with advantage be tried at Mossman. It is still grown to some extent near Mackay, but is giving place to Q.813, which is a better cropper and more resistant to disease.

In the Bundaberg district it is badly attacked by Mosaic, and its susceptibility to this disease is a great drawback, as it is the only suitable early maturing cane. At Nambour it is gummed, and is useless on that account. In the Beenleigh area it seems to promise well as a resistant cane to Fiji disease, but does take the disease and requires rogueing. It is subject to Red Rot and to root diseases where these are bad.

D. 1135.

(Frost Proof, Frost Resister, Seedling at Beenleigh, Bundaberg, and Fairymead, are local names for this cane).

This old favourite is gradually going out of vogue, owing to the fact that it is susceptible to most diseases. It stands up to any amount of mechanical injury, though it does not live up to its name of Frost Proof, as it is about as susceptible to this as is Q.813. It strikes well when healthy, and gives a great number of ratoons, which, however, become spindly. For this reason it is often grown in stump country in the South and as far as Mackay, and is ratooned seven or eight times. Farmers have never been particular about the plants they have used, with the result that the cane has "gone off." It is, perhaps, the best cane known for grub resistance, owing to its deep-rooting capacity, and is a favourite on sandy soils for the same reason. There has been a popular fallacy that this cane was resistant to disease; but, in reality, it is susceptible, especially to Fiji disease and Gumming; moderately susceptible to Mosaic and to Leaf Stripe; also to root diseases such as Peg Leg and Knife Cut. I have also seen the cane affected with Iliau. It does, however, seem to resist Leaf Scald, and I have never seen this variety affected with this disease in North Queensland. Reports from New South Wals confirm this. The planting of this cane is discouraged in Beenleigh and Maryborough owing to Fiji disease, and in Bundaberg owing to Gum. In Mossman it is badly affected with Leaf Stripe.

M. 1900 Seedling.

Another old favourite in the South, which has succumbed to disease. It is always a late maturer and will not ratoon if cut early. Gives a high c.c.s. if it remains erect, and crops heavily. Owing to the weight of the sticks it is liable to fall, and the density immediately drops. It is not as sure a striker as Q.813, and for various reasons is being replaced by this variety in the Mackay area. Being a brittle cane, it requires more attention than D.1135 during the early stages.

Unfortunately, it is very susceptible to disease, and succumbs to Fiji disease at Beenleigh and Maryborough, Gum at Nambour and Bundaberg, root diseases at Childers (Iliau, Peg Leg, Marasmius, &c.), and Red Rot in the Mackay area. It is also subject to Top Rot on the Burdekin, though not to such an extent as Badila. Its planting is not recommended except in areas which are known to be free of disease.

It is not popular in the North owing to rank growth and consequent low density, and is hardly a commercial cane north of Mackay.

The Gorus.

(N.G.24, N.G.24 A, and N.G.24 B).

These canes are not popular in the South, and are rarely seen; on the Burdekin they come into prominence, and are practically free of disease. In the months of September and October they form fairly profitable canes in this district, but if not cut at this time they are not good. Farther North, Leaf Scald has practically caused their extermination.

They are not to be recommended north of Townsville, and in Leaf Scald areas they should be prohibited as they carry the disease, and do not give a crop. It would be safe to say that practically every field of Goru north of Ingham was affected with Leaf Scald.

They occur to some extent at Beenleigh, where they show Gum and Fiji disease.

7 R. 428 (Pompey).

This cane, which is a late maturer, and which gives a heavy crop of moderate or low c.c.s., is somewhat popular at Mackay, and is in danger of becoming so at Mossman. It is also popular at Goondi, on the poorer soils, but at Mourilyan it averaged under 10 c.c.s. during the last season, and is, fortunately, out of favour.

It is unpopular among pathologists, owing to the fact that it is very susceptible to Fiji disease, Mosaic, Leaf Stripe, Leaf Scald, and Gum, and moderately susceptible to Spindle Top and Top Rot. Extensive planting of this cane is not advised owing to the probability of its developing disease. It suffers from Leaf Scald in the Innisfail districts, and Leaf Stripe on the Burdekin.

Korpi.

This cane has been used extensively at Ingham in the control work of Gumming disease, and we are assured by officers of the Colonial Sugar Refining Company that it is pretty resistant. It requires a rich soil and a good rainfall. It arrows early, is a good striker and ratooner, and is erect in habit. Just now its distribution is confined to the Herbert River, Childers, and a few farms at Mossman and Ayr. The powers of resistance of this cane to other diseases than Gumming should be tested, and it is hoped that this will be done at an early date.

Orambo.

This variety also is grown almost exclusively in the Herbert River districts and resists Gumming. It is a heavy cropper of very good density, and seems from the few tests made in the North to mature early. If it retains this property in the South and proves resistant to Gum there also, it will be a boon to the pathologists and farmers. It is not so erect as Korpi, but does not arrow at all freely, nor does it require such good soil. It seems a better cane than Q.813 in the North, and more suited to the tropical climate. It also needs to be tried out in the South in controlled experiment plots, and to be brought into use in the control of Gumming in Bundaberg and Childers.

Nanemo (probably the same as Bogela).

Another cane of the series which may be used to combat Gumming in the South. It is a good cropper, but not such a good striker as Oramboo, which rivals Q.813. It appears to be susceptible to Leaf Scald, and so will probably not come into general use in the Innisfail and Cairns areas, and is not recommended at Mossman.

E.K. 1.

This is a cane with rather a heavier stick than Q.813 but much of the same colour. It has a low density, and though it gives a heavy crop is, as a rule, disappointing. Moreover, it is very susceptible to Gum, Fiji disease, Mosaic, &c. It is not recommended to the farmer.

E.K. 2.

This variety has proved even less successful than E.K.1, and is not grown commercially in Queensland, except perhaps on a few isolated farms.

E.K. 28.

The best of the E.K. canes in this State is this variety, which gives a heavy crop with a few very heavy sticks in the stool, and a high density if cut late in the season. When cut early it will not ratoon, and is at its best in October, November, and December. It is a sure striker and ratooner when planted at the right time, especially on poorer soils. North of Ingham it is too rank a grower unless planted in September or October. It is always erect, and for this reason does not fill in the rows quickly. On the poorer soils at Bauple this cane is giving better returns than D.1135 on hillsides, also at Mackay and Ayr it gives heavy crops, approaching 60 tons per acre at times. When forced it has a tendency to become pithy and the density falls. It has not become a favourite at Mossman owing to this fact, and also, as it arrows early many farmers regard it as an early maturer.

It is, like the other E.K. canes, very susceptible to Gumming, Fiji disease, Mosaic, and Root Fungi. For this reason it can only be recommended in a limited area, including Bauple, Mackay, and the Burdekin, and also for further trial at Mossman.

M. 189 (Black Innis).

This cane has an erect habit, and is a good stooler and ratooner, giving a number of ratoon crops in the Mackay district. Here it is used to replace D.1135 in the stump country, and is an early maturer though its density does not seem to be dependable. It is rather similar to Q.813 except that it is more erect.

Farther south, it becomes a late maturer, as does Q.813, but is still widely grown. It also loses its power of giving numerous ratoon crops.

It is not extensively grown north of Proserpine, but occurs to some extent in all areas south of this, except at Beenleigh.

Unfortunately, it is very subject to Mosaic disease, and seems to defy control measures owing to its great susceptibility to the disease. In the Hampden area it is practically free, and is fairly clean in the Bingera section of Bundaberg, but is becoming infected owing to the negligence of the farmers. In other parts it is very badly infected, which is a pity, as it is tolerant and moderately resistant to Gumming at Bundaberg and Childers, but is moderately susceptible to Fiji disease. It is attacked by the Red Rot fungus at Sarina, and has gone out of favour there for that reason.

M. 55 (Double Eye).

This cane is similar in habit to M.1900 Seedling, but is more erect, a better stooler, and has a double eye, by which it is characterised. The stick is heavy, but the density is on the low side as a rule, though the purity of the juice is high and the fibre low. It is grown in the Isis district, where it seems to be showing resistance to Gumming. As, however, the only field seen in Bundaberg was badly streaked, it seems that further resistance trials are necessary before placing reliance on this variety as a resister. It is highly susceptible to Mosaic, and plants should be carefully selected. Steps have been taken by Millaquin to introduce the cane to the Woongarra in the hope that it will resist Gum, and we hope that it will prove at least a moderately resistant cane.

B. 147.

A thin hard cane much after the erect habit of D.1135; as a young crop it stools out well and covers the rows, which should be about 4 feet 6 inches apart. It trashes easily, strikes and ratoons very well, and gives a moderate c.c.s. It is little grown in the southern districts, but comes into prominence on the Mulgrave and Mossman Rivers where it is much favoured.

It is very susceptible to Mosaic and Leaf Stripe, and is badly affected by the latter disease at Mossman. At Aloomba it has shown strong powers of resistance to Gum, and I have seen a field of first ratoons growing alongside a badly-gummed field of H.109 without showing any trace of the disease, even when cut up into plant lengths. For this reason, it should prove a useful cane in the Bundaberg district if the farmers could only keep it free from Mosaic.

Q. 855.

This is a late maturing cane somewhat similar in appearance to Q.813, but heavier and thicker in the stick and more brownish in colour. It is also more erect, and a deeper rooter. It stools and ratoons well, and is a favourite at Bingera, parts of the Mackay district, and Mossman.

Its powers of resistance to disease are less than those of Q.813, and it is only moderately resistant to Gum and Mosaic, and is suceptible to Leaf Stripe, being badly affected by the latter disease at Mosssman. It might be worth trying for resistance to Fiji disease.

Malagache.

This is an old variety which is still extensively grown in the Homebush district and elsewhere at Mackay, also at Bauple and Yerra. It crops heavily and ratoons well, giving a moderate but constant density. It is not a cane which would find favour in many places but suits poor soils.

At times it appears susceptible to Mosaic, and at others it shows surprising resistance. It is not, however, a cane which we could recommend for general use, and will, no doubt, be replaced by canes with a higher density.

H.Q. 458.

This variety is often thought to be a sport of Clark's Seedling, but is really a different cane with a rather similar stick. Its leaves are lighter in colour, and its habit more erect. There are a few heavy sticks to the stool, which covers the rows badly and allows weeds to grow. It occurs in many districts, but is not extensively grown owing to its requiring too much work in the early stages. It shares with Clark's Seedling the susceptibility to disease of that variety, and takes Mosaic and root diseases rather readily. It has not been thoroughly tested, but will probably never be a popular variety.

H. 227.

This is grown to a very limited extent at Nambour and Bundaberg, where it shows promise of resistance to Gumming. It is an early maturing cane, and as such is important, owing to the fact that H.Q.285 is susceptible to Gum. It is erect in habit, and somewhat resembles D.1135, though the sticks are heavier and the density better.

Unfortunately, it is highly susceptible to Mosaic, and for this reason was practically discarded from the Bundaberg Experiment Station. If kept free from this disease, it should be useful to farmers on the Woongarra and at Nambour. There is no record of the variety in an area free from Gum, and this is unfortunate. Endeavours are being made to keep a stock of the cane as clean as possible for the benefit of the Bundaberg farmers.

Mahona.

This cane is of high density and is a good cropper. It is confiend to the river soils at Bingera, and to a few farms at Nambour. Its susceptibility to Leaf Scald (which was found by Mr. Kelly in the variety at Nambour) makes it a risky cane to grow, and that fact that it is also susceptible to Gumming and Mosaic in Bundaberg makes it a variety which requires to be carefully watched. Strangely enough it is regarded as moderately resistant to Mosaic in New South Wales.

Petite Senneville or Brown Innis.

This variety is practically confined to the Maryborough and Bauple districts, and is a good cropper of fair density. It stools very well, and is popular in these parts. It is, however, susceptible to Gum, and very susceptible to Mosaic, but, from trials at Maryborough, it seemes to have a possibility of resistance to Fiji disease. Further trials, however, are necessary before this can be established. This cane does well on the red forest soils at Maryborough. It might with advantage be introduced into resistance trials at Beenleigh.

B. 156.

This cane is grown to a very small extent in Queensland at present, and is usually diseased where it is found, as it is especially susceptible to Mosaic and Leaf Stripe. It has lately been prohibited in the Mulgrave area owing to a serious infestation of Mosaic in an otherwise clean area. It still occurs to some extent at Proserpine and Mackay. It has little to recommend it, as it is a poor tester and not the best of croppers.

B. 208.

This is a variety which occurs in isolated places in the Bundaberg and other districts, where it is a harbour for disease, but is grown extensively on the Burdekin and Houghton Rivers. It has the advantage of giving an abnormally high density, even in the early part of the season, and a good crop, but it will not ratoon and requires annual planting.

It has been wiped out of most districts by Gumming, Mosaic, and Leaf Stripe, to all of which it is very highly susceptible. On the Burdekin and at Giru, the farmers still persist with it, despite the fact that it is badly infested with Leaf Stripe and Mosaic and often dies out as a result of these diseases. It would be more profitable to grow canes which would give, perhaps, a lower yield in the plant crop, and will ratoon well, as does Clark's Seedling, but the old idea held by most Burdekin farmers that ratoons do not pay dies hard. Those who do ratoon find that it is the most economical way of farming.

H. 109.

This variety has proved a great disappointment to farmers in Australia who have read of the results obtained with it in Hawaii. It does not yield the returns that our better varieties do, and is highly susceptible to Gumming, Mosaic, and other diseases. From the results that I have seen with this cane, I feel that it is an undesirable variety from the point of view of the Queensland farmer.

Uba.

The properties of this cane are well known to farmers, and the discussion of its merits and demerits is still open. It is immune to Mosaic, shows gum streaks, and takes Fiji disease rather readily in the few observed cases, so that it is not by any means immune to other diseases than Mosaic. I should recommend it in gullies in the South where the Wild Sorghum has got a hold, and is menacing the other varieties with Mosaic.

Shahjahanpur (stated to be identical with P.O.J.36).

This is a cane which should be condemned throughout Queensland, and farmers who plant it will no doubt be ordered to get rid of it under the new "Disease" gazettals, owing to the fact that it is in all cases 100 per cent. infected with Mosaic, and is a centre of infection for all varieties which surround it.

Striped Singapore (similar to "Imperial" on the Burdekin).

This is a heavy cropper with a moderate to low density. When healthy it is a good striker and ratooner, and is grown to some extent at Beenleigh, where it succumbs to Wilt fungi, and other diseases. It is also grown on the Burdekin where it is known as Imperial, and at Booyal and Dallarnil, where it is badly affected with Mosaic. In other places it is occasionally seen.

It is very susceptible to Gum, which caused it to be given up at Bundaberg, and also to Mosaic, but seems moderately resistant to Fiji disease at Beenleigh. Only light infections have been noticed in this variety.

Rappoe.

Another old timer which has gone out of favour owing to disease, but which still exists in the Beenleigh district, Booyal, and Dallarnil. It is highly susceptible to Gumming, Mosaic, and other diseases. In the last two districts mentioned it is badly affected by Mosaic.

Q. 116 (Purple Innis or Blue Innis).

This cane is not an Innis, but somewhat resembles Black Innis in habit. It is grown commercially only at Proserpine, but is a cane which matures very late, and is useful towards the end of the season. Unfortunately, it arrows early, and is therefore not much use as a two-year cropper in the South. At Broadwater, in New South Wales, it showed favourable resistance to Gumming, and should be tried again in the areas affected with this disease, where it should be at least a useful parent for seedlings. A cane, stated to be Purple Innis, is showing Fiji disease badly at Beenleigh, but there was no cane on the plants at the time of inspection so that its identity with Q.116 is not proved.

Q. 1098.

This cane gives a heavy stick and a fair stool, with fair density, and is erect. It is scattered in distribution, but is not generally grown. Its resistance to disease has not been tried out, but it is known to be rather susceptible to Mosaic. It might, with advantage, be given a further trial, under supervision.

Q. 812 A.

This cane seems to differ from Q.813 in some respects. It is hoped that its identity will be established in the near future. It is grown to some extent at Nambour, where the farmers assert that it is a different cane.

Q. 822.

This cane is confined to Bauple, and its identity is doubtful, the more so as the cane Q.822 has not been recorded as having been given out to farmers from the Bureau of Sugar Experiment Stations. It much resembles Q.813 and may prove identical.

Q. 903.

An erect cane of moderate to low density which is commercially grown only in the Jarvisfield and Rita Island sections of the Burdekin district. It seems to possess some powers of disease resistance.

Q. 970.

This cane does not give good results on the whole, and is only grown sporadically on a small number of farms scattered throughout the State. It is very susceptible to Gumming and Mosaic, and does not seem to be worth further trials.

H.Q. 5.

This cane is a good stooler but light cropper, with a very hard stick. It falls badly, and is unpopular with the cutters. It is confined to the Proserpine district, where it is still grown to some extent. According to the results obtained at Broadwater, it resists Gumming better than any other variety tried, and is almost immune to Mosaic, so that it merits a further trial in the Bundaberg and Nambour districts. It might be useful for seedling work. A few farmers grow the variety at Beenleigh. It is a slow striker but a great grower.

P.O.J. 2714.

According to some resistance trials, where this cane was planted alongside B.208 and corn, it is almost, if not quite, immune to Mosaic, but does take Leaf Stripe and Gum to some extent. It is a new variety to Queensland, and requires to be thoroughly tried out. It appears to be a heavy cropper but only moderate in density.

D. 109.

This variety is grown only at Sarina and Mackay to a limited extent. It falls badly, is a moderate stooler with a long rather thin stick, and does not seem worth extensive trials.

Malabar.

This is a very heavy cropper and prolific ratooner, but its cane is so difficult to treat in the mill that it is prohibited almost throughout Queensland. It is susceptible to Mosaic and Fiji disease, but is very resistant to Gumming, and for this reason it has been permitted at Nambour. It is a two-year cane, and is not recommended, as we have better canes to take its place.

Yellow Caledonia.

This is similar to Malabar in appearance. It is certainly very susceptible to Gum on the Bundaberg Station, and a selected plot of plants had to be ploughed out this year owing to this disease.

Cheribon.

An old cane which is almost universally prohibited. Its resistance to Gumming and other diseases is low, and it is not a desirable variety, though retained in the Bingera area as a very late cane.

Gingila and Gingor.

These canes are very susceptible to diseases and are not recommended; they are grown only on a few farms in the State.

Mavoe, or Mahoavu.

This is a heavy cane of the Badila type, but very susceptible to disease. Grown at Maryborough. It should not be planted.

N.G. 47, Green Baruma.

(Known in Beenleigh at Green Goru, which is also present).

This is almost 100 per cent. infected with Mosaic, and is a useless variety of very low density. It is susceptible to Fiji disease.

Meera.

This is an old cane of low density but fair stooling and cropping qualities, which is still grown at Maryborough and Beenleigh. It is susceptible to Fiji disease and Gum, and possibly to Mosaic, and is not worth a place among the commercial canes.

N.G. 64. (Purple Top).

This variety is grown only at Beenleigh and on Tinana Creek, Maryborough, where it is going out of cultivation. It is very susceptible to Mosaic and Gum, and also to Fiji disease. It falls badly, is light in tonnage and poor in density.

Kikarea (Striped New Guinea).

This variety is confined to Beenleigh, but is rapidly going out. It takes Gum badly, and is susceptible to Fiji disease. It is somewhat similar in appearance to Singapore, but has a striped leaf.

N.G. 16.

This is a heavy cane of the Badila type, with the same heavy stick and stool. It is grown in the South of Queensland, mainly on the plantations around Bundaberg. It matures late in the year, and is a two-year cropper. It is very susceptible to Fiji and Gum, and moderately so to Mosaic and Leaf Stripe.

NEW VARIETIES THAT ARE BEING PROPAGATED.

A series of new canes have been raised from seed at the South Johnstone Experiment Station. They are heavy croppers, and are of good density. Measures are being taken to try their resistance to disease, especially to Gumming and Top Rot, and it is hoped to try them in contact with Fiji disease in the near future. Hitherto the tests have been carried out in small plots at the Stations, and field trials are necessary before a true idea of their value can be obtained. The C.S.R. Company are also raising seedlings at Macknade.

Other varieties have been imported from overseas, and are being planted in trial plots.

Conclusion.

It will be seen that many canes which resist one disease are badly attacked by another, so that they cannot be used for control in many areas. This is especially the case with Gum and Mosaic in the Woongarra. It necessitates efficient control of both diseases.

My thanks are due to Mr. D. S. North, of the C.S.R. Company, for information concerning the behaviour of varieties in New South Wales.

TABLE OF RESISTANCE TO DISEASE, 1927.

Variety.	Fiji Disease.	Mosaic.	Leaf Stripe.	Leaf Scald.	Gum.	Top Rot.	Spindle Top.	Red Rot.	Root Disease.
Badila North ..	H.R.	H.R.	H.R.	M.S. & T.	H.R.	V.S.	V.S.	M.R.	M.R.
Badila South ..	H.R.	H.R.	H.R.	?	V.S.	?	?	M.R.	M.R.
H.Q. 426 ..	?	M.R.	H.R.	V.S.	V.S.	H.R.	M.R.	M.S.	M.R.
Q. 813	M.R.	H.R.	M.R.	H.R.	H.R.	M.S.	M.R.	M.R.	M.S.
H.Q. 285.. ..	H.R.–M.R.	M.S.	M.S.	?	M.S.	?	?	?	M.S.
D. 1135	V.S.	M.S.	V.S.	H.R.	V.S.	S.	?	M.?R.	V.S.
M. 1900 S. ..	V.S.	M.–V.S.	M.?S.	?	V.S.	M.S.	M.S.	V.S.	V.S.
Goru Canes ..	H.R.?	H.R.	H.R.	V.S.	?	M.R.	?	?	?
Pompey (7 R. 428)	V.S.	V.S.	V.S.	V.S.	V.S.	?	M.S.	?	?
Korpi	?	?	?	S.?	H.R.	?	?	?	?
Oramboo.. ..	?	?	?	?	H.R.	?	?	?	?
Nanemo	?	?	?	V.S.	H.R.	?	?	?	?
E.K. 1	V.S.	V.S.	V.S.	?	V.S.	?	?	M.S.	M.S.
E.K. 2	V.S.	S.V.S.	V.S.	?	V.S.	?	?	M.S.	M.S.
E.K. 28	V.S.	V.S.	V.S.	?	V.S.	M.S.	?	M.S.	M.S.
M. 189	M.S.	V.S.	M.S.	?	H.–M.R.	?	?	V.S.	M.S.
M. 55	?	M.–V.S.	?	?	H.R.?	?	?	?	V.S.
B. 147	?	V.S.	V.S.	M.R.?	H.R.	H.R.?	H.R.?	?	H.R.?
Q. 855	?	M.R.	M.R.	M.R.?	M.R.–S.	?	?	?	M.R.
Malagache ..	?	M.R.	?	?	?	?	?	M.S.	?
H.Q. 458.. ..	?	M.S.	?	?	M.S.	?	?	M.S.	V.S.
H. 227	H.R.?	V.S.	?	?	H.R.	?	?	?	?
Mahona	?	M.S.	?	V.S.	V.S.	M.S.	?	?	?
Petite Senneville	H.R.?	V.S.	?	?	V.S.	?	?	?	M.S.
B. 156	?	V.S.	V.S.	?	V.S.	?	?	?	?
B. 208	?	V.S.	V.S.	V.S.	V.S.	?	M.S.	?	M.S.
H. 109	?	V.S.	?	V.S.	?	?	?	?	?
Uba	M.S.	I.	?	?	M.R.	?	?	?	?
Shahjahanpur 10	?	100%S.	?	?	?	?	?	?	?
Striped Singapore	M.R.	V.S.	V.S.	?	V.S.	V.S.	?	V.S.	V.S.
Rappoe	M.R.	V.S.	V.S.	?	V.S.	V.S.	?	V.S.	V.S.
Q. 116	?	?	?	H.R. (N.S.W.)	?	?	?	?	?
Q. 1098	?	M.R.	?	?	?	?	?	?	?
Q. 970	?	V.S.	?	?	V.S.	?	?	?	?
H.Q. 5	M.S. (N.S.W.)	A.I.	?	?	A.I.	?	?	?	?
P.O.J. 2714 ..	?	I.	S.?	?	M.S.?	?	?	?	?
Malabar	M.S.	M.S.	M.?S.	M.R.	H.R.	?	?	?	?
Yellow Caledonia	?	V.S.	?	?	V.S.	?	?	?	?
Cheribon.. ..	?	V.S.	M.S.	?	V.S.	?	?	?	?
Gingila, &c. ..	?	V.S.	?	?	V.S.	?	?	?	?
Mahona	V.S.	V.S.	?	?	V.S.	?	?	?	?
N.G. 47	M.S.	V.S.	?	?	S. ?	?	?	?	?
Meera	M.S.	M.S.	?	?	M.S.	?	?	?	?
N.G. 64	V.S.	V.S.	?	?	V.S.	?	?	?	?
Kikarea	M.S.	M.S.	?	?	M.S.	?	?	?	?
N.G. 16	V.S.	M.S.	M.S.	?	V.S.	?	?	?	M.S.

These resistance phenomena are those indicated by the field evidence in Queensland in 1927. There is some indication that a cane which has shown resistance for some years may unaccountably become susceptible to a given disease, so that this work should be supplemented often.

KEY TO TABLE OF RESISTANCE.

R.	Resistant to the disease concerned.
M.R.	Moderately resistant.
H.R.	Highly resistant.
M.S.	Moderately susceptible.
V.S.	Very susceptible.
S.?	Means that cane is susceptible, but degree of susceptibility is uncertain from available data.
H.S.?, &c.	Means that this needs confirmation.
?	No data of resistance to this disease obtainable.
I.	Immune.
A.I.	Almost immune.
H.R. (N.S.W.)	Highly resistant in New South Wales according to the C.S.R. investigations.

FINANCIAL RESULTS OF FERTILISING EXPERIMENTS.

THIRD SERIES.

The following results of fertilising trials are with mixed manures and single fertilisers. The use of mixed manures containing nitrogen, potash, and phosphoric acid in nearly every case gives the most payable results.

These trials should be of great interest to cane farmers, for they show conclusively that fertilising, combined with good cultivation, can be made to pay handsomely.

Results of experiments with single and mixed fertilisers, at the Sugar Experiment Station, Mackay. First ratoons, 1927. Cane value, £2 5s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertiliser, in Tons Cane per Acre.	Cost of Manure and Application. £ s. d.	Increase in Value of Crop due to Fertilisers. £ s. d.
300 lb. Sulphate of Potash ..	36·3	1·7	2 12 0	1 4 6
500 lb. Meatworks Manure ..	41·4	6·8	2 17 0	12 9 0
No Manure	34·6	..	..	..
400 lb. Nitrate of Soda 100 lb. Sulphate of Potash 300 lb. Sulphate of Ammonia 400 lb. Meatworks Manuro	50 5	15·9	9 5 0	26 10 6
400 lb. Nitrate of Soda ..	47·3	12·7	3 15 0	24 16 6
300 lb. Sulphate of Ammonia..	41·7	7·1	3 2 0	12 17 6
500 lb, Superphosphate ..	35·7	1·1	2 8 0	0 1 6

The above trials are remarkable for the high tonnage of cane per acre secured from the use of nitrate of soda alone. It perhaps need not be said that this would not always be the case, and mixed manures are the safest to use for general purposes.

Results from the use of fertilisers at the South Johnstone Sugar Experiment Station. First ratoons. Cane value, £1 18s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers.	Cost of Manure and Application. £ s. d.	Increase in Value of Crop due to Fertilisers. £ s. d.
300 lb. of Phosphates	46·80	9·16	2 10 0	14 18 0
No Manure	37·64	..	..	..

Results from the use of fertilisers at the Bundaberg Sugar Experiment Station. Second ratoon crop. Cane value, 30s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d
4 cwt. Mixed Fertilisers containing—				
Sulphate of Ammonia, 150 lb.				
Sulphate of Potash, 100 lb. ..	29·75	7·58	3 0 0	8 7 4
Superphosphate, 150 lb.				
No Manure	22·17	..	..	..

Results from the use of mixed fertilisers at the Sugar Experiment Station, Bundaberg. First ratoon crop, Badila—Fifteen months old. Cane value, 38s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilieers, in Tons Cane per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	
Mixed Manure consisting of—				
Sulphate of Ammonia, 150 lb.				
Nitrate of Soda, 100 lb.				
Sulphate of Potash, 150 lb.	30·11	14·57	4 18 0	22 15 7
Meatworks Manure, 200 lb.				
No Manuro	15·54	..	..	..

Results from the use of mixed fertilisers at Sugar Experiment Station, Bundaberg. Second ratoon crop, Badila—age, 21 months. Cane value, £2 per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
Mixed Manure consisting of—				
Sulphate of Ammonia, 250 lb.				
Nitrate of Soda, 200 lb.				
Sulphate of Potash, 150 lb.	25·78	12·94	6 6 0	19 11 7
Meatworks Manure, 200 lb.				
No Manure	12·84	..	..	..

Results from the use of fertilisers at the Bundaberg Sugar Experiment Station. First ratoons, Q.813—Eleven months. Cane value, £2 per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
700 lb. Mixed Manure consisting of— Sulphate of Ammonia, 100 lb.; Sulphate of Potash, 500 lb.; Meatworks Manure, 100 lb.	27·30	15·53	5 12 0	25 9 2
500 lb. Sulphate of Potash ..	23·15	11·38	4 4 0	18 11 2
No Manure	11·77	..	..	..

Results from the use of mixed fertilisers at the Bundaberg Sugar Experiment Station. First ratoons, Q.813—Twelve months old. Cane value, £2 per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons per Acre.	Cost of Manure and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
600 lb. Mixed Manure consisting of— Sulphate of Ammonia, 150 lb.; Sulphate of Potash, 200 lb.; Meatworks Manure, 250 lb.	34·21	12·12	4 9 0	19 15 9
No Manure	22·09	..	..	..

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report from the Northern Assistant to Pathologist, Mr. N. L. Kelly, for the month ended 11th February.

CAIRNS AND GORDONVALE.

In various parts of this area are to be found Leaf Scald, Leaf Stripe, Mosaic, Gumming, and Top Rot. This latter is a most interesting disease which is much more extensive this season than ever before, and so some time was given to a special investigation of it, particulars of which will appear later.

Gumming.

Though this disease is present on only one farm at Aloomba, it is probably the most dangerous of all from the point of view of possible spreading and of the damage that it does. From first ratoon H.109 it has spread to the B.147 adjoining, in which it was definitely detected. Now some of this latter has been planted out, and though the cane shows no symptoms at present it must be considered a diseased plot, and must not be planted out. It is of the utmost importance that these three plots be ploughed out at least at the end of the year, and that cane knives after harvesting them be sterilised.

Mosaic.

This disease, which Mr. Wood had reported in B.156 at Highleigh, is present on four farms there, and on one of them has spread slightly to the H.Q.426 adjoining. While it is not spreading rapidly this at least shows the danger incurred by leaving Mosaic-infected cane in a field. The impoverishment of diseased stools was very obvious in the above variety. As regards the Mosaic which I found at Aloomba previously, this has now spread not only to other stools of H.109, but also to the B.147 adjoining. Practically all these fields will be ploughed out at the end of the current season.

Leaf Stripe.

Like Mosaic, this disease can be economically controlled—when the infection is light—by "rogueing" (digging out diseased stools). The three farmers in Sawmill Pocket whose cane is affected all intend to do this, so that very soon the disease should be eradicated from this centre. It is mainly in 7 R.428, but also in D.1135.

Farmers near Meringa Railway Station must also beware as a small field of second ratoon N.G.15 was found to be infected. Its history could not be ascertained. It will, of course, be ploughed out, but the fields adjoining may easily contract this infectious disease between now and November.

Leaf Scald.

This is epidemic, except in parts of Hambledon, Wright's Creek, Sawmill Pocket, and Meringa. As the disease is not always manifest, however, for absolute safety the history of blocks should be known. For the whole district the best control measure is the slow one—the introduction of guaranteed healthy seed from the Tableland or other isolated nurseries. To this end the Farmers' Association has been engaged in negotiations with certain Tableland growers, and by 1930 a considerable influx of clean and vigorous N.G.15 and H.Q.426 should be assured.

Top Rot.

This disease is widespread in N.G.15 in the lower parts of the Freshwater area, Highleigh, and Meerawa; and at Aloomba well above flood-level. It also occurs heavily on the Lower Burdekin. A similar disease occurs in Hawaii, Tucuman, Louisiana, and other countries.

Symptoms.—The presence on one or more leaf blades of one or more watery green streaks visible from both above and below, except when under the midrib. These become watery brown and finally bright red, and the tissues composing them die. The disease may then suffer a check, or further active streaks may form on the same or on younger leaves, and finally, in many cases the young folded leaves become yellow and can be pulled out when the growing point is seen to have decomposed. The disease usually first appears in young cane in November, and has done its damage by the middle of February.

Etiology.—An actively motile bacterium was observed in sections of the diseased tissues. This was isolated with suitable aseptic methods on tubes of nutrient agar, and formed round convex glistening yellow colonies of about 1 mm. diameter in thirty-six hours. A preliminary batch of inoculations with this organism into the immature tissues of the stem tip was attempted on 1st February, with colonies one week old. It failed, possibly because of the age and thus lack of vigour of the colonies; possibly because rain, which may have washed the bacteria from the leaves, followed within twelve hours. Time did not permit of another attempt, which must be deferred until next year. However, the following facts may be noted:—

(1) The disease is not hereditary and is very infectious, as (*a*) Last year a certain corner of a young plant crop alone was infected. This year that portion was unaffected, and a large part of the remainder of the field was infected. (*b*) From a certain field of sloping soil at Hambledon (now healthy, as first ratoons) cane was planted, some in the field adjoining (now healthy) and some in low-lying alluvial land at Meerawa which is now in parts heavily infected.

(2) The cane adjoining this, which was planted earlier, and was thus "out of hand" earlier, is almost entirely healthy.

(3) In every infected field investigated, the roots had been interfered with to some extent, either because the land had a very variable water level, being ineffectively drained or cultivated, or because roots had been cut by cultivating deeply in November or later. The result of this is that in the hot dry spells, the growing point was weakened and made susceptible to the attacks of comparatively weak bacteria, as this species probably is.

BABINDA.

A very short stay only was made in this locality, every day of which was wet, and for facilities in transport I am much indebted to the mill management.

Leaf Scald is the only major cane disease to be found, and it occurs in every locality visited, though certain farmers have been making a determined attempt to check it. In fact it would be wise for those who desire clean seed to purchase from these farms, whose names have been left with the manager of the mill.

This applies especially to the farmers in the northern end of the area, whose fields are generally more heavily infected than elsewhere. The management will doubtless facilitate and supervise the transfer of this seed through the mill yard.

If, despite these facilities, a farmer decides to plant his own cane, he should at least discard every stool showing any suspicious sticks. This minimises the risk of planting diseased cane.

Spindle Top.

Many examples of checked growth resulting in the binding of the young heart leaves by the outer ones were noted throughout the Cairns-Babinda area. In several cases these were entirely unassociated with fungus diseases of the leaf or leaf sheath, and it appears that only when the check has been prolonged secondary fungus infections are to be found. This disease, however, needs further investigation.

Summed up, the disease problem will be most effectively controlled by the introduction of clean cane to every diseased farm, and the planting of it in a special nursery plot for seed purposes.

The Assistant to Pathologist, Mr. George Wilson, has submitted the following report, covering the period 23rd January to 13th February, on the Mount Bauple cane areas, to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—

MOUNT BAUPLE.

Bauple and the surrounding cane areas have been and still are greatly handicapped by continuous wet weather. Frequent showers prevent horse work being carried on in many fields, and chipped weeds readily grow again. Many fields which would have been planted in late spring or in February have been too wet to be cultivated, and now bear heavy crops of Natal grass. In consequence the area under cane is less than it might be.

The heavy infestation of weeds has been responsible for increasing the amount of damage done by moth borers to shoots of young ratoon and plant cane. This is especially noticeable near headlands where Natal grass is plentiful.

The dead hearts of plant and young ratoons contain two types of larvæ. The large boring larva about 1½ inches long is responsible for the death of the shoot, and is developed from the egg laid by *Phragmatiphila truncata*, a greyish brown moth about three-quarters of an inch long, covered with long silky hairs. The small larvæ are developed at a later stage from eggs laid by species of Anthromyidæ, small flies attracted by the rotting shoot.

Farmers would benefit by employing more labour in chipping early in summer so as to have weed-free cane before rains set in, with consequent insect damage.

Millet grass thrives on creek sides and in wet patches, and an alarming amount of secondary infection of cane by Mosaic is seen in the neighbourhood of millet grass. Since Mosaic is the only disease which is generally present in the district, the problem of dealing with millet grass is of supreme importance. Many farmers have planted small fields of Uba, and it is suggested that the value of Uba lies in the fact that it might be planted along creek sides to protect superior but less resistant sugar-canes from direct contact with millet.

Another situation where secondary infection of cane by Mosaic is very heavy is on the spurs of the mountain, especially those with a southerly exposure. Compared with the amount of secondary infection seen on the more or less level fields such as occur along the Gootchie road, the infection on these spurs is high, up to 50 per cent., and unavoidable as long as Mosaic is present in quantity in the district. The heavy infection of hillsides has been explained by the fact that the insect carriers of Mosaic disease are carried by wind for long distances, as they are very small and light, and descend amongst the cane when they are blown on a mountain side, comparatively few dropping en route on level country.

Farmers are advised never to go to these spurs for sets, and in this district always to plant cane from lower fields. It is also advisable to plant Q.813 as extensively as possible on these situations, as this cane is much more resistant to Mosaic than any other variety in common use. It is only to be expected that a certain amount of Mosaic will occur in Q.813 where this is planted on infested farms, but the number of stools affected will be fewer and the rogueing lighter than with any other variety, and as the farm becomes cleaner less and less infection will be seen. Resistance to disease is affected by general health of the cane, and this can be increased by frequent cultivation and drainage where necessary. Although most farmers readily concede the necessity for green manuring, it is surprising how little and how irregularly this is done.

A more systematic rotation of fields with regular crops of cowpea or Mauritius bean would increase efficiency of farms by giving greater tonnage and eliminating the heavy infestation of Mosaic which occurs in old ratoons of D.1135, which are left in too long in many cases.

Gum was seen in several fields of E.K.28 in one locality, all the crops affected being derived from the same source.

This variety should be got rid of entirely in the small area infected, as it is quite impossible to select plants in a field affected in parts with gum. D.1135 and M.1900 Seedling should also be avoided in the gummed area, as these canes are highly susceptible.

The high resistance of Q.813 to gum is well demonstrated in one affected field of E.K.28, which was so bad that it was partly ploughed out and replanted with Q.813. The Q.813 is so far quite healthy, although badly gummed stools of E.K.28 are on both sides of it.

On several farms complaints were heard that on certain knolls ratoons had completely died out. One farmer, more observant than others, reported a white mildew on the young shoots, which appeared after cutting, but later died out. A couple of dead stools were examined and signs of fungal attack on the roots were seen, but it is not certain that this was the primary cause of death. This matter is one that will be given further study.

Mosaic disease is the most outstanding problem in the district, and I am glad to say that it is receiving proper appreciation and treatment on many farms, but on occasional places indifference or ignorance of its importance is shown by the state of the fields.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has received from the Entomologist, at Meringa, the following report (6th March, 1928) made by the Assistant, Mr. J. H. Buzacott:—

LOWER BURDEKIN.

Ten days were spent in the Ayr district during January, and observations were made on the flighting habits of beetles in that district, and also investigations on the giant termite were continued, whilst minor cane pests were studied in general.

Beetles were being collected, and paid for at the rate of 2s. 6d. per quart, by the Lower Burdekin Pest Destruction Board, and, in order to do this, farmers in different parts of the district were appointed as receivers for measuring the quantities of beetles and destroying them as they were brought in by collectors. In all about £300 was paid out during the flight, and this represents over 2,000 quarts of the beetles.

On examining the morning's catch at a receiving depot on several occasions, it was noted that at first practically only greybacks were being brought in, but towards the end of the flight specimens of *Anoplognathus frenchi* were becoming frequent, and finally there was a predominance of *Calloodes grayanus*. The latter genus of beetles have never been recorded as cane pests, and these specimens probably bred in the forest.

Collecting from the feeding trees, the figs yielded most greybacks, and Moreton Bay ash was also favoured. *Calloodes grayanus* and *C. rayneri* were taken solely on bloodwoods, *Anomala australasiæ* from flowers not yet identified, and *Anoplognathus frenchi* mainly from a large soft-leaved weed.

No grubs, unfortunately, were examined, because, owing to the wet weather, ploughing operations were not being carried out.

Specimens of the beetle-feeding trees were brought back for the collection, and series of the various beetles were also obtained for comparison with far northern species.

Termites.

Further investigations were made into the habits of the Giant Termite (*Mastotermes darwiniensis*), but the queen still remains undiscovered. However, further knowledge was obtained as regards the nesting of the species, and it was ascertained that communication tunnels might be at a depth of 6 feet or even more from the surface of the ground. This termite has not caused so much damage in the district this year as last, probably owing to the good rains experienced throughout the year. It has thus not been necessary for the pests to turn their attention to cane for moisture. Keeping the land surrounding cane fields bare of timber, logs and stumps, is undoubtedly the best method of safeguarding the crops from attack by termites.

Moth Borers.

A search was made for the large moth borer (*P. truncata*) with a view to obtaining its Braconid parasite (*Apanteles monagriæ*). A few "dead-hearts" were found, but no borers, even at Rita Island, which used to be fairly badly infested with them.

Minor Pests.

Chief among the minor pests observed was a small green grasshopper (*Atractomorpha* sp.). This was occurring in large numbers in the cane and doing a fair amount of damage. A large grasshopper (*Cyrtocanthacris* sp.) was also very commonly found feeding on cane, whilst at the roots a large black cricket was operating. About 2,000 living specimens of termites were transported to Meringa for experiments, and these are still alive. Specimens of the winged form were also brought back, but these died shortly after arrival.

FIELD REPORTS.

Mr. E. H. Osborn, Central Field Officer, reports for the period ending 13th February:—

Bloomsbury.

This district has progressed rapidly. With its altitude of 142 feet above sea level, its beautifully running river (the O'Connell), along the banks of which are the rich alluvial flats so favourable to cane growth, it is a favoured area. Last year some 8,668 tons of cane were sent to Proserpine from the three sidings of Mikaloo, Bloomsbury, and Morvo.

All the cane seen looked well—Badila, Clark's Seedling, M. 1900, and Q. 813 looking superior to any cane inspected in the Proserpine area, and in most cases in a very good state of cultivation.

So far no losses have been caused through pests or diseases, and growers are advised to be very careful in bringing seed cane in from any other area unless after careful inspection by a competent person.

Bowen.

Very little cane is now grown hereabouts, fruit being the principal product.

Ayr.

Although only some 3½ inches of rain had been registered for the month, the crops were looking wonderfully well. Fine crops of plant cane and also ratoons were seen, the latter being especially good upon Rita Island.

Cane Varieties.—The c.c.s. of four principal varieties (1927 season) were—

	H.Q. 426.	Goru.	B. 208.	N.G. 15.
June ..	15.3	13.9	15.6	15.05
July ..	15.6	14.7	15.8	15.00
August ..	16.0	15.7	16.4	15.20
September ..	16.7	15.9	16.9	16.30
October ..	16.7	15.6	17.1	16.80
November ..	15.8	14.6	17.2	16.40
December ..	14.8	—	—	15.60
Average ..	15.8	15.0	16.3	15.76

These figures were kindly supplied by the Pioneer Mill management as a sample of the high density figures ruling. The average density of E.K. 28 was not worked out, but it must have averaged over 16.0, for odd samples went 17.4 during the second week in December. So satisfied are growers with this cane that nearly every one on the Burdekin has an area planted. Probably the best returns from E.K. 28 were those of Cameron and Irving—*i.e.*, 5 acres April plant, cut in October, yielded 51 tons per acre, with an average c.c.s. of 16.4.

Diseases and Pests.—Very little disease was apparent. Leaf Stripe was the most noticeable, as it was found in nearly every patch of B. 208 ratoons, and in many cases in the plant. Top Rot so far is only noticeable to a very slight degree in N.G. 15 (Badila). Mosaic was seen only in a few stools of B. 208 ratoons. Pests are mainly cane grubs and white ants. One well-known grower near Plantation Creek, whose cane formerly suffered from grubs, now claims that his losses are negligible since he cleaned away the feeding trees between the creek and his cane area. White ants do not seem to be as bad as in past years, but according to local growers they seem to be spreading to farms which were formerly regarded as free.

Fertilising.—One Jarvisfield grower mentioned that his plant cane got such a start aided by fertilisers that so far he has not irrigated it, while the unmanured portions nearby have already been watered twice. The stooling, too, of the fertilised cane is far ahead of the other. Green manuring is probably carried out to a larger extent upon the Kalamia mill's estate than elsewhere in this district, and its benefits are quite noticeable. Many other growers were also seen to be growing green crops in the Kalamia area. One or two growers are still using corn for a green crop, despite the fact that with its relation to Mosaic disease such practice is condemned.

Home Hill.

On the river areas some fine crops were noticed, some third and fourth ratoons (Badila) being much admired, but away from there, upon the poorer forest areas, some of the cane was very backward, bad cultivation and lack of watering being no doubt responsible. Here, as in many cane areas, many growers will persist in trying to handle too large an area, with the result that the yield per acre suffers.

Earlier mill estimates for 1928 were in the vicinity of 160,000 tons.

Cane varieties are practically the same as upon the Ayr side of the river.

Fertilising and green manuring are only carried out to a limited degree, but where the plant crop has been fertilised the stand of cane is markedly superior, both in the greater number of sticks to the stool and its healthier aspect.

Top Rot, Leaf Stripe, &c., were only noticed to a slight degree, and the same can be said of pests, as only a few stools of white ant eaten cane were observed.

The Southern Field Officer, Mr. J. C. Murray, reports for the period 14th January to 14th February:—

Goodwood.

The cane here is making good growth. Grubs are causing considerable loss. Growers are asked to consider the possibilities of (*a*) wire-netting their farms, (*b*) establishing a poultry farm with the important objective in view of using the birds as grub destroyers, (*c*) having the run on the corner of the farm where the birds could be readily released, and (*d*) studying the habit of the pest, so that ploughing could be carried out when the grubs were near the surface. These suggestions are in no way intended to encroach on the entomological domain, but with the thought that any practical suggestion may be of some use in overcoming what is at present a very serious pest.

Cane varieties doing well here are Q. 1121, Q. 813, M. 1900 Seedling, D. 1135, and Uba. The last mentioned is grown largely by the Fairymead Sugar Milling Company, who are obtaining excellent results from this variety.

Considerable loss is being caused, excepting in Uba, by root rot, or "peg-leg" disease. It is one of many root-destroying fungi, and the only remedy is extensive fallowing of the land. Careful plant selection from non-infected fields should follow. Most farms cleared and planted within the last seven years could, for practical purposes, be termed non-infected. Almost all the old red-soil farms are infected with root-rot disease. The writer has not observed one case where Q. 813 has followed M. 1900 Seedling in old soils but what the Q. 813 was infected. Canes with light root systems should never be planted in farms where root rot is present. As pointed out in a previous report, there is good reason to believe that root-rot disease is the main reason why most of our old soils will not produce as they should. A field of cane stubble, ploughed out on the Goodwood area, showed evidence of 100 per cent. infection by root-destroying fungi. The variety was M. 1900 Seedling. This state of affairs must also be a fruitful cause why cane will not ratoon. The following recommendations, if applied, will help in dealing with it:—Fallow for twelve months; totally destroy all cane debris by burning; select plants from new land.

Childers.

Much rain has fallen in this district since the new year. The cane, however, is not as forward as might be expected. This may be due to the long, cool summer preceding the middle of January, or (in this particular area) may be owing to root disease on the older soils due probably to some particular plant food shortage in the soil. The writer is of the opinion that the reason why the variety Q. 813 will not do well on the older soil in the Childers district is that its light root system almost immediately suffers from an attack of root-rot disease.

In manuring, the most important thing for the farmer to have is a thorough knowledge of peculiar conditions on his own farm. For instance, a grower may take the advice of a neighbour who has grown good crops with a certain artificial manure and find it is a complete failure on his own land. Perhaps his friend's land may have required those particular ingredients in the manure used, and his own land may have had abundance of them with the exception, maybe, of one ingredient. Therefore it must appear to the intelligent farmer that, for a rational and economical system of farming, he must thoroughly known his own soil.

Cane varieties growing in the Childers district include H.Q. 285, M. 1900 Seedling, D. 1135, Q. 813, E.K. 28, and M. 55. The first named and the two last are making a very fine showing. Growers appear to be confident that these three varieties will be good commercial canes for the Isis district. However, the growers supplying the Childers mill are recommended to get in touch with the mill investigator (Mr. Richardson) on the question of varieties for local mill supply, as gumming disease may at any time reach epidemic proportions here, and the matter of varietal resistance is very important.

CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, who returned recently from a short visit to the Bundaberg and Mackay cane area, informs us that the continued rain, while ensuring a good season, has prevented a good deal of cultivation from being carried out. Farmers have been unable to get on the land and clean up weed growth for some considerable time past. The cane is not quite so forward as it should be at this time of year, due to absence of hot sunny spells between the rains and the long cool period up to the middle of January.

At Bundaberg, the Burnett River was in high flood, the wharves were covered and low-lying places inundated.

Up to 27th February, the rainfall at Mackay had amounted to 65 inches since the 1st December; this is equal to the annual average rainfall at that place. Since that date further heavy rains have been experienced.

Nevertheless, the mills in both districts are anticipating good to excellent crushings, though it is thought by many that the tonnage may not be quite equal to that of last year. On the other hand, there has been an increased area put under cane at Mackay.

The whole of the country between Brisbane and Mackay presents a beautiful green appearance, with a splendid growth of grass. On the trip up, water was seen in sheets on both sides of the line. Such a wet season has not been experienced for many years on the coast.

SOIL SCIENCE.

Extract from the Report of the Travelling Soils Scholar, Dr. H. W. KERR, for year ending 23rd January, 1928.

With the second semester of the University year commencing during the first week of February, 1927, I continued my studies in soils and allied subjects at the University of Wisconsin. I took courses in Soils Physics, Soils Bacteriology, and Colloidal Chemistry, while working intensively on a research problem regarding the nature of soil acidity. Rather late in the year I came upon what appeared to be a useful clue in the elucidation of this problem, and in following it up, found that it yielded much useful information regarding our knowledge of the mechanism of the acidic condition of the soil.

The results of these researches were embodied in a thesis which I presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy, which was awarded me in June, 1927. I regret that I am unable to forward a copy of this dissertation at present, but I expect it to appear in an early number of the Journal of the American Society of Agronomy. I will forward reprints of this paper as soon as they appear.

Following instructions, I left Madison early in June to attend the International Congress of Soil Science in Washington, D.C. A brief report of the proceedings of these meetings, and of the subsequent field tour through the U.S.A. and Canada, I have already forwarded. The printed volumes of the proceedings are not available as yet, though they were to have been ready by the end of last year. A copy of these I will forward when they are distributed.

Early in August I sailed for England. At Rothamsted Experiment Station I spent about six weeks in studying the work in progress, and the results of previous researches on agricultural problems. The staff at this Station are a very able and congenial group, and, of course, the reputation enjoyed by the Institution is world-wide. Sir John Russell, the Director of the Station, I had met at the Soils Congress in America, and I found him very sympathetic and willing to assist me in all my demands. He remarked, incidentally, that Queensland was one part of the Empire from which they had heard but little at Rothamsted, and he expressed the hope that we might avail ourselves of the information and service which they would only too gladly place at our command.

I would have liked to have spent a little further time at Rothamsted, but the opening of the Imperial Research Conference on 4th October, drew me to London. A short report of my experiences at this Conference, I enclose herewith. It was an inspiration to find there all of the notable workers in the home countries, met together to confer with those from overseas, and to give freely of their aid in the elucidation of the difficulties confronting the dominion and colonial workers. Their presence seemed to impart some of the enthusiasm and determination through which they have overcome seemingly insurmountable difficulties in the past, and filled those from far distant parts with the firm resolve that their future efforts should be redoubled in an attempt to emulate these leaders.

At the conclusion of the Conference, it was necessary for me to sail once more for America, to continue with my researches on soil acidity, as you had instructed me. Arriving in Madison on 26th November, I assumed my duties as Research Assistant at the University. I feel that my time has been very profitably spent in this work, but I cannot say at present, what these investigations will reveal. I feel optimistic regarding the ultimate isolation of these soil compounds which play so important a part in the agriculture of humid Queensland, but perhaps the time available for these present studies may be insufficient for the task.

I propose leaving Madison about the first day of March, and continue my itinerary as previously outlined—to spend about two months in Hawaii, proceeding thence to Java, and arriving in Brisbane in August next.

IMPERIAL AGRICULTURAL RESEARCH CONFERENCE.

The Imperial Agricultural Research Conference opened in London on 4th October, 1927. It was an historic occasion; for it marked the first successful attempt of the agricultural workers to meet and seek a solution for the various problems with which research officers in all parts of the Empire are confronted. In response to the invitation of the British Government about 100 overseas delegates attended. These included representatives from all the Dominions and most of the Crown colonies and dependencies. With London as the meeting centre, the overseas workers were able to benefit from the able advice and assistance so generously given by eminent workers in the home countries.

More than 200 delegates were present when Lord Bledisloe, as chairman, formally opened the Conference. At this, the first conference of its kind, it was felt desirable to discuss rather those questions involving administrative considerations than the more purely technical aspects of the work. It was with this object in view that the majority of the overseas delegates had been chosen. The first five days of the Conference were devoted to the plenary sessions, and such questions as—Establishment of Information Bureaux and Research Centres, Recruitment and Training of Officers, Interchange of Workers—were fully debated. The framing of definite resolutions was, however, wisely deferred until the final sessions. This enabled the officers to discuss their points of variance and crystallise their views during the days of the committee meetings and those spent on the tour of the country by the entire Conference.

Following the plenary sessions, the Conference was divided into committees, which grouped together the workers interested in each of ten or more specialised branches of agricultural research. Four days of meetings gave the officers an opportunity to discuss the particular difficulties which have confronted them, and to formulate plans for greater efficiency and harmony in their future efforts. I attended the meetings of the Soil Workers, who numbered about twenty, including the local delegates. Under the able chairmanship of Sir John Russell, Director of Rothamsted Experiment Station, a number of important resolutions and suggestions were drafted by the committee. These, together with the reports from other specialist committees, were presented at the final plenary sessions for ratification by the full conference.

At the conclusion of the preliminary plenary and committee meetings, the Conference adjourned on 13th October, to enable the delegates to visit the agricultural research institutions in Cambridge, Edinburgh, and Aberdeen. They were thus afforded an opportunity to acquaint themselves with the work in progress at these centres, the methods by which various problems are attacked, and the facilities offered for specialised research. Four days were very profitably employed at the Cambridge laboratories and experiment stations; three days in Edinburgh in visiting similar institutions there; and one day at the Rowett Institute in Aberdeen. At the invitation of Imperial Chemicals Limited, the Conference was privileged to inspect the nitrogen-fixation plant at Stockton-on-Tees. The company has a very ambitious programme under way, for they are nearing the completion of sufficient new units to enable the production of 700 tons of sulphate of ammonia per day. They hope also to begin shortly the manufacture of concentrated fertilisers similar to those of the German manufacturers.

As the result of the observations made during the tour, one cannot but be impressed by the good quality of the work which is carried out at these research centres—and, equally, by the fewness of the institutions and workers employed in furthering the progress of a more efficient agriculture. The latter aspect is particularly noticeable after the experiences of the International Soils Congress held in the United States of America during June and July last, when an opportunity was given the visitors to see the corresponding institutions in America. But the fact that many of the centres are the fruits of the post-war period gives hope for a stouter army of agricultural scientists in the forward march of British agriculture.

On the return of the Conference to London, the concluding plenary sessions were held. The final resolutions and recommendations were endorsed by the delegates, after further discussion, and the remainder of the time was spent in short excursions to the agricultural research centres within easy access of London. The Conference finally adjourned during the second week of November.

It was decided by the Conference that their next meeting place be Australia, in five years' time. This should be of particular interest to us in the more distant outposts of the Empire, for a visit from outstanding workers will doubtless lend a stimulus and an impulse to our future research. The conference just concluded in London must be regarded as an unqualified success; and it was felt by all who attended that much benefit will result from this and future meetings of a similar nature. The delegates were enabled to gather specific data relevant to the particular phases of their research problems; but perhaps the greatest value of such conferences lies in the personal contacts established in the short time that the workers were privileged to spend together. This is an accomplishment which makes for better understanding, closer co-operation, and keener appreciation between the individual workers.

The conclusions of the Conference should prove of considerable interest to those who were not so fortunate as to be present at the meetings. To convey these accurately and concisely, I think it best to forward the verbatim reports of the concluding sessions; these contain the reports of the committees and the recommendations of the full conference. I have awaited the final report, which was to have been available by the end of December, but this has not arrived as yet. In presenting this brief personal report, I trust that I may be able to supplement it in the near future by forwarding the official publication.

STANDARDISATION OF PRIMARY PRODUCTS.

One of the suggested means to relieve the depressed agricultural industry in Great Britain that has lately received a good deal of publicity is pre-market standardisation of farm products. The latter term is used in its fullest sense and includes meat, fruit, and vegetables, as well as dairy goods, grains, &c. While it is recognised that the enforcement of rigid grades would hardly be possible to all of the foregoing, many leaders of thought in agricultural and marketing circles hold that the principle is capable of very wide application. To-day, apparently, little or nothing is done in the direction of standardisation, either in respect of grading, packing, or containers. As a result British-grown produce has to compete with imported goods, that are generally carefully graded and branded, at a considerable disadvantage. It is acknowledged that the problem of introducing an at all adequate system bristles with difficulties, but it is believed these are not impossible of solution.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of February in the Agricultural Districts, together with Total Rainfall during 1928 and 1927, for Comparison.

Divisions and Stations.	Average Rainfall. Feb.	Average Rainfall. No. of Years' Records.	Total Rainfall. Feb., 1928.	Total Rainfall. Feb., 1927.
	In.		In.	In.
North Coast.				
Atherton	8·98	26	18·11	21·42
Cairns	14·75	45	16·12	37·38
Cardwell	16·53	55	22·36	44·99
Cooktown	13·01	51	23·42	14·89
Herberton	7·29	40	13·60	10·30
Ingham	15·47	35	31·45	36·27
Innisfail	21·67	46	26·25	45·42
Mossman	14·37	14	36·73	26·56
Townsville	11·45	56	9·66	20·10
Central Coast.				
Ayr	8·92	40	20·64	14·80
Bowen	8·90	56	13·07	7·09
Charters Towers ...	4·51	45	5·14	3·41
Mackay	11·36	56	25·51	8·47
Proserpine	11·65	24	24·11	10·55
St. Lawrence ...	7·74	56	26·53	3·94
South Coast.				
Biggenden	3·74	28	19·88	2·90
Bundaberg	5·98	44	13·18	5·30
Brisbane	6·31	76	16·12	5·37
Caboolture	7·15	40	23·35	3·51
Childers	5·77	32	29·57	5·12
Crohamhurst ...	12·53	35	38·01	4·25
Esk	5·15	40	13·69	5·17
Gayndah	4·12	56	12·14	3·58
Gympie	6·44	57	18·20	3·38
Kilkivan	4·77	48	14·86	6·17
Maryborough ...	6·30	55	17·37	6·14
South Coast—continued:				
Nambour	8·47	31	42·58	8·78
Nanango	4·10	45	10·10	2·44
Rockhampton ...	7·14	40	18·01	3·67
Woodford ...	8·28	40	24·03	2·76
Darling Downs.				
Dalby	2·76	57	8·47	3·59
Emu Vale ...	2·24	31	11·33	2·25
Jimbour	2·67	39	3·65	1·87
Miles	2·66	42	7·32	3·30
Stanthorpe ...	3·21	54	8·36	1·38
Toowoomba ...	4·22	55	15·17	4·36
Warwick	3·03	62	8·65	1·67
Maranoa.				
Roma	3·05	53	4·09	1·74
State Farms, &c.				
Bungeworgorai ...	2·68	12	1·70	1·71
Gatton College ...	3·16	27	12·09	2·43
Gindie	3·03	27	3·28	1·68
Hermitage ...	2·29	20	...	2·15
Kairi	8·51	12	16·61	22·76
Sugar Experiment Station, Mackay	10·31	29	28·49	7·68
Warren	3·93	12	10·62	4·81

Note.—The averages have been compiled from official data during the periods indicated; but the totals for February this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

BAITING FOR BANANA WEEVIL BORER CONTROL.

By JOHN L. FROGGATT, B.Sc., Entomological Branch.

The seriousness of the menace of this pest to the continued prosperity of the banana industry is now being generally recognised, resulting in a considerable amount of attention being paid to the requisite measures for bringing the pest under control. A brief review of the various methods of baiting should, therefore, be of some interest to those engaged in banana-growing. The following notes are in no way an exhaustive account of the control measures that have to be undertaken, because these have been dealt with in detail in other publications; for the same reason, the life history and habits of this weevil will only be briefly considered, giving a few of the salient features which have a direct bearing on baiting.

In the life cycle of the banana weevil borer the beetle is the reproductive stage, and the grub, or larva, is that in which the damage is done to the plants. The developmental stages are passed entirely within the plant, while the adult lives the major part of its life in the soil. It is therefore obvious that the egg, larva, pupa, and newly-emerged adult are not vulnerable to attack by spraying or fumigation. The adult weevil, living outside the plant, is, therefore, the stage against which any attack must be launched. As the beetles are never completely inactive, that attack should be maintained throughout the whole year. As, however, they are most active during the spring and autumn, the work of carrying out the required control measures should be intensified from late in February to the end of April, and from late in August to the end of November. By this procedure a large number of beetles will be killed at the beginning of these seasons, resulting in the reduction of the numbers of the subsequent generations.

Material for Bait.

In order to gather the beetles together, some form of attractive bait is necessary; portions of the plant are quite satisfactory for this purpose, the corm being preferable to the stem. If baits are laid in or around the stools, large numbers of beetles come to them, and at periodic examinations the beetle population can be very markedly reduced by collecting and destroying the borer weevils found. This, however, entails a considerable expenditure of time and labour, which would be obviated by treating the bait with poison.

Poison Employed.

As a result of a large series of trials it was found that several chemicals killed an appreciable percentage of the weevils after they had fed on the treated corm, but that Paris green was the most efficient, in that it killed the highest percentage in the shortest time. In practice one part of Paris green is mixed with six parts of flour; this should be done by shaking together the measured amounts of Paris green and flour in a large tin, while a smaller tin with a finely punctured lid can be used for dusting the baits in the plantation.

Method of Application.

There are several ways of applying this poison mixture, a summary of which should be of interest. It may be stated that all the methods enumerated have been tested out under plantation conditions, and have proved to be practicable.

In Young Plantations.

In young plantations in which the first bunch has not been cut the best procedure is as follows:—From an old patch of banana plants anywhere within a reasonable distance obtain some old corms and split each one into four or six pieces; if the corms are large, they may be cut into more pieces than this. Dust the freshly-cut surfaces of each piece with the poison-mixture, and lay the bait cut (surface downwards) on the ground close to the stool. Then cover it with a thick layer of dry trash, with the object not only of preventing too rapid drying-out of the bait but also of rendering the immediate vicinity of the bait darker, a condition favouring the approach of the beetles to the bait. Baits made in the above manner need to be renewed periodically, as they become too dry to be attractive. Portions of cut stem, split in half, can also be used, but these have to be renewed much more often.

In Older Plantations.

In older plantations, after the bunch is cut, the stem should be cut off low onto the ground; the top of the butt then offers an excellent means of utilising the poison mixture for the destruction of the adult beetles. Any one of the following methods of application can be practised:—

The top of the freshly-cut butt is dusted with the powder and covered over with trash. In this method the surface is liable to dry after a time, and to very largely lose its attractive powers. If a thin slice is then taken off the top and a fresh application of the powder made, its function as a poison bait is restored. The drying-out can be minimised by covering the top of the butt after dusting with a slice cut from the base of the stem, a small stick or pebble being inserted between the two faces; if this is done the bait should still be covered with trash, and it is also advisable to dust the "cover" with the poison mixture.

An alternative method may be employed wherever the sucker-pruning gouge is used, a cone-shaped piece being taken out of the top of the butt; the poison is then dusted into the hollow and over the plug, the latter being dropped back again, first inserting a pebble or small piece of stick to prevent the plug fitting in too tightly. The top of the butt should then be dusted and covered over with trash. When suckering with this tool, every hole made can be dusted with the poison-mixture with excellent effect.

In a third method of preparing the bait, a V-shaped portion is cut out of the top of the butt right across the corm. Dust the powder into the groove so formed and also over the portion cut out; this latter is then put back into position, first inserting a small pebble or piece of stick. Dust the top of the butt and cover it over with trash.

Of the above methods the last mentioned has the advantage over that in which the sucker-pruning tool is used of having a direct opening to the soil on either side of the bulb, thus permitting the beetles to gain more ready entrance to the surfaces carrying the poison than if they have to come up out of the soil and climb over the bulb. Both systems have, however, given highly satisfactory results in the field.

THE MINISTER IN NEW ZEALAND.

IMPRESSIONS OF A DOMINION TOUR.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, who, accompanied by Mrs. Smith and Mr. T. G. Hope (Private Secretary), recently toured New Zealand, has favoured the Journal with some impressions of his visit to our sister Dominion. His mission was primarily one of health, but, through the courtesy of the New Zealand Government and other authorities, he was brought into touch with many facets of Dominion life and industry, and found much that was both interesting and informative. Mr. Smith had a most enjoyable time in the Dominion and had benefited much in health by the change. New Zealand, the Minister informed us, is a country that has been very well developed, and the standard of living of the people is fairly high, although wages and working conditions are not of such a high standard as prevail in Queensland. Much speculation in land had taken place during recent years, and the change of land policy from that laid down by the Seddon Government had resulted in a serious over-capitalisation of land, with the inevitable consequence that the farmers are carrying a larger burden of interest than the present-day prices for primary products warrant. "That is recognised generally," added Mr. Smith, "and is a tremendously difficult problem for solution."

New Zealand Farming Methods.

Commenting on his impressions of agriculture, Mr. Smith said that the standard of agriculture was good, and farming methods generally were conducted on up-to-date lines. He had visited the State Farm at Ruakura, in the Waikato district, North Island, where purebred stock were raised and sold to the dairymen. That institution was very well managed by Mr. Munro, the officer in charge, and its activities had a good influence in raising the standard of dairy stock. Mr. Smith also visited the Lincoln Agricultural College, in the Canterbury Province, where large numbers of potential farmers are trained in scientific methods. The Canterbury district is an exceedingly fertile one, and farmers there have excellent crop yields owing to the natural fertility of the soil and to the scientific methods of cultivation adopted.

Industrial Conditions.

Mr. Smith also visited a number of industrial undertakings in the Dominion, and found the operations being conducted very efficiently, the articles produced being of a first-class quality. It appeared to him, however, that the people did not give that patronage to the locally manufactured article that they should, preference being shown for the imported goods. There was considerable unemployment and resultant distress in New Zealand at the present time, particularly in the Auckland Province, and as this is unusual in the summer time, the outlook was not very promising. As a result of that certain individuals were making an attack on the arbitration system, having for their purpose a general attack on wages standards.

A Municipal Milk Supply.

While in Wellington the Minister took the opportunity of going very fully into that city's municipal milk supply, and found the scheme to be very efficiently conducted. The Wellington City Council have an agreement with their farmer-suppliers, receive the milk at certain depôts, pasteurise it, and deliver it in sealed bottles to the people. As a consequence of this the milk available to the people is of a very high quality, its hygenic standard being the prime consideration, and there is no doubt that it has an important bearing on the health of the community. The elimination of waste by a centralised and organised system such as in Wellington enables the people to obtain their milk and cream at reasonable prices, the farmer also securing a fair price for his product.

Civic Enterprise.

Owing to the fact that for many years the municipal franchise had been on the same basis as that for the election of Parliament, Mr. Smith said that practically all of the essential public services in the Dominion were owned and controlled by the municipality in most of the larger centres of population. The supply of

Plate 67.—Trout in Fairy Springs, Rotorua.

New Zealand rivers and streams abound in fish, many of which have been introduced. The water in the picture is of crystal clearness and the fish are swimming against a swift current.

Plate 68.—Stacking Paspalum Hay at the Ruakura State Farm, N.Z.

Mr. Forgan Smith and his two small sons are with the Manager, Mr. H. Munro, in the foreground.

PLATE 69.—THE MINISTER AT THE CANTERBURY AGRICULTURAL COLLEGE, LINCOLN, CHRISTCHURCH, N.Z.

In the group with Mr. and Mrs. Smith are the Director of the College, Mr. R. E. Alexander and Mrs. Alexander, Dr. F. W. Hilgendorf (Professor of Biology), Mr. P. R. Climie (Secretary, Canterbury Progress League), and Mr. T. G. Hope (Private Secretary to the Minister).

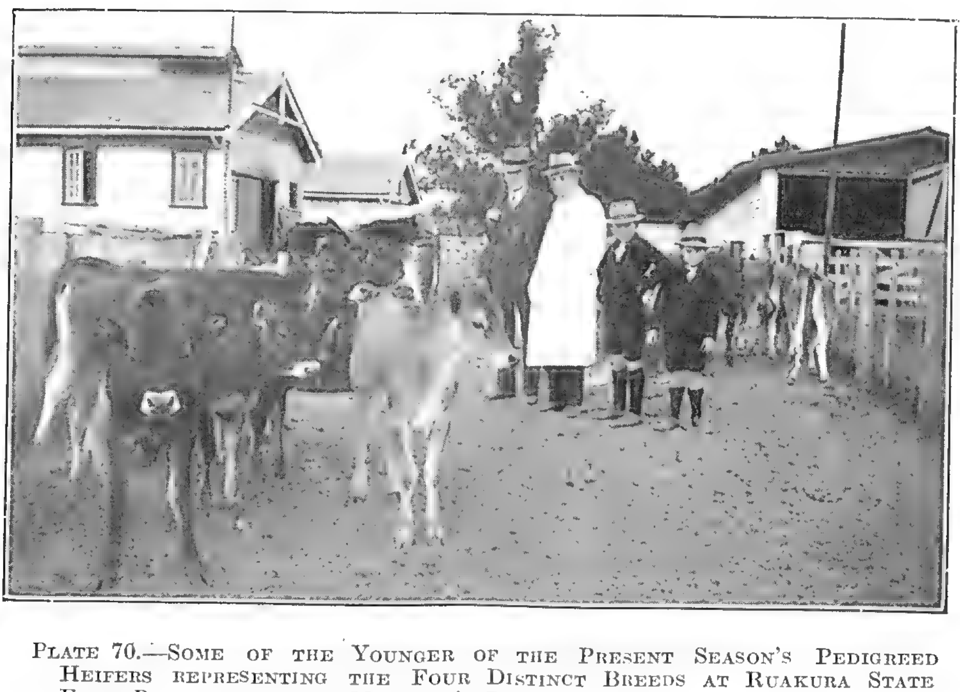


PLATE 70.—SOME OF THE YOUNGER OF THE PRESENT SEASON'S PEDIGREED HEIFERS REPRESENTING THE FOUR DISTINCT BREEDS AT RUAKURA STATE FARM PARADED FOR THE MINISTER'S INSPECTION.

electricity and gas and public abattoirs were controlled by the local authorities, and were conducted in a very efficient manner with corresponding advantage to the people generally.

In the city of Dunedin, the profits from municipal undertakings amounted to a considerable sum per annum, notwithstanding the cost to the general public for such services was kept very low. As a matter of fact, Dunedin is to have a new town hall, to cost approximately £120,000, the cost of which is to be defrayed from accumulated profits of municipal undertakings. In many parts of the Dominion facilities for the storage of water and the generation of electrical power were available, the water supplies being fed by mountain streams, and as a consequence hydro-electrical energy could be secured at a comparatively low price.

The Citizen of To-morrow—Infant Welfare.

Mr. Smith said that he had also the opportunity of visiting some of the Plunkett institutions, and investigated there the policy of child welfare that was being carried

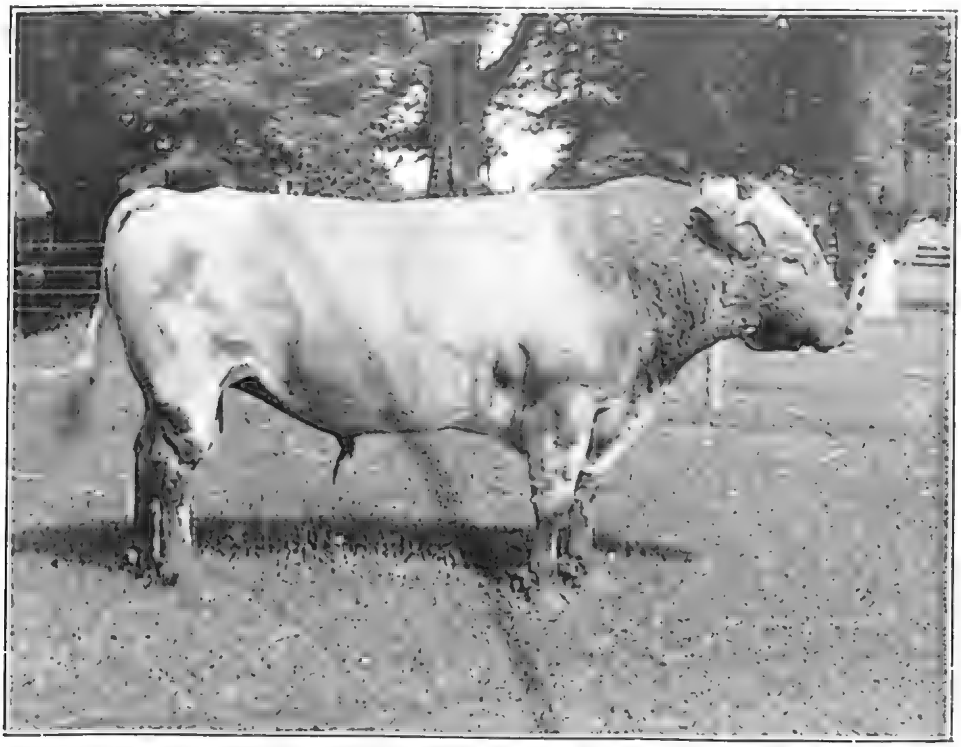


Plate 71.—"Dominion Director," another of the Shorthorn Sires at the Hamilton Farm of Instruction at Ruakura.

out. There can be no doubt that the activities of such institutions had resulted in placing New Zealand in the proud position of having the lowest infantile mortality rate in the world. "What I saw in New Zealand," added the Minister, "is another indication that the policy pursued by the Labour Government in Queensland in regard to the establishment of baby clinics, maternity hospitals, &c., is proceeding on sound lines."

Social Service.

The hospital system of the Dominion is also very efficient, and is conducted by hospital boards subsidised on the rates. Large sums of money had been spent in recent years in bringing hospital buildings up to requirements and in providing modern facilities for the treatment of accident and disease. Mr. Smith met and exchanged views with Sir Truby King, whose genius is largely responsible for putting into operation the general public health policy now in existence in the Dominion, and there was no doubt that New Zealand owed a great deal to Sir Truby King's services.

High Educational Standards.

The University system in New Zealand provides splendid facilities for students, and maintains a very high standard. Mr. Smith had the opportunity of visiting the Dunedin University with the Chancellor (Mr. T. K. Sidey, M.P.), who gave him much valuable information concerning the activities of that institution.

In all centres which he visited, the Minister met prominent representatives of the Labour movement, and discussed with them matters of mutual interest. The Labour

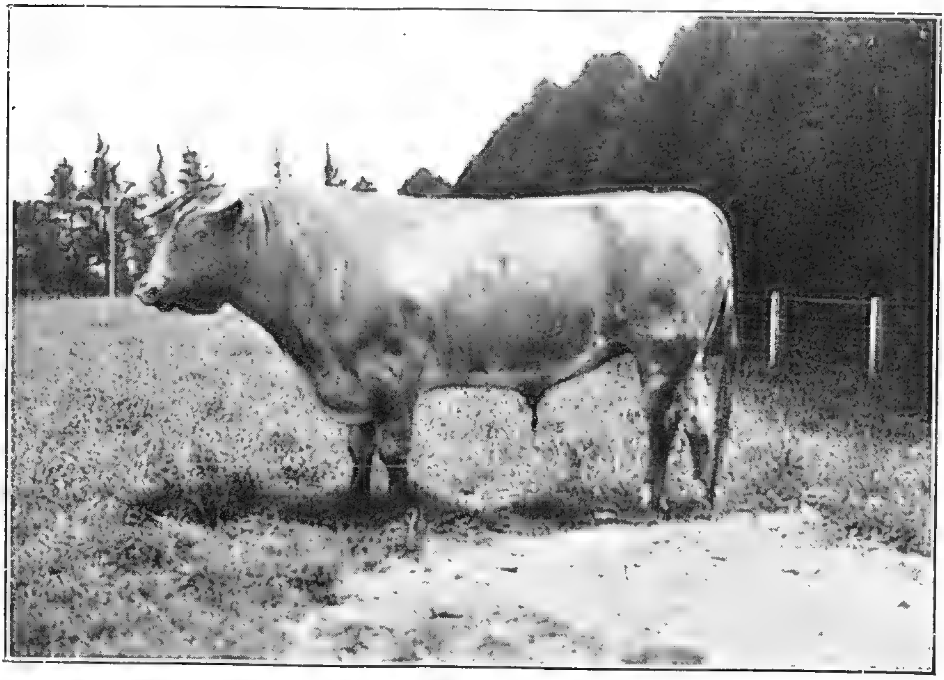


PLATE 72.—"PUKERIMU DAUNTLESS," ONE OF THE SHORTHORN SIRES ON THE RUAKURA FARM OF INSTRUCTION, HAMILTON, NEW ZEALAND

Party have fourteen members in the New Zealand Parliament, and the general opinion is that they will at least gain a large accession to their numbers at the next election.

Mr. Smith expressed his keen and warm appreciation of the courtesy extended to him at the hands of the Prime Minister (Mr. Coates), and of Dominion hospitality generally. He had the pleasure of meeting most of the Cabinet Ministers, and added that every kindness was extended to him and that everything possible was done for him by the Government and other authorities to make his stay instructive and enjoyable.

Mr. Smith's secretary (Mr. Hope) made a pictorial record of the tour, especially of their travels in the agricultural districts of the Dominion, and he has made a series of photographs available to us which are of particular interest to Journal readers. A set of them is published in this issue, and others will appear in following numbers.

Plate 73.—"Dominion Sis's Prince," another Sire in the Shorthorn Herd at Ruakura.

Plate 74.—Shearing Southdown Ewes on the Ruakura Farm of Instruction, Hamilton, New Zealand.

These ewes have been culled and are ready for mating with the different stud rams. The rams, which will be the progeny of these ewes, will be mated to long-wool ewes (mostly Romney). The ultimate resultant male from this cross is considered the right type of sire for the fat lamb trade.

PLATE 75.—JERSEY BULL "HOLLY OAK BEAUTY KNIGHT" (19 MONTHS OLD).

Bred at the Ruakura State Farm from the highest producing strain in New Zealand. A very fine type of the breed, which finds favour among New Zealand dairymen.

PLATE 76.—"DALETHORPE PRINCE," ANOTHER HIGH-CLASS NEW ZEALAND DAIRY SIRE IN THE HERD AT RUAKURA

FEEDING THE PIG.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

To correctly understand this important aspect of pig raising, it is necessary first that we should get right down to bedrock, as it were, and to begin at the beginning by studying the objects aimed at in feeding stock. All life requires food (and also warmth and moisture) and water, whether it be the minutest form of germ or animal life, or whether it be the fully developed male or female plant or animal; indeed, this is not only true of the physical, but of every other part of our bodies, and though in stock raising we aim mainly at developing the body, we also aim at the reproduction of bodies equally as well prepared as are the parents for the battle of life. We understand, therefore, that the animal body requires food to supply the material necessary for its growth. The animal stomach might, for purpose of comparison, be likened to a locomotive boiler and engine, in which both water and fire operate towards the production of the steam and power which represent the driving force. As the steam is required in considerable quantities constantly, it is necessary to continually stoke the fire, to keep the ashes and cinders well raked out and a sufficient draught of air passing under and through the fire, and to keep up the water supply in order that pressure may be retained, or as it is commonly referred to, "that there may be a sufficient 'head' of steam to do the necessary work." Thus there is not only a constant pressure or production of steam in building up, but there is also a constant waste going on in the utilisation of both the fuel and water, and these losses need to be made good by the addition of fresh supplies which must be at hand all the time. The animal body is constantly being built up as a result of the strength generated from the food, as it is absorbed in the form of "digestible nutrients" from the food stream as it passes through the stomach and bowels, and there is also a constant breaking down of tissue or waste as it has been referred to above; so it is equally necessary that fresh supplies of nutritious, succulent, and appetising food be at hand to feed the body as occasion requires.

In stock feeding, certain specific objects must be kept in view, and we must thoroughly understand each of these objectives in order to gain the maximum benefit from a study of our feeding problems.

The Objects of Feeding.

Technically speaking, the objects of feedings are—

(1) To maintain bodily heat and strength.

(2) To repair waste of tissue (muscle, flesh, fat, bone, sinew, blood, &c.).

(3) To prepare for the reproduction of young.

(4) To form new tissues and organs.

(5) To enable the animal to perform muscular labour, or to fatten in preparation for slaughter for the purpose of converting the carcase into bacon, &c.

(6) To allow of the secretion of various products, such as milk, blood, digestive juices, &c.

(7) To allow of a reserve of stores being laid by in the form of fat, &c.

To Maintain Bodily Heat and Strength.—In a normal state the bodily temperature of various animals differs somewhat, though all reach the century mark. The normal temperatures of domestic stock are as follows:—

Horse	100	to	101	degrees Fahr.
Cow	101	to	102	,, ,,
Dog	101	to	102	,, ,,
Pig	102.6	to	103	,, ,,
Sheep	103	to	104	,, ,,
Fowl	105	to	107	,, ,,

The cat has about the same temperature as the horse. The temperature of the healthy animal body does not fluctuate, however, to more than a very slight extent. The heat required to maintain temperature is provided from the food. Thus it is important that the food supply should be of sufficiently good quality and quantity at all times.

To Repair Waste of Tissue, &c.—As with the locomotive, so with the body there is a constant wear and tear. Bodily activity involves the destruction of the various elements of which the body is composed. No sooner is this destroyed than it needs replacing, hence the food supply must not only be sufficient and of good quality, but it must be given at regular periods and in sufficient bulk to enable the digestive organs to handle it to advantage, for some bulk is necessary, though the pig does not require the same bulky food as does the cow and the horse.

It matters not whether an animal such as the horse is at regular and at hard work or is at rest, there is still a waste of tissue going on; it cannot stop, and when there is a greater supply of fuel than is actually needed at the moment the energy is produced, the balance is stored in the form of fat for future use.

Even where an animal is at rest a certain amount of energy is needed for the performance of the internal work of the body. The heart is constantly beating, the acts of inspiration and respiration keep the lungs in regular movement; these, in company with the labour involved by the action of the stomach and intestines in the process of digestion, are a constant drain on the energy thus stored. All this energy thus required and stored comes from the food.

To Prepare for the Reproduction of Young, &c.—It stands to reason that a brood sow carrying a litter of, say, a dozen young pigs, must require more food than a sow not in pig, for not only must the sow's own body be kept going, but the development of the young pigs in her breeding sac must be kept provided for; these absorb large quantities of nutrients as they develop and mature.

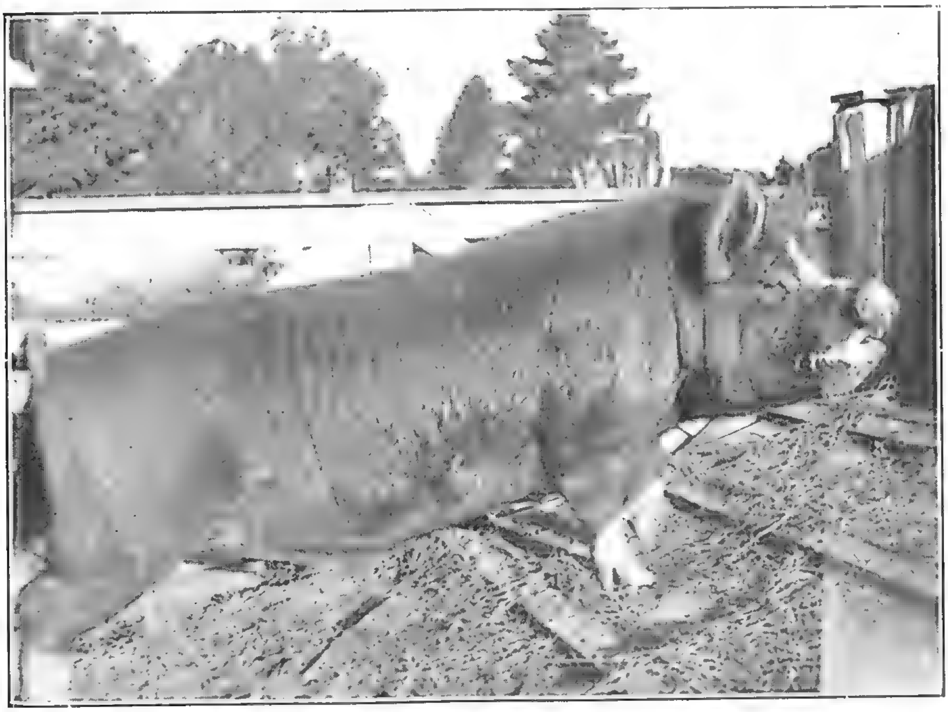


PLATE 77.—STUD BOAR "DOMINION GOOD HOPE," AGED 14 MONTHS.
Ruakura Farm of Instruction, Hamilton, New Zealand.

Winner of first prize for boars under that age, and also reserve championship at the last New Zealand Royal Show. This boar was paraded for inspection, with others (as typical of the requirements of New Zealand pig raisers), before Mr. Forgan Smith (Minister for Agriculture) in the course of his recent New Zealand tour.

Nature will even provide for their maintenance at the expense of the sow's own body if the food supply of the sow is insufficient or of poor quality. Breeding sows require abundant supplies of succulent green foods in preference to more limited supplies of concentrated food, such as maize, wheat, or barley, &c.

To Form New Tissues and Organs and to Enable the Animal to Perform Muscular Labour, &c.—It is not difficult to understand why the horse requires food when he is regularly occupied in farm or team work, or to understand why it is that an in-pig sow should have additional food, but many farmers find it difficult to realise that when the pig is fattening or even when he is growing it is performing something of the same muscular labour (though certainly the strain is not so severe) as is being performed by the horse. Here it is then that we see again the urgency of providing for an abundant supply of succulent, nutritious food of an appetising nature and sufficiently laxative in its action to keep the bowels working freely.

Plate 78 (Fig. 1).

There is nothing pigs like better than grazing over sweet succulent pasture, nor is there any "supplementary" food that can be utilised to more advantage in the production of pigs the progeny of brood sows that have lived in the open and have had the benefit of sunshine, exercise, and fresh succulent nutritious pasture. [This photograph by courtesy of the Principal of Dookie Agricultural College, Victoria.]

To Provide for the Secretion of Various Products.—The brood sow once relieved, internally, of her young pigs at birth, then takes on their feeding by way of the teat, and as young pigs usually have very vigorous appetites, the sow requires suitable milk-producing foods in liberal quantities in order to be able to secrete sufficient milk to maintain her growing litter. The milch cow, the brood mare, the lambing ewe, &c., all require similar study, nor are these the only ones, for the young pigs require careful tending even when they have reached a stage when they can be removed from the care of the sow and be weaned.

The young pigs and the pigs that are fattening in preparation for sale to the butchers and bacon curers are secreting and laying up stores both of flesh and fat. The horse stores his energy in the form of strong muscular tissue, capable of standing a heavy strain during the day's work. Animals fatten readily on good food, and the fat animal can be maintained for a long period on a much reduced ration of food.

Nor do we need to understand the objects of feeding alone; it is equally important that we understand the composition of the various constituents of the ration the pig consumes. We must also understand something of the composition of the tissues that need rebuilding.

The breaking-down and the building-up processes going on in the body are frequently referred to under the term metabolism.

Breeding and Feeding.

There is an old saying in connection with the care of live stock that "half the breeding is in the feeding," which saying contains more than an ordinary share of common sense, as, after all, no matter how well bred as animal is, it will not prove successful as a breeder and as a unit on the farm unless it is properly fed.

It is especially important that the composition of the various foods and the part played by the different elements in the food should be properly understood by the breeder, and the composition of the tissues that need rebuilding.

Food Constituents.

In general it can be said that food is made up of four main parts, namely—Water, mineral matter, nitrogenous matter, and non-nitrogenous matter.

A more minute classification of the dry portions of food shows that they consist of—Albumenoids (or proteids), oils (or fats), soluble carbohydrates, crude fibre, and ash.

Water.—Water constitutes about two-thirds of the weight of the body; it enters into the composition of all its tissues and fluids. As there is not sufficient water in the ordinary food usually given to stock, it is necessary to provide additional supplies, and these are best given ad lib. so that the animal can drink when it likes. Water is just as necessary to the animal's body as is dry food.

Influence of Minerals.—Mineral substances in general make up about 5 per cent. of the body's weight. They enter into the formation of the teeth and bones, regulate the density of the blood and other fluids of the body, and have important functions to perform at all times.

The mineral substances consist principally of lime, potash, phosphoric acid, sodium, magnesia, iron, silica, and certain other acids—viz., sulphuric and hydrochloric. Most foods contain all of these ingredients to a greater or lesser extent, though many of our permanent pastures, as well as crops, are very deficient in lime and potash.

Proteins.—The nitrogenous components of the body are commonly called the flesh-formers. The proteins (i.e., those containing nitrogen) are principally found in the bones, gristle, tendons, ligaments, brain, nerves, hair, skin, and in the muscles and internal organs generally. Protein is generally called albumen, and the group name albumenoids is freely used. The white of an egg is an example of albumenoids. The protein portion of the food is generally the most expensive. The proteins can be changed into fats in the body, though in their absorption they cannot replace fat. They serve as fuel to make up for the daily waste of animal tissue, heat, and energy.

Carbohydrates.—The parts of the food that are free from nitrogen are divided into two main classes—the carbohydrates and the fats. The carbohydrates consist of sugars, gums, and woody fibres. They form the bulk of the food, and in the process of digestion they are converted into fats, and are used as fuel. The gums play only a secondary part as regards the nutritive value of any food. The carbohydrates represent the fat-forming portion of the food. For the purpose of heat and energy production, fat is worth 2.25 times as much as carbohydrates, in the form of starchy matter; that is, 1 lb. of fat is equivalent, when used as fuel, to 2.25 lb. of the starchy matter.

Fats.—As fat is an essential body and is necessary in the digestion of food, the fat stored in the body is drawn upon largely if it is deficient in the food given to the animal. Protein may be converted into fat in the body and may be used as such. It is, therefore, plain that in feeding stock it is essential to have a proper proportion of fat in the food. If this is possible, not only is the fat in the body protected, but indirectly also the protein of the muscles and flesh. This is an important point.

The Process of Digestion.

Before food can be of any use to the animal it must undergo the process commonly called digestion. Digestion is the process by which the nutritious properties of the food are converted into a soluble form, so as to render them capable of being absorbed into the system to nourish and maintain the body. During the process of chewing, or masticating the food, there is mixed with it in the mouth, before it is swallowed, the first digestive juice called the saliva. Mastication is a mechanical action, the object of which is to reduce the food to a fine pulp, in which state it is most readily mixed with and acted upon by the chemical digestive juices. On completion of mastication, the food is swallowed. It must be remembered that in those animals that chew the cud (the ruminants), the food is returned to the mouth to be re-masticated. The muscular action of the stomach keeps the food churning, and as it passes through it becomes mixed with the gastric juice, one of the most important of the digestive juices. The food passing onwards enters the small intestines, where it becomes mixed with another digestive juice, the bile, secreted by the liver, and still another, the pancreatic juice, secreted by the pancreas. These various digestive juices have a special mission to perform. They change as large a portion as possible of the different constituents of the food into soluble form, which then pass directly or indirectly into the blood, and are made to serve the various requirements of the animal.

The saliva acts on starchy (carbohydrates) foods, also dissolves savory substances, salt, &c., enabling them to be tasted. It also assists in forming the food into a soft mass prior to swallowing. In the ruminants this mass is called a bolus or a ball of food.

The gastric juice acts on the nitrogenous (flesh-forming) portion of the food.

The bile emulsifies fats and causes the squirming (worm-like) action of the small bowels (peristaltic action).

The pancreatic juice acts both on the starchy foods and in the emulsifying of fats.

The coagulation of albumen and the prevention of putrefaction during digestion are special duties performed in the stomach by this gastric juice.

The soluble and diffusable substances formed by the action of the gastric juice on albuminous substances are called peptones; these are ready for absorption. Other substances are absorbed during the passage of food through the stomach and intestines. While the food is thus in passage through the body it is called chymous matter, and it consists not only of partially digested foods, but also of the several juices already named, mucous or saliva, and the indigestible substances (the residue), which, resisting the action of the digestive juices, is eventually passed out from the body in the form of fæces or dung. The nutritious matter that is absorbed and passed into the blood circulation is called "chyle."

Quality of Food—The Water Supply.

Food can, of course, be too rich, just as it can be of poor quality; it must always contain bulk. While it will be noted that only the soluble and diffusible nutritious portion of the food has any direct feeding value, a certain quantity of crude fibre and indigestible matter is necessary not only to form bulk and help in satisfying the animal's appetite, but also to increase the efficiency of digestion by increasing the bulk of the food, and thus causing it to fill the stomach and intestines and keep them in proper working order. This is why rich foods, such as oil cakes, linseed oil meals, and others of the same description must be fed in a small quantity in company with less valuable but more bulky foods. The direct opposite of this feeding principle is also true. Skim milk, although a bulky food, satisfying the animal and filling his stomach and intestines, is poor in actual feeding value, and needs enriching by the addition of fat-formers in the way of oil cakes or meals or concentrated cereal meal like pollard.

PLATE 79 (Fig. 2).—FINDING THE PEAS.

A group of young pigs that have the benefit of a roomy pasture, portion of which had been well littered over with Cow Pea Hay. The pigs appear to be enjoying the search for the hidden peas. There are many farm crops of great value in pig-feeding purposes in both the fresh succulent and the dried form. Pea hay is a favourite item on the pig's menu.

PLATE 80 (Fig. 3).—CLOVER VARIETY TRIALS.

Several varieties of clover are suitable for pig feeding, and for use in laying down mixed pastures. Bokhara Clover, White Clover, and Bursiess or Egyptian Clover are typical examples. The trials were carried out on the Warren State Farm, Queensland.

Plat 81 (Fig. 4).

Mineral matters play an important part in the feeding of pigs, for minerals are very necessary and are unfortunately deficient in many of the concentrated or more bulky foods. Wood ashes, charcoal, &c., are examples of minerals that can be made available on the farm at a nominal cost. This picture illustrates the manner in which the Manager of Warren State Farm, took advantage of gathering a supply of wood ashes and charcoal during clearing operations on the farm.

Plate 82 (Fig. 5).

Raking up the charcoal and bagging for future use is a money-making proposition. After the charcoal is gathered, the ashes should be evenly distributed over surrounding areas, in this way benefiting a larger area and making more efficient use of this very useful mineral matter.

Palatability of Foods.

The palatability of the food is also a most important feature. A small portion of salt added to food makes a great difference in its agreeable qualities; sugar in the same way makes some forms of food much more pleasant, yet few farmers realise the necessity of making the pig food palatable and nutritious. All stock derive more benefit from food that is easily obtained and is palatable, even though it may contain a percentage of indigestible fibre.

As already indicated, water is contained in all foods and is present in large quantities in the body. In some root crops and in melons, &c., it exists in quantities up to over 90 per cent., but in concentrates, such as pollard, the percentage varies from five to eight.

The fat of food as indicated is either burned to furnish heat and energy or is stored up in the body for future use.

The ash is what is left when the combustible part of a feeding stuff is burned away. Ash consists chiefly of the mineral part of the food—i.e., lime, magnesia, potash, soda, iron, silica, and the acids already named. Part of the ash is used in the formation of bone and part of it is stored up in the body for future use. The particles not otherwise required are voided in the urine and dung.

The fibre is the framework of plants and is, as a rule, the most indigestible portion of a foodstuff. The coarser fodders, such as sorghum grass and other plants, contain a large proportion of fibre, but, as already stated, this is a very necessary part of the food. In feeding pigs, however, it must be remembered that (unlike cattle) they have a small stomach, and, therefore, are not able to deal expeditiously with foods containing a very high percentage of indigestible fibre; in fact, nature teaches the pig not to swallow too much fibrous matter. Sorghum, for instance, makes an excellent grazing crop for pigs. When the plant flowers and forms seed, it can safely be fed (it is regarded as poisonous prior to the flowering stage and should not on any account be fed to any class of stock). Brood sows, in particular, relish a good crop of sorghum; they will graze on this plant, be satisfied and contented and do well, but they will not swallow the indigestible fibre—they chew it thoroughy and extract all the nutritious matter, then reject the coarse fibre. Coarse bran is of no value as a food for pigs; though, owing to its being in the form of meal, it may be swallowed, it passes through the pig undigested and may be wasted. There is nothing better for a brood sow that has a tendency to constipation than a good warm bran mash, but this is a bulky laxative mash, which, passing through the bowels quickly, relieves the costive condition, but does not satisfy the demand for nutrition. Cattle and sheep, and also goats, can consume large quantities of indigestible fibre and make some use of it, because they have capacious stomachs and have the power of rumination. The pig has a relatively lower power of dealing with fibrous foodstuffs, but it has a very high power of converting easily digested foodstuffs into meat; this is why pigs do so well on concentrated, non-bulky foods such as pollard, meals of various descriptions, dairy by-products, root crops, potatoes, artichokes, &c.

For a more detailed description of the composition of various foods, a study of the nutritive ratio and its application to the balancing of rations, and, in general, for the theoretical aspect of this great question, the reader is referred to the special text-books dealing with the subjects of Feeding Farm Animals, Feeds and Feeding, and other pamphlets on Stock Foods by J. C. Brünnich. Particulars of these can be supplied, if required, on application.

Definition of Terms.

For the benefit of junior readers of these articles, a few definitions of terms that they will come across in reading up this subject are here given. These definitions are stated in every-day language and make clear the several points.

When food is mixed and fed to stock in certain quantities, the term "ration" is used. A ration is the total allowance of food given to an animal for twenty-four hours.

"Balanced ration" has been defined as one in which the constituents are so blended as to produce the results sought in feeding, with but little or no waste.

"Dry matter" represents that portion of a feeding stuff which remains after all the water or moisture has, in analyses, been expelled by heat.

"Digestive nutrients" is that portion of the dry matter which can be digested by the animal and does not pass off through the bowels as excrement.

"Protein" is that portion of the digestible nutrients which goes to the formation of lean meats, ligaments, hair, horns, and the casein (or curd) of milk. Protein is the most expensive portion of any foodstuff. It is generally believed that protein may be, and many times is, converted into the fat in milk. The basis of protein is nitrogen, hence the protein elements are termed the nitrogenous part of the food. They are also called albumenoids.

"Carbohydrates" are that portion of the digestible nutrients which are the primary source of sustaining animal heat and furnishing the energy for keeping the animal's mechanism in operation. They are composed of the woody fibre of the plant and grain and the starch, sugars, and gums. In the published list of chemical analyses of foods, the carbohydrates are usually subdivided into the terms:—"Crude fibre," which is the least digestible portion of the food; "nitrogen free extract," so called, because it does not contain any nitrogen; "ether extract," that portion of the digestible nutrients which may be dissolved out of the foodstuff by ether. It is frequently called "crude fat." It can be used by the animal for maintaining the bodily temperature, and for this purpose is from 2.2 to 2.5 times more efficacious than the carbohydrates. It is maintained by some writers that the fat in milk comes largely from the crude fat in the food, but it has been demonstrated that it is not absolutely necessary for this purpose.

What is a Balanced Ration?

A balanced ration is one in which the essential constituents are supplied in adequate amount and in correct proportion for the purpose in view; or, in more definite language, a balanced ration is one which supplies an adequate amount of starch equivalent, containing the requisite quantity of digestible protein, and combined with a suitable bulk of food for the purpose in view.

In addition to the primary consideration of adequate supplies of starch equivalent and digestible protein in the construction of balanced rations, many other factors must be taken into account, of which the following are a few of the more important:—

(1) The stock of home-produced foods on hand.

(2) Relative costs of foodstuffs.

(3) Palatability.

(4) The characteristics of the foodstuffs used as regards the laxative or costive effects; the percentage of fibre; their effect on the colour and flavour of butter and milk; and in some cases their effect on the flavour and texture of the meat.

(5) Mineral matter.

(6) Vitamins—in some cases.

In commencing to build up a balanced ration it is necessary to ascertain approximately what quantites of such foods as are on hand can be arranged for per head per day. If, on calculation, it is found that the allowance of foods is insufficient to supply a ration which complies with the required feeding standards, consideration must then be given to the purchase of suitable supplementary foods.

Balanced Ration for Pigs.

The pig must be well bred, well fed, and well looked after if the maximum profit is to be derived. The pig is well known as the farmer's best scavenger, the housewife's most wholesome sink, but he excels as a rent payer, for he provides the dairyman with a return for his skim milk, the butcher a return for his offal, and the farmer a return for his surplus roots, grain, and greenstuff, and the profits are even greater when these feeds are combined, for skim milk contains too large a proportion of water, butchers' offal an excess of protein, and grain (with the exception of peas and beans) an overplus of carbohydrates. In balancing a ration for pigs, the fact that young animals require more protein than those that have arrived at the mature stage should not be overlooked. In this connection pollard, a product of milling wheat, is exceedingly valuable, provided it is up to the specified standard. It is wise too to keep a mixture of salt, ashes, sulphur, and lime constantly before pigs of all ages.

No food is too good for the pig, and the best is the most economical in the end. Breeding, feeding, and management are factors that play a highly important part in the fattening of pigs.

Feeding Points.

When making up rations for young pigs, the following points should be borne in mind:—

(1) The ration should be easily digested. In this respect milk is one of the best foods for pigs at weaning time.
(2) The fibre content should be low.
(3) The ration must contain plenty of raw material.

When the food is unduly sloppy it means that a greater bulk of food has to be consumed, the alimentary canal becomes greatly distended, and the animal does not thrive so well. A sufficiency of food does not, however, fulfil the requirements of a pig's diet. Quality is just as important as quantity, and the ration must be constituted as to include, in the most economic proportions, the variety of food constituents necessary for the maintenance of maximum efficiency in the normal working of the animal's body, as well as for the purpose of growth and the formation of flesh and fat.

Early Maturing Bacon Pigs.

Many farm pigs do not reach medium bacon weights until they are eight or nine months old. On this account they cost more to produce and not only is the risk of keeping them increased, but the profits are reduced. Young pigs should be hurried along from the weaning stage to maturity and should be topped up on a proportion of grain for the last two or three weeks of their life. This is done in order that the flesh may "firm up" and be in good condition for curing.

Slop fed pigs do not give the best results as baconers unless they are topped up on grain. This grain feeding appears to put the finishing touch to the feeding, for grain and milk-fed pigs kill out to the best advantage.

Food Necessary for Pigs.

A certain quantity of food is required by every pig daily to keep it alive and to keep its internal organisation in working order. If a pig were being maintained on grain or mash alone, it is estimated that the food necessary for this purpose would be 2 lb. of meal daily for each 100 lb. body weight, so that a pig weighing 100 lb. live weight would have to eat 14 lb. of meal each week without gaining any increase in weight from it. This increase ought really to amount up to 1 lb. per day increase in weight or 7 lb. per live pig in a week, equal to 4 or 5 lb. of pork for a pig between 4 and 4½ months old per week with increasing returns weekly.

This shows that the old-fashioned plan of keeping pigs in a merely store condition for many months and then fattening them would, under present conditions, be simply ruinous. Another and equally fatal objection to the out-of-date system is the fact that a young and growing pig is able to make a far greater proportionate increase from the food it consumes than is possible for the old pig.

One of the causes of this is that the food suitable for the pig supplies both the necessary requirements for growth and for the production of fat, whereas the old pig has no need for that portion of the nutrient in the food which merely increases growth, as it passes through the body unused and wasted. Further, the young pig consumes and turns into flesh a far greater proportionate quantity of food, according to its live weight, than the old pig is willing or able to do.

A still further reason for the practice of the combined growing and fattening system in the production of pork is the fact that pork, the produce of young, prime-quality pigs, is in so much greater demand than pork from older pigs, and at a much higher price per pound. So far as one can see, everything is in favour of the liberal system of feeding pigs from their earliest days.

The advantages pointed out exhaust the arguments in favour of liberal feeding. The cost of production of meat, as of most other articles, is increased by the extension of the period of manufacture, as all the standard expenses of rent, labour, interest on money, &c., continue whether the outturn be half or the full extent possible. In many instances, at least twice the outturn of pork might be made without any increase in the working expenses.

This would be equal to halving these expenses and doubling the other profits on the production of the pork. The enormous benefit thus available to the majority of pigkeepers needs no emphasising for during recent years the production of pork has been, comparatively speaking, one of the most profitable branches in the mixed farming world.

GESTATION CHART FOR BREEDING SOWS.

Jan.	Date of Farrowing.	Feb.	Date of Farrowing.	March.	Date of Farrowing.	April.	Date of Farrowing.	May.	Date of Farrowing.	June.	Date of Farrowing.	July.	Date of Farrowing.	Aug.	Date of Farrowing.	Sept.	Date of Farrowing.	Oct.	Date of Farrowing.	Nov.	Date of Farrowing.	Dec.	Date of Farrowing.
1	22 April	**1**	23 May	**1**	20 June	**1**	21 July	**1**	20 Aug.	**1**	20 Sept.	**1**	20 Oct.	**1**	20 Nov.	**1**	21 Dec.	**1**	20 Jan.	**1**	20 Feb.	**1**	22 Mar.
2	23 ,,	**2**	24 ,,	**2**	21 ,,	**2**	22 ,,	**2**	21 ,,	**2**	21 ,,	**2**	21 ,,	**2**	21 ,,	**2**	22 ,,	**2**	21 ,,	**2**	21 ,,	**2**	23 ,,
3	24 ,,	**3**	25 ,,	**3**	22 ,,	**3**	23 ,,	**3**	22 ,,	**3**	22 ,,	**3**	22 ,,	**3**	22 ,,	**3**	23 ,,	**3**	22 ,,	**3**	22 ,,	**3**	24 ,,
4	25 ,,	**4**	26 ,,	**4**	23 ,,	**4**	24 ,,	**4**	23 ,,	**4**	23 ,,	**4**	23 ,,	**4**	23 ,,	**4**	24 ,,	**4**	23 ,,	**4**	23 ,,	**4**	25 ,,
5	26 ,,	**5**	27 ,,	**5**	24 ,,	**5**	25 ,,	**5**	24 ,,	**5**	24 ,,	**5**	24 ,,	**5**	24 ,,	**5**	25 ,,	**5**	24 ,,	**5**	24 ,,	**5**	26 ,,
6	27 ,,	**6**	28 ,,	**6**	25 ,,	**6**	26 ,,	**6**	25 ,,	**6**	25 ,,	**6**	25 ,,	**6**	25 ,,	**6**	26 ,,	**6**	25 ,,	**6**	25 ,,	**6**	27 ,,
7	28 ,,	**7**	29 ,,	**7**	26 ,,	**7**	27 ,,	**7**	26 ,,	**7**	26 ,,	**7**	26 ,,	**7**	26 ,,	**7**	27 ,,	**7**	26 ,,	**7**	26 ,,	**7**	28 ,,
8	29 ,,	**8**	30 ,,	**8**	27 ,,	**8**	28 ,,	**8**	27 ,,	**8**	27 ,,	**8**	27 ,,	**8**	27 ,,	**8**	28 ,,	**8**	27 ,,	**8**	27 ,,	**8**	29 ,,
9	30 ,,	**9**	31 ,,	**9**	28 ,,	**9**	29 ,,	**9**	28 ,,	**9**	28 ,,	**9**	28 ,,	**9**	28 ,,	**9**	29 ,,	**9**	28 ,,	**9**	28 ,,	**9**	30 ,,
10	1 May	**10**	1 June	**10**	29 ,,	**10**	30 ,,	**10**	29 ,,	**10**	29 ,,	**10**	29 ,,	**10**	29 ,,	**10**	30 ,,	**10**	29 ,,	**10**	1 Mar.	**10**	31 ,,
11	2 ,,	**11**	2 ,,	**11**	30 ,,	**11**	31 ,,	**11**	30 ,,	**11**	30 ,,	**11**	30 ,,	**11**	30 ,,	**11**	31 ,,	**11**	30 ,,	**11**	2 ,,	**11**	1 April
12	3 ,,	**12**	3 ,,	**12**	1 July	**12**	1 Aug.	**12**	31 ,,	**12**	1 Oct.	**12**	31 ,,	**12**	1 Dec.	**12**	1 Jan.	**12**	31 ,,	**12**	3 ,,	**12**	2 ,,
13	4 ,,	**13**	4 ,,	**13**	2 ,,	**13**	2 ,,	**13**	1 Sept.	**13**	2 ,,	**13**	1 Nov.	**13**	2 ,,	**13**	2 ,,	**13**	1 Feb.	**13**	4 ,,	**13**	3 ,,
14	5 ,,	**14**	5 ,,	**14**	3 ,,	**14**	3 ,,	**14**	2 ,,	**14**	3 ,,	**14**	2 ,,	**14**	3 ,,	**14**	3 ,,	**14**	2 ,,	**14**	5 ,,	**14**	4 ,,
15	6 ,,	**15**	6 ,,	**15**	4 ,,	**15**	4 ,,	**15**	3 ,,	**15**	4 ,,	**15**	3 ,,	**15**	4 ,,	**15**	4 ,,	**15**	3 ,,	**15**	6 ,,	**15**	5 ,,
16	7 ,,	**16**	7 ,,	**16**	5 ,,	**16**	5 ,,	**16**	4 ,,	**16**	5 ,,	**16**	4 ,,	**16**	5 ,,	**16**	5 ,,	**16**	4 ,,	**16**	7 ,,	**16**	6 ,,
17	8 ,,	**17**	8 ,,	**17**	6 ,,	**17**	6 ,,	**17**	5 ,,	**17**	6 ,,	**17**	5 ,,	**17**	6 ,,	**17**	6 ,,	**17**	5 ,,	**17**	8 ,,	**17**	7 ,,
18	9 ,,	**18**	9 ,,	**18**	7 ,,	**18**	7 ,,	**18**	6 ,,	**18**	7 ,,	**18**	6 ,,	**18**	7 ,,	**18**	7 ,,	**18**	6 ,,	**18**	9 ,,	**18**	8 ,,
19	10 ,,	**19**	10 ,,	**19**	8 ,,	**19**	8 ,,	**19**	7 ,,	**19**	8 ,,	**19**	7 ,,	**19**	8 ,,	**19**	8 ,,	**19**	7 ,,	**19**	10 ,,	**19**	9 ,,
20	11 ,,	**20**	11 ,,	**20**	9 ,,	**20**	9 ,,	**20**	8 ,,	**20**	9 ,,	**20**	8 ,,	**20**	9 ,,	**20**	9 ,,	**20**	8 ,,	**20**	11 ,,	**20**	10 ,,
21	12 ,,	**21**	12 ,,	**21**	10 ,,	**21**	10 ,,	**21**	9 ,,	**21**	10 ,,	**21**	9 ,,	**21**	10 ,,	**21**	10 ,,	**21**	9 ,,	**21**	12 ,,	**21**	11 ,,
22	13 ,,	**22**	13 ,,	**22**	11 ,,	**22**	11 ,,	**22**	10 ,,	**22**	11 ,,	**22**	10 ,,	**22**	11 ,,	**22**	11 ,,	**22**	10 ,,	**22**	13 ,,	**22**	12 ,,
23	14 ,,	**23**	14 ,,	**23**	12 ,,	**23**	12 ,,	**23**	11 ,,	**23**	12 ,,	**23**	11 ,,	**23**	12 ,,	**23**	12 ,,	**23**	11 ,,	**23**	14 ,,	**23**	13 ,,
24	15 ,,	**24**	15 ,,	**24**	13 ,,	**24**	13 ,,	**24**	12 ,,	**24**	13 ,,	**24**	12 ,,	**24**	13 ,,	**24**	13 ,,	**24**	12 ,,	**24**	15 ,,	**24**	14 ,,
25	16 ,,	**25**	16 ,,	**25**	14 ,,	**25**	14 ,,	**25**	13 ,,	**25**	14 ,,	**25**	13 ,,	**25**	14 ,,	**25**	14 ,,	**25**	13 ,,	**25**	16 ,,	**25**	15 ,,
26	17 ,,	**26**	17 ,,	**26**	15 ,,	**26**	15 ,,	**26**	14 ,,	**26**	15 ,,	**26**	14 ,,	**26**	15 ,,	**26**	15 ,,	**26**	14 ,,	**26**	17 ,,	**26**	16 ,,
27	18 ,,	**27**	18 ,,	**27**	16 ,,	**27**	16 ,,	**27**	15 ,,	**27**	16 ,,	**27**	15 ,,	**27**	16 ,,	**27**	16 ,,	**27**	15 ,,	**27**	18 ,,	**27**	17 ,,
28	19 ,,	**28**	19 ,,	**28**	17 ,,	**28**	17 ,,	**28**	16 ,,	**28**	17 ,,	**28**	16 ,,	**28**	17 ,,	**28**	17 ,,	**28**	16 ,,	**28**	19 ,,	**28**	18 ,,
29	20 ,,	—	—	**29**	18 ,,	**29**	18 ,,	**29**	17 ,,	**29**	18 ,,	**29**	17 ,,	**29**	18 ,,	**29**	18 ,,	**29**	17 ,,	**29**	20 ,,	**29**	19 ,,
30	21 ,,	—	—	**30**	19 ,,	**30**	19 ,,	**30**	18 ,,	**30**	19 ,,	**30**	18 ,,	**30**	19 ,,	**30**	19 ,,	**30**	18 ,,	**30**	21 ,,	**30**	20 ,,
31	22 ,,	—	—	**31**	20 ,,	—	—	**31**	19 ,,	—	—	**31**	19 ,,	**31**	20 ,,	—	—	**31**	19 ,,	**31**	22 ,,	**31**	21 ,,

NOTE.—Black figures in above table indicate date of service.

This chart presents in an instructive form figures relating to the gestation period of brood sows. For example, a sow mated to the boar on 1st January is due to farrow on 22nd April; a sow mated on 1st July is due on 20th October. The chart should be preserved for future reference by breeders of all classes of pigs. The normal period of gestation, *i.e.*, the period from the time of conception to the birth of the young pigs, is 112 days, this period is sometimes remembered as roughly three months three weeks three days, or 16 weeks. With very young sows the period is sometimes of shorter duration, and instances are on record where young sows have farrowed at from 100 to 108 days after becoming pregnant; on the other hand, old sows in abnormal condition have been known to carry their young for more than 140 days.—E. J. SHELTON, H.D.A., Instructor in Pig Raising.

BUSH HAY.

N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

Among stock owners opinions are divided as to the merits of bush hay as a fodder in extra dry seasons, such opinions being probably influenced by the quality of the material from which the experience was gained.

All will agree, however, that the nutritive value of a grass varies from early growth to maturity, for the rapid advance of stock on young succulent pasturage as compared with the same pasturage when matured offers evidence that must be accepted. It would follow as a natural corollary that hay made from grasses at different stages of growth would vary similarly in nutritive value.

As set out in "Dry Season Safeguards and Animal Nutrition," "Q.A.J.," May, 1927, the proper time to cut grasses of perennial habit in order to ensure a maximum palatability and nutritive content, is just as they are breaking into flower.

An illustration of this is afforded in the result of an analysis of a sample of bush hay secured at Mr. N. H. Philp's holding, Stanley Downs, Stamford, in the Hughenden district, towards the close of last year. In this, the Government Botanist identified the following grasses and herbage, with a noting that the sample was very typical of the average better pastures of the Northern Downs and Central West.

Grasses.

Astrebla triticoides—Mitchell Grass.
Andropogon decompositum—Barley Grass.
Andropogon sericeus—Blue Grass.
Iseilma membranacea—Flinders Grass.
Chionachne barabata.

Herbage.

Malvastrum spicatum.
Hibiscus trionum—Bladder Ketmia.
Trichodesma Zeylanicum.
Ipomea sp.—A native convolvulus.
Datura Leichhardtii—Native thorn apple (poisonous), only one small fragment present.

The analysis returned by the Agricultural Chemist is as follows:—Water, 9.0; ash, 18.2; protein, 8.3; fibre, 25.4; fat, 1.6; carbohydrates, 37.5.

Analysis of the ash showed—Lime, 1.2 per cent.; phosphoric acid, 0.36 per cent.; chlorine, .567 per cent.

The striking feature of the fodder analysis is the very satisfactory protein content, showing the hay to be not only of high nutritive quality, but to provide a sufficiently balanced ration in itself for feeding in times of scarcity. The analysis of the ash shows the amount of phosphoric acid and chlorine also to be satisfactory.

The hay from which the sample was taken was cut at the right period, and presented a bright and well-cured appearance with good aroma.

This analysis should prove convincing testimony as to the value of properly made bush hay on the country devoted to depasturing sheep in the western areas of the State.

Pasture Improvement.

In the cutting of bush hay on the rolling downs and elsewhere, complaint is made of the difficulty in cutting low owing to the tussocky nature of the Mitchell Grass and also of the lack of thickness in the stand, both of which disallows a satisfactory yield to be harvested from each acre. Graziers will have noted that where the fire plough was used a more luxuriant growth of grass occurred on the loose soil turned back than on the soil not touched thereby, and that this grass not only grew better but preserved its green colour longer.

It is generally accepted that production lessens as age increases, so it may be expected that the tussocks of Mitchell Grass which are in general of more than a few years duration are less capable of production than those of newer growth.

As a remedy, it is suggested that a discing of the soil with a one-way disc harrow, such as manufactured by the Sunshine Harvester Works, followed by a good harrowing would level off the land to allow of close cutting by a mower and the production of a better growth of pasturage without any sowing of seed, as it is considered the land would already be sufficiently seeded from previous crops.

Feather Top.

A menace to the pastures on many holdings on the Rolling Downs is the spread of "Feather Top," *Aristida* sp., a three-awned spear grass. This grass, through its seed becoming entangled in the wool, reduces the latter's value while, being unpalatable to sheep, it is allowed to seed freely and thus to take possession of space that would be more profitably occupied by better grasses.

By the use of a tractor drawing a one-way disc harrow, followed by an ordinary harrow, a comparatively large area could be treated each year until the whole of the holding had been gone over, thus improving the pasturage which in its invigorated growth would tend to crowd out the Feather Top, increase the carrying capacity, and allow of more satisfactory cuts for hay.

In addition, the pasturage could be further improved by sowing prior to or during the discing operations, seeds of legumes found to do well in the locality, such as species of *Psoralea, Rhyncosia, Glycine,* &c.

Psorlea cinerea, a Valuable Legume.

A legume that is plentiful in many holdings in the western areas of the State, and worthy of further distribution through the pasturage, is found in *Psoralea cinerea,* a description of which, by the Government Botanist, together with an illustration, appeared in the "Queensland Agricultural Journal" for December, 1918.

An analysis of a sample secured in the Hughenden district and air dried was submitted to the Agricultural Chemist in December of 1927, and gave the following very fine analysis:—Moisture, 9.8; ash, 10.2; protein, 22.0; fibre, 10.1; fat, 7.4; carbohydrates, 40.5.

The analysis of the ash showed—Lime, 2.6 per cent.; phosphoric acid, 0.5 per cent.; chlorine, .157 per cent.

The chemist noted, "Only the leaves and young shoots were analysed, the hard central stalks discarded, which accounts for the low fibre. A very nutritious fodder."

The very high protein content of this legume and its adaptability to western conditions mark its extreme value.

Since the problem of feeding in dry times resolves itself into the supply of the necessary protein, the presence of this and other suitable legumes in the pasturage from which bush hay is made would be most advantageous.

CANE PRICES BOARD.

The following have been appointed Millowners and Canegrowers' Representatives respectively on the Local Sugar Cane Prices Boards against which their names are set, and the person so designated has been appointed chairman:—

Babinda Local Board—
Millowners' Representatives—F. A. Lamont and W. J. Ryan.
Canegrowers' Representatives—S. H. Warner and D. O. James.
Chairman—A. H. O'Kelly.

Bingera Local Board—
Millowners' Representatives—A. J. Gibson and B. A. Bourke.
Canegrowers' Representatives—N. Poulsen and T. Dexter.
Chairman—C. D. O'Brien.

Gin Gin Local Board—
Millowners' Representatives—C. M. English and E. N. Annand.
Canegrowers' Representatives—J. Laurison and G. Powell.
Chairman—C. D. O'Brien.

Goondi Local Board—
Millowners' Representatives—R. T. Challinor and D. A. Williams.
Canegrowers' Representatives—W. D. Davies and J. Moran.
Chairman—A. E. Aitkin.

Inkerman Local Board—
Millowners' Representatives—H. G. Bell and Wm. Gibson.
Canegrowers' Representatives—F. J. Woods and S. W. Gibson.
Chairman—R. A. Tait.

Isis Local Board—
Millowners' Representatives—A. Adie and John Alison.
Canegrowers' Representatives—W. M. Duncan and A. W. Macpherson.
Chairman—H. B. Carney.

Macknade Local Board—
Millowners' Representatives—E. Irving and A. H. Edwards.
Canegrowers' Representatives—G. Cantamessa and T. J. McMillan.
Chairman—J. A. Murray.

Marian Local Board—
Millowners' Representatives—A. J. Coyne and J. O'Neill.
Canegrowers' Representatives—A. J. Duncan and E. C. Walz.
Chairman—M. Gallagher.

Mossman Local Board—
Millowners' Representatives—E. J. O'Brien and C. J. Crees.
Canegrowers' Representatives—H. B. Schnitzerling and R. D. Rex.
Chairman—T. R. Beck.

RATIONS FOR DAIRY COWS.

E. H. GURNEY, Senior Analyst.

Feeders of dairy stock frequently forward to the Department lists of feed materials available to them, desiring to know how to make balanced rations from such material. On account of this it was thought that examples of rations made up with various feeds might prove useful, some of the examples being composed of feed stuffs named in the lists mentioned above.

The Agricultural Chemist, Mr. J. C. Brünnich, has written a pamphlet entitled "Stock Foods," in which the objects of feeding, description and analyses of various stock foods, and the making up of rations are all very fully detailed, and with this information the dairy farmer can judge how to feed to the best advantage.

Modern experience has shown that rations with somewhat lower protein content than was previously considered necessary can be successfully used.

Examples of rations computed from analyses of feed stuffs contained in "Stock Foods" are given below, and are in accordance with the feeding standards for dairy cows published in "Feeds and Feeding Abridged," by Henry and Morrison.

Professor J. K. Murray states that this standard is referred to in lectures in the Agricultural Course at the Queensland University.

HENRY AND MORRISON FEEDING STANDARD.

——	Digestible Crude Protein.	Total Digestible Nutrients.
Dairy Cows.		
For maintenance of a 1,000-lb. cow	0·700	7·925
To allowance for maintenance add—		
For each 1 lb. of 2·5 per cent. milk ..	0·045—0·053	0·230—0·256
For each 1 lb. of 3·0 per cent. milk ..	0·047—0·057	0·257—0·286
For each 1 lb. of 3·5 per cent. milk ..	0·049—0·061	0·284—0·316
For each 1 lb. of 4·0 per cent. milk ..	0·054—0·065	0·311—0·346
For each 1 lb. of 4·5 per cent. milk ..	0·057—0·069	0·338—0·376
For each 1 lb. of 5·0 per cent. milk ..	0·060—0·073	0·362—0·402
For each 1 lb. of 5·5 per cent. milk ..	0·064—0·077	0·385—0·428
For each 1 lb. of 6·0 per cent. milk ..	0·067—0·081	0·409—0·454
For each 1 lb. of 6.5 per cent. milk ..	0·072—0·085	0·434—0·482
For each 1 lb. of 7·0 per cent. milk ..	0·074—0·089	0·454—0·505

Then upon this standard, a 1,000-lb. cow, yielding 25 lb. of milk of 3.5 per cent. fat, would require from a minimum amount of digestible crude protein $0.049 \times 25 = 1.225 + 0.7 = 1.925$ lb. to a maximum amount $0.061 \times 25 = 1.527 + 0.7 = 2.225$ lb.; and this cow would require from a minimum amount of total digestible nutrients $0.284 \times 25 = 7.1 + 7.925 = 15.025$ lb. to a maximum amount $0.316 \times 25 = 7.900 + 7.925 = 15.825$ lb.

Again, a 1,000-lb. cow, yielding 25 lb. of milk of 4.0 per cent. fat, would require from 2.05 lb. to 2.325 lb. digestible crude protein, and from 15.7 lb. to 17.57 lb. total digestible nutrients.

The term "nutritive ratio" means that amount of digestible protein that exists in a feed compared with the amount of non-nitrogenous digestible nutrients in that feed. As fat is capable of producing more heat when digested than the other nutrients, the fat content in the following rations has been multiplied by 2.3, and the product added to the amount of digestible carbohydrate and fibre—this total divided by the digestible protein gives the "nutritive ratio" of the ration. Thus in No. 1 ration, there is one part of digestible protein to six parts of other digestible nutrients.

When considering rations for animals it must be understood that other factors, beside the digestible crude protein and total disgestive nutrients supplied to the animal, must be taken into account, such as succulence, palatability, and variety of feeds.

Proteins are very complex bodies, and different proteins yield different substances when digested, and a number of these different substances have to be supplied by the food for satisfactory nutrition. Therefore there is less chance of feeding an unbalanced protein content by using several feedstuffs, than by using only one or two.

Rations are useful guides in feeding, but it must be noted that the analyses of the feedstuffs from which they are computed are averages only—that is to say, the composition of the feedstuff varies according to soil and climate wherein grown, and particularly to the age of growth when harvested.

The legumes, such as lucerne, cowpea, clover, &c., are characterised by the high amount of phosphorus and lime (particularly lime) they contain. Therefore, when animals graze on grass pastures growing upon soils deficient in phosphoric acid and lime, the inclusion of a legume in a ration is of particular value to these animals supplying both protein and mineral matter. Bran is also relatively rich in phosphorus.

Another consideration is the cost of a particular ration—whether it pays, when it is compared with the price obtained from the milk produced. But care should be taken that blame for unprofitable feeding is not placed upon the ration, when the fault is due to the cow. Some cows are capable of producing a large amount of milk, other cows are only capable of yielding a small amount of milk, even when supplied with ample well-balanced feed; such poor producers do not pay, and should be culled out from the herd.

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK.

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbro-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
1—							
40 lb. Green Sorghum ..	8·0	0·48	0·08	2·32	1·36		
60 lb. Mixed Pasture (average)	12·0	0·53	0·12	3·48	3·01		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
	27·4	2·25	0·25	8·02	5·04	15·5	1÷6·0
2—							
65 lb. Green Sorghum ..	13·0	0·78	0·13	3·76	2·14		
7 lb. Lucerne Chaff ..	6·4	1·08	0·04	1·95	0·58		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·4	2·21	0·38	9·91	2·79	15·3	1 ÷ 6·1
3—							
45 lb. Green Sorghum ..	9·0	0·54	0·09	2·61	1·49		
13 lb. Wheat Chaff	11·3	0·27	0·12	3·39	2·04		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2¾ lb. Cotton Seed Meal (decorticated)	2·5	0·96	0·17	0·54	0·06		
2 lb. Molasses	1·5	0·02	..	1·15	..		
	27·9	2·16	0·43	8·90	3·69	15·2	1 ÷ 6·2
4—							
50 lb. Green Sorghum ..	10·0	0·60	0·10	2·90	1·70		
40 lb. Green Cowpea ..	8·8	0·64	0·12	2·92	1·14		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1¾ lb. Cotton Seed Meal (decorticated)	1·6	0·61	0·11	0·34	0·03		
4 lb. Molasses	3·0	0·04	..	2·29	..		
	26·0	2·26	0·38	9·66	2·97	15·3	1 ÷ 5·5

RATIONS FOR DAIRY COWS—*continued.*

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
5—							
42 lb. Sorghum Silage ..	10·7	0·38	0·08	3·06	2·06		
9 lb. Lucerne Chaff ..	8·3	1·39	0·06	2·49	0·75		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·0	2·12	0·35	9·75	2·88	15·1	1 ÷ 6·3
6—							
35 lb. Sorghum Silage ..	8·9	0·31	0·07	2·55	1·71		
5 lb. Lucerne Chaff ..	4·6	0·77	0·03	1·38	0·42		
6 lb. Wheat Chaff	5·3	0·12	0·05	1·56	0·96		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
3 lb. Pollard	2·7	0·41	0·09	1·62	0·06		
3 lb. Rice Meal	2·7	0·20	0·28	1·50	0·06		
	26·0	2·25	0·67	9·24	3·30	15·5	1 ÷ 6·2
7—							
65 lb. Green Maize	11·7	0·65	0·19	3·90	2·01		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
7 lb. Maize Meal	6·0	0·35	0·21	4·20	0·07		
	25·1	2·24	0·45	10·32	2·75	15·7	1 ÷ 6·3
8—							
54 lb. Green Maize	9·7	0·54	0·16	3·24	1·67		
10 lb. Wheat Chaff	8·7	0·21	0·09	2·61	1·57		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2¾ lb. Cotton Seed Meal (decorticated)	2·5	0·96	0·17	0·54	0·06		
	26·1	2·23	0·56	9·40	3·43	5·6	1 ÷ 6·3
9—							
30 lb. Maize Silage	9·0	0·30	0·09	3·21	1·56		
5 lb. Good Bush Hay ..	4·6	0·14	0·03	1·20	1·13		
4 lb. Cowpea Chaff ..	3·6	0·45	0·07	0·76	0·54		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
3 lb. Cocoanut Cake ..	2·6	0·40	0·21	1·19	0·20		
1 lb. Blood Meal	0·9	0·67	0·01	0·05	..		
	25·1	2·21	0·56	9·41	3·48	15·6	1 ÷ 6·4
10—							
35 lb. Maize Silage	10·5	0·35	0·10	3·75	1·82		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
7 lb. Barley Meal	6·2	0·65	0·06	4·27	0·21		
	24·1	2·24	0·21	10·24	2·70	15·4	1 ÷ 6·0
11—							
80 lb. Green Paspalum ..	20·0	1·20	0·16	5·60	4·96		
6 lb. Lucerne Chaff ..	5·5	0·93	0·04	1·67	0·50		
	25·5	2·13	0·20	7·27	5·46	15·0	1 ÷ 1·6

RATIONS FOR DAIRY COWS—*continued.*

Rations per 1,000-lb. Cow Yielding 25 lb. Milk—*continued.*

—	Dry Matter.	Digestive Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
12—							
67 lb. Green Paspalum ..	16·5	1·00	0·13	4·69	4·15		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
2 lb. Cotton Seed Meal (decorticated)	1·8	0·70	0·13	0·39	0·04		
	23·5	2·22	0·40	8·09	4·32	15·0	1 ÷ 6·0
13—							
100 lb. Sudan Grass	22·0	1·50	0·10	7·50	3·80		
4½ lb. Lucerne Chaff ..	4·1	0·70	0·03	1·25	0·37		
	26·1	2·20	0·13	8·75	4·17	15·3	1 ÷ 6·0
14—							
100 lb. Sudan Grass	22·0	1·50	0·10	7·50	3·80		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1 lb. Cotton Seed Meal (decorticated)	0·9	0·35	0·07	0·19	0·02		
	25·5	2·22	0·22	8·90	3·92	15·3	1 ÷ 6·0
15—							
50 lb. Sudan Grass	11·0	0·75	0·05	3·75	1·90		
8 lb. Wheat Chaff	7·0	0·16	0·07	2·09	1·29		
4 lb. Lucerne Chaff ..	3·7	0·62	0·02	1·11	0·33		
3 lb. Maize Meal	2·6	0·15	0·09	1·80	0·03		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
	26·1	2·12	0·38	9·38	3·64	15·5	1 ÷ 6·5
16—							
20 lb. Green Oats	4·6	0·28	0·08	1·30	0·98		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
10 lb. Wheat Chaff	8·8	0·21	0 09	2·61	1·61		
3 lb. Cocoanut Cake ..	2·6	0·40	0·22	1·19	0·20		
3 lb. Molasses	2·3	0·03	..	1·72	..		
	25·7	2·16	0·45	9·04	3·46	15·1	1 ÷ 6·3
17—							
25 lb. Green Barley.. ..	5·2	0·45	0·10	1·50	1·07		
13 lb. Wheat Chaff	11·4	0·27	0·11	3·40	2·10		
6 lb. Lucerne Chaff ..	5·5	0·93	0·04	1·67	0·50		
2 lb. Linseed Oil Meal ..	1·8	0·44	0·15	0·63	0·09		
3 lb. Molasses	2·3	0·03	..	1·72	..		
	26·2	2·12	0·40	8·92	3·76	15·2	1 ÷ 6·4
18—							
60 lb. Sugar-cane Tops ..	16·8	1·02	0·18	5·64	3·90		
10 lb. Cowpea Chaff ..	9·2	1·12	0·19	1·90	1·35		
	26·0	2·12	0·37	7·54	5·25	15·3	1 ÷ 6·4

RATIONS FOR DAIRY COWS—*continued.*

RATIONS PER 1,000-LB. COW YIELDING 25 LB. MILK—*continued.*

—	Dry Matter.	Digestible Nutrients. Crude Protein.	Fat.	Carbo-hydrates.	Fibre.	Total Digestible Nutrients.	Nutritive Ratio.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
19—							
50 lb. Sugar-cane Tops ..	14·0	0·85	0·15	4·70	3·25		
30 lb. Green Cowpea ..	6·6	0·48	0·09	2·19	0·84		
5 lb. Lucerne Chaff ..	4·6	0·77	0·04	1·38	0·42		
	25·2	2·10	0·28	8·27	4·51	15·2	1 ÷ 6·3
20—							
35 lb. Elephant Grass ..	7·0	0·32	0·07	2·03	1·75		
35 lb. Imphee	7·0	0·42	0·07	2·03	1·15		
8 lb. Lucerne Chaff ..	7·4	1·24	0·05	2·22	0·67		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	25·8	2·23	0·34	9·28	3·62	15·5	1 ÷ 6·1
21—							
35 lb. Elephant Grass ..	7·0	0·32	0·07	2·03	1·75		
35 lb. Imphee	7·0	0·42	0·07	2·03	1·15		
10 lb. Pumpkins	1·7	0·15	0·06	0·80	0·16		
7 lb. Lucerne Chaff ..	6·4	1·08	0·04	1·95	0·58		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	26·5	2·22	0·39	9·81	3·69	16·1	1 ÷ 6·4
22—							
65 lb. Mixed Pasture (average)	13·0	0·57	0·13	3·77	3·26		
9 lb. Lucerne Chaff ..	8·3	1·39	0·05	2·50	0·75		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
	25·7	2·21	0·33	9·27	4·06	15·8	1 ÷ 6·3
23—							
15 lb. Poor Bush Hay ..	14·0	0·21	0·08	2·77	3·03		
10 lb. Pumpkins	1·7	0·15	0·06	0·80	0·16		
5 lb. Lucerne Chaff ..	4·6	0·77	0·03	1·38	0·42		
7 lb. Maize Meal	6·1	0·35	0·21	4·20	0·07		
1 lb. Blood Meal	0·8	0·66	0·02	0·06	..		
	27·2	2·14	0·40	9·21	3·68	15·4	1 ÷ 6·4
24—							
65 lb. Prairie Grass ..	15·1	1·95	0·26	4·29	2·75		
5 lb. Wheat Chaff	4·4	0·10	0·04	1·30	0·80		
5 lb. Maize Meal	4·4	0·25	0·15	3·00	0·05		
1 lb. Molasses	0·7	0·01	..	0·57	..		
	24·6	2·31	0·45	9·16	3·60	15·5	1 ÷ 5·9

It has been mentioned before that better results are obtained from rations composed of a variety of feed ingredients than from a ration made up with only one or two feedstuffs.

A very convenient method is to have on hand a quantity of the concentrates already mixed, and then to feed a certain quantity of this mixture with the roughage that is being used, increasing the quantity of the mixture used until it is noticed that no further increased milk production is obtained. An example of this procedure has been published in the "Live Stock Bulletin" under the heading of "4-2-1" plan; this meaning that a concentrate mixture is made of four parts maize meal, two parts ground oats, and one part linseed meal. The above mentioned paper recommends the following:—3 lb. of silage and 1 lb. of legume hay for every 100 lb. of the animal's body weight, and to gradually increase the amount given of the concentrate mixture until the cow is getting 1 lb. for every 5 lb. of milk produced. Thus a 1,000-lb. cow, yielding 25 lb. of milk, would be given a ration of 30 lb. maize silage, 10 lb. lucerne hay, and 5 lb. of the concentrate mixture—containing 2.26 lb. digestible crude protein and 13.6 lb. total digestible nutrients. This ration has the amount of digestible crude protein required by the Henry and Morrison standard, but has a somewhat lower amount of total digestible nutrients. Other concentrates can be used in this convenient manner.

For instance, a concentrate mixture could be prepared by mixing eight parts maize meal, one part bran, and one part cotton seed meal. This mixture would have the following composition:—

—	Dry Matter.	Digestible.			
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.
	Lb.	Lb.	Lb.	Lb.	Lb.
1 lb. Concentrate Mixture	0·87	0·088	0·032	0·539	0·014
5 lb. Concentrate Mixture	4·3	0·44	0·16	2·69	0·07

If 4 lb. maize silage and 1 lb. lucerne chaff be used for every 100 lb. live weight, and 1 lb. of the above concentrate mixture for every 5 lb. of milk produced, the following will be the ration for a 1,000-lb. cow yielding 25 lb. of milk:—

—	Dry Matter.	Digestible.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
40 lb. Maize Silage	12·0	0·40	0·12	4·27	2·08		
10 lb. Lucerne Chaff	9·2	1·55	0·07	2·77	0·84		
5 lb. Concentrate Mixture ..	4·3	0·44	0·16	2·69	0·07		
	25·5	2·39	0·35	9·73	2·99	15·5	1 ÷ 5·6

The amount of digestible crude protein is a little higher in this ration than is required by the standard.

The following extracts from the "Agricultural Gazette" of New South Wales, December, 1927, are given as an illustration of what complete feeding, when combined with high milk-producing power, can accomplish:—

"On 15th October, 1927, Wagga Gladys, the seven-year old Jersey cow of the Hawkesbury Agricultural College herd, completed 365 days' official test for a yield of 20,835 lb. milk, with an average test of 5.52 per cent. and 1,149.385 lb. butter fat, which is equivalent to 1,384.8 lb. commercial butter. This is an official world's record for both milk and butter fat production for the Jersey breed. It was achieved on twice-a-day milking, whereas all the great records in other countries have been made on three and four milkings a day. Wagga Gladys calved on 9th November, 1926, and on the day of her last periodical test she yielded 53.5 lb. milk and 3.694 lb. butter fat in twenty-four hours."

The following is extracted from the "Agricultural Gazette" of New South Wales, October, 1927, and shows the ration fed to Wagga Gladys, together with the record of her 273 days' performance:—

"On her present lactations as a seven-year-old, which is still in progress, she has produced for the first nine-months' period 15,951 lb. milk, of 5.3 per cent. test, 839.814 lb. butter fat, being equal to 1,011.8 lb. commercial butter. . . . On the hypothesis that feeding must be linked with breeding to secure high production, an indication of the ration fed to Wagga Gladys may be given.

"*Concentrates.*—The following mixture was fed daily at the rate of 1 lb. to every 3½ lb. milk produced:—300 lb. maize meal, 200 lb. bran, 100 lb. crushed oats, 50 lb. linseed meal. During March and April the mixture was altered by the substitution of 25 lb. cotton seed meal for 25 lb. of the linseed meal.

"*Bulk Ration.*—The daily bulk ration consisted of:—25 lb. maize silage, 10 lb. lucerne chaff (of poor quality during May), 3 lb. bran, and 1½ lb. linseed meal. During March and April half the linseed meal was replaced by an equal amount of cotton seed meal. During the latter half of the month of March the silage was replaced by an equal amount of green corn stalks chaffed.

"*Grazing.*—The pastures were very poor, except after the Easter rain. In December, Wagga Gladys was grazed on a poor stand of green lucerne for two days prior to test. In January, she was grazed on green lucerne for two hours daily for a week previous to test. In February, March, and April, she was grazed on green lucerne for two hours daily, and in May and June for one hour daily. In July, green oats were given for a week previous to the test; Gladys and the whole herd went off in butter fat yield this month, and the green oats were blamed. In August, she was grazed on green lucerne for two hours daily."

It will be interesting to compare the above mentioned cow's milk production and her feeding, with the standard used in computing the examples of rations previously given. The weight of Wagga Gladys is not known, and though it may not be 1,000 lb. live weight, this figure will be used for the sake of comparison.

The cow produced 15,951 lb. milk in 273 days—that is, 58.4 lb. of milk per day, of 5.3 per cent. fat. Using the minimum requirements of the standard the cow should receive 4.32 lb. digestible crude protein and 29.7 lb. total digestible nutrients.

The cow produced on an average 58.4 lb. of milk per day, and it is stated that for every 3½ lb. of milk produced 1 lb. of the mixed concentrate was given, therefore, 16.6 lb. mixed concentrate was fed daily. The following is the total ration fed:—

—	Dry Matter.	Digestible Nutrients.				Total Digestible Nutrients.	Nutritive Ratio.
		Crude Protein.	Fat.	Carbo-hydrates.	Fibre.		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
Bulk Ration—							
25 lb. Maize Ensilage ..	7·5	0·25	0·07	2·67	1·30		
10 lb. Lucerne Chaff ..	9·2	1·55	0·07	2·77	0·84		
3 lb. Bran	2·6	0·37	0·05	1·21	0·10		
1·5 lb. Linseed Meal ..	1·3	0·33	0·11	0·47	0·06		
16·6 lb. Mixed Concentrate	14·6	1·50	0·52	8·20	0·37		
	35·2	4·00	0·82	15·32	2·67	22·8	1 ÷ 4·9
Allowing 10 lb. Green Lucerne for one hour's grazing ..	2·4	0·32	0·04	0·63	0·29		
	37·6	4·32	0·86	15·95	2·96	24·0	1 ÷ 4·83
Or Allowing 20 lb. Green Lucerne for two hours' grazing	4·8	0·64	0·08	1·26	0·58		
	40·0	4·64	0·90	16·58	3·25	25·4	1 ÷ 4·7

It will be seen that the digestible crude protein, 4.32 lb., agrees with that required by the standard, and that the amount of total digestible nutrients of this ration is somewhat lower.

Answers to Correspondents.

Mammitis.

W.B. (Millaa Millaa, N.Q.)—

Mr. Veterinary Surgeon Rudd advises that it is possible for a dry cow turned out quite free from mammitis to come in a few weeks later badly infected with the complaint. It is more likely, however, that she was infected before going out and that it was not noticeable. It is hardly likely that she would be infected in the paddock under the conditions mentioned, but if the camp which she frequented were infected, then it may be possible, but not probable. The possibility of tubercular mammitis has to be considered. This aspect of the case is fairly typical of tubercular mammitis.

BOTANY.

A Species of Dodder.

The following replies have been selected from the heavy outward mail of the Government Botanist, Mr. C. White, F.L.S.:—

H.T.R. (Jondaryan)—

Your specimen is *Cuscuta australis,* a species of Dodder. It is a parasite in Queensland on various weeds, &c. It is not, however, very particular as to its host and often attacks garden plants and agricultural crops. It is not uncommon about Brisbane, mostly on Smart Weeds (*Polygonum* spp.) in wet places, but we have had specimens submitted this season as parasitic on Chrysanthemum and other garden plants. For this reason it is not a suitable plant to propagate for weed destruction.

"Hairy Indigo."

T.K. (Goodwood)—

Your specimen is *Indigofera hirsuta,* the Hairy Indigo, a fairly common plant in Queensland and extending through to India. In Queensland it is most common along railway cuttings or where the ground has been disturbed, but is not confined to such situations, being sometimes found as a weed in the general pasture. Several of the same genus have been accused of being poisonous, but though the present species is fairly common here and abroad, it is not known to possess any harmful properties.

"Corn-Beef Wood."

L.H. (Brandon, N.Q.)—

The specimen is *Barringtonia calyptrata,* a native tree fairly common in North Queensland, particularly from Cairns north to Port Douglas. In the latter place the wood is used for fruit cases, though regarded as rather heavy. It is known as "Corn-beef Wood," because it is said to have an odour of corn-beef when freshly cut. It also occurs in New Guinea. The fruit is not edible.

Native Fodder Trees.

J.B. (Noumea, New Caledonia)—

We have no trees on hand at present of native fodder trees, but have seeds of a couple of species that are grown extensively here and thought highly of as fodders, viz., *Celtis sinensis*—miscalled here "Portugese Elm"—and *Phytolacca dioica,* the Portulacca or Bella Sombra tree. The latter is an exceptionally quick-growing species. When a fair size it is pruned every year and the prunings used for fodder. Both trees should do well on your west coast. The seeds of the Phytolacca will have to be freed from the sweet pulp with which they are surrounded.

Star Burr, a Noxious Weed—Fruiting Carob.

J.F. (Laidley)—

Your specimen is the Star Burr (*Acanthospermum hispidum*), gazetted a noxious weed throughout the State. The weed is very bad in North Queensland and covers large areas of country on the coast and along the river-flats in the Gulf country. We noticed a few plants about Laidley some years ago, but the plant does not seem to spread here anything like it does from, say, Townsville northwards.

The only explanation we can see for your Carob fruiting is that one or two of the female flowers have become fertilised from other trees in the same district. There are, we think, a few trees planted about Laidley. We have not seen them there, but have received specimens once or twice from Laidley for determination.

Atherton Flora Identified—A Poisonous Plant.

N.A.R.P. (Townsville)—

1. *Gastrolobium grandiflorum.* Heart-leaf Poison Bush, Wall-flower Poison, or Desert Poison. One of our worst poisonous plants. It varies somewhat in the leaf shape.

2. *Eucalyptus clavigera.*

3. The eucalypts are—

    Bloodwood—*Eucalyptus corymbosa.*
    Ironbark—*Eucalyptus crebra.*
    Cabbage Gum or Pudding Gum—*Eucalyptus papuana.*
    Silver-leaved Ironbark—*Eucalyptus malanophloia.*
    Moreton Bay Ash—*Eucalyptus tessellaris.*
    Poplar Gum—*Eucalyptus alba.*
    Scented Gum—*Eucalyptus citriodora.*
    Gray Box—*Eucalyptus leptophleba.*

A Rhodes Grass Ally.

G.B. (Drillham)—

Your specimen is *Chloris virgata,* a very close ally of the Rhodes Grass, but is not as palatable to stock as that species, and is an annual, not a perennial, grass. It is fairly well established in many parts of Queensland, and its light seeds tend to give the grass a wide range.

Pine Tree Propagation.

F.E.J. (Pittsworth)—

Reference your query on the propagation of the Aleppo Pine (*Pinus halepensis*) and Insignis or Remarkable Pine (*Pinus insignis*), these plants are easily raised from seed. Get ripe cones and extract the seeds from between the woody scales; sow these in flats or specially prepared garden beds; thin out if necessary when the seedlings are a couple of inches high, and transplant into permanent positions when anything from 6 inches in height or more. The Insignis Pine does not shed its seeds very freely and the cones remain closed on the trees for years, so you will have to break them open. The cones of the Aleppo Pine open naturally; get those that are commencing to split and extract the seeds.

"Rag Weed."

INQUIRER (Brisbane)—

The specimen of "Horse Weed" from Imbil is *Erigeron linifolius,* commonly known here as "Rag Weed." The name "Cobblers' Pegs" is also given to it, though this name is now more generally applied to another weed—*Bidens pilosa.*

Whitewood.

INQUIRER (Melbourne, Victoria)—

A. hemiglauca is universally known throughout Queensland as "Whitewood." It has a very wide distribution over the whole State. In the South it is generally regarded as quite a useful fodder tree. In the far west—say, the Georgina River—and central and north-west the young shoots are looked upon as causing "staggers" or "shivers" in working horses, acting in much the same way as *Stachys arvensis*. This has simply been mentioned to us when in the west or has been noted in correspondence, but has never been put on record.

Grasses Identified.

J.M.B. (Pickanjinnie)—Your specimens are—

1. *Iseilema membranacea*. Flinders Grass. The specimen was without seed head, and determination is, therefore, a little doubtful, but I think correct. One of the best known fodder grasses of Queensland.

2. *Eleusine indica*. Crow-foot Grass. A species with a wide distribution over the warmer regions of the globe. It occurs as a weed mostly along cultivation headlands, around cowyards, &c., or, in fact, anywhere where the ground has been disturbed. Like young Sorghum it contains a prussic-acid yielding glucoside, but I have never heard of deaths from it.

3. *Panicum colonum*. Wild Millet. This grass, like the last, grows mostly in cultivation paddocks, &c., also often in wet, swampy situations. It has a wide distribution over the warmer parts of the world. It is looked on as one of the wild forms of such cultivated fodders as Japanese Millet and White Panicum.

4. *Setaria glauca*. Pigeon Grass.

Jambool or Jamum Fruit—Candle Nut.

T.W.A. (Charters Towers)—

(1) The fruit is *Eugenia Jambos*, the Jambool or Jamum Fruit, a native of India. The fruit is edible.

(2) The nut is *Aleurites moluccana*, the Candle Nut. A large tree with a wide distribution from the East Indies, through Australia, to the Pacific. The nuts are commonly eaten without ill effects, but are always dangerous, often causing severe gastric troubles, though I know of no cases of deaths from eating them. The oil of the seeds is a drying oil, and can be used in the same way as linseed oil in the manufacture of paints, varnishes, linoleums, &c.

"Lambs' Tails"—Castor Oil Plant—Thorn Apple.

H.C.P. (Fernvale)—

The specimen is *Boussingaultia basellioides*, a climbing plant, native of South America, and commonly grown in gardens as an ornamental creeper under the name of "Lambs' Tails." It is allied botanically to the salt-bushes, and is not known to possess any poisonous properties.

The seeds of the true Castor Oil plant are poisonous; this plant is naturalised in Queensland. A plant known commonly, though erroneously, as Castor Oil plant in various parts of Queensland is the Thorn Apple or Stramonium (*Datura Stramonium*), a bad weed in Queensland, and the whole plant, particularly the seeds, is very poisonous. If either plant is growing on your place and the fowls have eaten the seeds they are the cause of your trouble.

"Balloon" or "Cape Cotton."

INQUIRER (Cabarlah)—

The specimen is *Gomphocarpus fruticosus*, the Balloon or Cape Cotton, a native of South Africa and a common naturalised weed in Queensland. It is sometimes grown as a curiosity in gardens, but can become a most aggressive weed. In some districts, such as along the North Coast, it overruns the pastures to the exclusion of other plants, particularly over newly fallen scrub land. It is practically untouched by stock, but is reputed poisonous and belongs to a poisonous family, the Asclepiadaceæ. The silk-cotton within the pods has some value as a kapok, but the collection here would be far from a paying proposition. The stem has a strong fibre.

PIG RAISING.

The following replies have been selected from the outward mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

A Point in Pig Practice.

W.H.S. (Miva)—

Never place a sick pig in a pen with other healthy ones, as the risk of infection is too great. Pigs are not valuable enough to take risks with; it is better to cull out immediately and get rid of unsatisfactory sorts and put the feed into more healthy, growthy animals.

Artichokes for Planting—Gloucester Old Spot.

C.A.S. (Kairi, N.Q.)—

(1) The principal difficulty experienced by seed merchants in regard to stocking artichokes is that it is difficult to keep these tubers during the off season. They require to be stored in moist sand and be kept in a comparatively cool spot in order to maintain them in good condition for planting when planting time arrives. Most of the seedsmen have not the conveniences for storing them, and as the demand is limited they do not bother.

(2) We have not had sufficient experience with the G.O.S. breed in this country yet to be able to definitely place them ahead of the Tamworth, Berkshire, or similar well-known breeds and types. They certain appear to be well worth trial, and you could obtain further local experience from Mr. C. W. Roseblade, of Yungaburra, who has been using the G.O.S. type now for several years.

Poland-Chinas—Duroc-Jerseys.

H.S. (Ardlethan, N.S.W.)—

(1) The Poland-China breed has a tendency to fatten very readily and, unless carefully handled, the resulting product is overfat and realises less in comparison than prime, fleshy pigs would. However, with proper care and management and the provision of abundant supplies of green food, there seems to be no reason why the Poland-China should not prove an excellent type for cross-breeding with grade sows of superior type and quality.

(2) As to whether the Duroc-Jersey is superior to the Poland-China or Tamworth-Berkshire cross for quick-maturing porkers is largely a matter of opinion. So far, in Australia, we have had no opportunity of testing out these breeds in competition one with the other.

Points in Feeding—A Bad Practice.

INQUIRER (Northern Downs)—

You are making a great mistake in feeding to your pigs without boiling or other treatment milk from cattle suffering from Contagious Mammitis. The feeding of uncooked milk or flesh to pigs from cattle suffering from diseases of any description is invariably the cause of trouble amongst the pigs and, as you will note, prevention of such troubles can only be brought about by absolutely discarding the milk or flesh from diseased stock, or, if this is not possible, thoroughly boiling these foods before they are utilised for pig feed. The germs of mammitis appear to have their natural home in the mammary glands of the female, and apparently these germs thrive equally as well in the mammary glands of cattle and pigs. In your attempt to rid your pigs of disease, attention must be given to the matter of feeding. It is waste of time giving the pigs medicine unless the conditions in regard to feeding are attended to.

It is apparent that some of your pigs have been fed too heavily on fattening foods. These would be the pigs which, whilst seemingly fat and healthy, suddenly go away and mope on their own and appear very ill.

Though this may not be classified by the veterinarian as heat apoplexy, it is a condition brought about largely by exposure of over-fat animals to abnormal weather conditions.

It appears that numbers of the pigs have been suffering from constipation and bowel disorders. This is indicated by the fact that the animal to which you have given a good dose of castor oil rapidly improved. Constipation is responsible for a great number of ills to which stock of all descriptions are liable. Attention must, therefore, be given to the supply of succulent green food and, where necessary, to medicines like castor oil or the more rapidly acting purgative, Epsom salts.

Sweet Potato Vines as Pig Food.

A.E.S. (Landsborough)—

We have no definite record of any ill effect resulting to pigs fed with a proportion of Sweet Potato Vines mixed with their other food. It is certainly not advisable to attempt to force pigs to consume more vines than they care to eat at each meal by refusing to give them other more concentrated foods like the Sweet Potato itself, corn, lucerne, milk, or other foods. Any attempt to force pigs to live on Sweet Potato Vines would certainly be disastrous, for the proportion of indigestible fibre in them is very high, while the food value itself is very low. Pigs turned on to a patch of Sweet Potatoes and that had opportunity of consuming both the tubers and the vines would suffer no ill effect, providing they had ample water, suitable accommodation, and some grain. If it is not convenient to feed the crop in this way, a proportion of vines may be utilised as green food, preferably after the animals have been fed their ordinary ration each day. The vines themselves are not poisonous, hence there is no necessity to refuse the animals a proportion as suggested above.

Western Trees.

M.F. (Brisbane)—

The "Flooded Gum" of Tambourine, so far as we know, does not grow west of the Main Range, though it is common along the coast from the Tweed northwards to Cairns. It is not confined to mountains, but often grows on flats inclined to be flooded; hence the name. There are many western trees you could use for your purpose—the River Red Gum—magnificent trees with white boles, splashed with red or green—along all the western rivers; the Coolibah—smaller, but along rivers and flats; the Bimble Box, Yellow Box, and Ribbon Box—all western trees. The Brigalow and Beelah, which form inland scrubs. The Whitewood, the Wilga, and the Gruie or Emu Apple—all good fodders and small, but beautiful shade trees.

Honey Bean.

G.C. (Swan Creek, Warwick)—

The tree widely planted on the Downs and known as Honey Bean is *Gleditschia triacanthos*, a native of North America, widely planted in temperate countries everywhere as an ornamental tree. The beans are used as cattle fodder, and the sweetish pulp in the pods is freely eaten by children wherever the trees grow. If a child were to swallow the seeds mechanical injury might follow, but the pods are certainly not known to possess any poisonous character.

Wild Millet.

C.J.G. (Toowoomba)—

Your specimen is *Panicum colonum*, commonly known here as "Wild Millet." It is a grass with a very wide distribution over the warmer parts of the world, and is supposed to be one of the parents of such fodders as Japanese Millet and White Panicum. It is an annual, and in Queensland is mostly seen either as a weed in fallows, along cultivation headlands, &c., or in wet, swampy situations.

SHEEP AND WOOL.

Abstracts from the outward correspondence of the Assistant Instructor in Sheep and Wool, Mr. J. Carew.

Sheep Drench.

C.C. (Mungallala)—

The bluestone and mustard drench recommended by this Department is as follows:—

1 lb. bluestone, avoirdupois (sulphate of copper).
1 lb. mustard (fresh).
10 gallons rain water.

Dose for grown sheep, 4 fluid oz.; for 9 to 15 months, 3 fluid oz.; for lambs, 2 fluid oz.

The bluestone should be in clear blue crystals having no white crust. Dissolve the bluestone in a wooden or enamelled vessel. Mix the mustard in a small quantity of water to get it to a damp paste, then add to the bluestone water and make up to the desired strength. The drench should not be brought into contact with iron or metal. If the animal coughs while dosing, stop pouring the drench and lower the head at once, as it is likely to get in their lungs and cause trouble or perhaps death. Give the same treatment to sheep both before and after drenching with arsenic, except to those sheep that are weak and cannot stand the starving, or in time of drought when sheep are actually starving in the paddocks, when they should be kept away from water for several hours before and a few hours after drenching. One drench of bluestone to 3 of arsenic is recommended.

QUEENSLAND SHOW DATES.

The following show dates have been listed by the Queensland Chamber of Agricultural Societies for the present year:—

MARCH.	
Goombungee	23-24
Goondiwindi	21-22
Killarney	27-28
Chinchilla	27-28
Milmerran	29
APRIL.	
Pittsworth	3
Clifton	11-12
Toowoomba	16-19
Kingaroy	19-20
Dalby	26-27
Nanango	26-27
MAY.	
Beaudesert	2-5
Taroom	2
Maleny	2-3
Longreach	2-3
Kalbar	2
Charleville	2-3
Wondai	3-5
Oakey	4
Mitchell	8-9
Mundubbera	9-10
Boonah	9-10
Murgon	10-12
Blackall	8-10
Roma	15-16
Gayndah	16-17
Ipswich	16-18
Springsure	16-17
Wallumbilla	22-23
Biggenden	24-25
Toogoolawah	25-26
JUNE.	
Marburg	2-4
Childers	2-6
Lowood	8-9
Bundaberg	7-9
Wowan	7-8
Miriam Vale	13-14
Gladstone	20-21
Mount Larcom	22-23
Gatton	28-29
Rockhampton	27-30
JULY.	
Mackay	3-5
Kilcoy	5-6
Esk	13-14
Townsville	10-12
Woodford	12-13
Nundah	14
Charters Towers	18-19
Caboolture	19-20
Ingham	20-21
Rosewood	20-21
Charters Towers	18-19
Laidley	25-26
AUGUST.	
Bowen	1-2
Royal National	6-11
Crow's Nest	22-23
Coorparoo	-25

General Notes.

Canary Seed Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Act empowering the Canary Seed Board to borrow money and give the necessary security.

Staff Changes and Appointments.

The appointments as Inspectors under the Diseases in Stock Act of Messrs. James Bishop, Ravensbourne, and N. C. Copeman, Helidon, have been confirmed, as from the 22nd August, 1927.

Messrs. S. C. Smith (late of Wandal, Rockhampton) and Archibald Dick (late of Purga) have been appointed Inspectors of Slaughterhouses, as from the 20th February, 1928.

Mr. S. E. Stephens, Inspector under the Diseases in Plants Acts, at present stationed at Innisfail, is to be transferred to Cardwell, as from the 23rd March, 1928.

The Officer in Charge of Police, Kumbia, has been appointed an Acting Inspector of Stock, as from the 1st March, 1928.

Mr. M. J. Hickey, Clerk of Petty Sessions, Cairns, has been appointed to act as Chairman of the Babinda and Hambledon Local Sugar Cane Prices Boards during the absence of Mr. A. H. O'Kelly, Police Magistrate.

The following have been appointed Honorary Officers under the Animals and Birds Acts:—

Mrs. W. M. Mayo, Secretary of the Nature Lovers' League of Queensland; Mr. J. H. Grice, Southport; Mr. J. W. Troyahn, Southport; Mr. J. W. Proud, Southport; Mr. J. C. Tuesley, Southport; Mr. W. H. Gould, Southport; and Mr. J. D. Maddox, Gap View, *viâ* Kalbar.

Mr. A. V. Wilson, of Waterloo, *viâ* Yandaran, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

The resignation has been accepted of Mr. A. H. Warner, of Talwood Station, Talwood, as Acting Inspector of Stock, as from the 18th February, 1928.

Mr. J. E. James, of Myer's Ferry, Southport, and Mr. H. C. Fenn, lodgekeeper, Government House, have been appointed officers under the Animals and Birds Acts, as from the 1st March, 1928.

Constable J. H. Daley, of Mourilyan, has been appointed Inspector of Slaughter-houses, as from the 17th February, 1928.

The transfer has been approved of Mr. D. J. Callaghan, Inspector under the Dairy Produce Acts, from Brisbane to Mundubbera.

Messrs. F. C. Anderson ("Hazlebrook," Booinbah, Goomeri) and J. J. McLachlan (Poultry Inspector, Department of Agriculture and Stock, Brisbane) have been appointed Officers under the Animals and Birds Acts, as from the 17th March, 1928.

The following Police Constables have been appointed Inspectors of Slaughter-houses:—F. F. W. Jahnke, Cordalba; J. M. O'Malley, Sapphire; and Frank Dawson, Marmor.

The following transfers of Inspectors of Slaughter-houses have been approved:—Mr. G. R. L. Anderson, to be attached to Brisbane; Mr. A. Dick, to be attached to Ayr; Mr. S. C. Smith, to be attached to Mareeba; Mr. R. T. Cridland, to be transferred from Mareeba to Bundaberg; and Mr. W. A. D. Davidson, to be transferred from Bundaberg to Brisbane.

Tractor School at Gatton.

The tractors likely to be used at the Fifth Queensland Tractor School this month at Gatton College are—Advance (crude oil), Case, Caterpillar, Fordson, Cletrac, Hart Parr, McCormick Deering, Peterbro', Ronaldson-Tippett, Twin City, and Wallis.

The Parker Producer Gas Company have been cabled to, asking that one of their producers for a Fordson tractor be made available, if possible; and the Migration Department, which, it is understood has been testing such a plant with trucks, has been asked to make the plant available for demonstration at the Tractor School.

Government House Grounds Declared a Sanctuary.

The grounds surrounding Government House, Paddington (portion 223 and subdivision 1 of portion 291, parish of Enoggera, county of Stanley, area 41 acres 3 roods 9.7 perches), have been declared a Sanctuary under the Animals and Birds Acts.

A Pest Destroyer—Copper Dust.

A regulation has been issued under the Pest Destroyers Act providing for the addition of copper dusts to the list of pest destroyers under the Act.

This pest destroyer is defined as—"Copper salts, as copper carbonate and other copper compounds, in the form of fine, dry dust for the treatment of wheat against bunt." It must contain not less than 50 per cent. of metallic copper, and be of such fineness as to permit of 95 per cent. passing through a sieve of 200 meshes to the linear inch.

Success.

"There is another form of success within the reach of ordinary mortals, not indeed as the outside world understands and uses the word, but from the individual's own point of view; it is to preserve your own peace of mind and respect by the consciousness of honest work well done, and duty carried out without fear or favour, in making others better and happier in body and mind, and by freedom from discomfort and regrets for any action mean and contrary to the golden rule to 'do unto others as you would they should do unto you.' "—Sir Humphry Rolleston, in the "Lancet."

Custard Apple Levy.

A regulation has been issued under the Fruit Marketing Organisation Acts extending the Custard Apple Levy Regulations passed last year.

This levy is at the rate of one halfpenny per half-bushel case of custard apples, and will operate from the 1st March, 1928, to the 28th February, 1929. It will be collected by means of levy stamps, which are obtainable from the Head Office of the Committee of Direction of Fruit Marketing, Brisbane. These stamps are to be affixed to account sales, credit notes, or any other document giving evidence of the sale of custard apples. Agents who affix these stamps are entitled to deduct the value thereof from the money payable to the custard apple growers concerned.

The object of the levy is to enable the custard apple growers of Queensland to carry out an extensive advertising scheme to popularise the custard apple in the South.

Oil from Coal.

The promotion of a £10,000,000 scheme in Great Britain for the extraction of smokeless fuel and oils from coal at the pithead has been announced. It was stated by Sir Arthur Wheeler, Bt., at the recent annual meeting of Low Temperature Carbonisation, Limited, that for the first time the low temperature carbonisation process is completely successful, both from the technical and commercial standpoints. The four objects attained by the process were: (1) The obviation of the enormous loss due to the burning of raw coal in an open grate; (2) the production of a fuel (coalite) as bright as coal, but smokeless; (3) the extraction of oil (including petrol) and gaseous products, retaining their chemical and physical properties at their highest possible value; (4) the utilisation of small coal (slack) which constitutes so large a percentage of the total output of many collieries.

Butter Board Election.

The election for the return of two members for Divisions Nos. 1 and 6 for the Butter Board resulted as follows:—

Division No. 1 (North Queensland)—	
William James Sloan, Malanda	187 votes
Walter Scott, Peeramon	89 votes
Division No. 6 (Gympie to Kingston)—	
Thomas Flood Plunkett, Beaudesert	1,238 votes
Edwin Brabiner, Gympie	575 votes

Messrs. Sloan and Plunkett, the retiring members, have therefore been re-elected, and together with the other four members will hold office until the 30th June, 1931.

For the Divisions Nos. 2, 3, 4, and 5, Messrs. J. L. Wilson, James McRobert, James Purcell, and Charles Henry Jamieson, respectively, were returned unopposed.

Fertilisers from the Dead Sea.

Queensland Light Horsemen who fought in Palestine and endured campaign rigors in the Jordan Valley will be interested in the press reports that indicate that the Imperial Chemical Industries, Limited, a huge British chemical combine, of which Sir Alfred Mond is the head, has secured concessions which will enable it to extract valuable fertilisers, &c., from Dead Sea water, Palestine.

Atherton Tableland Maize Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Act empowering the Atherton Tableland Maize Board to give, subject to the approval of the Governor in Council, a mortgage over any property to which the Board now is or may hereafter become entitled, or a mortgage or security over any machinery or effects to which the Board now is or may hereafter become entitled, to secure the repayment of any money borrowed by the Board from, or in which it may become indebted to, any person, Government, or corporation.

European Maize Imports.

Official returns of the imports of maize from 1st August, 1927, to 21st January, 1928 (twenty-five weeks), to principal European ports amounted to 20,536,000 quarters (480 lb.), or at the rate of 42,700,000 qr. (480 lb.) per annum (exclusive of trans-frontier imports). The price offering in England at the end of 1927 for f.a.q. maize was from 8s. 6d. to 8s. 9d. per bushel. Great Britain's imports for 1927 show a total of 9,784,075 qr., against 7,416,212 for 1926. The chief consignors were—Argentine, 8,315,939 qr.; South Africa, 466,086 qr.; Roumania, 292,123 qr.

New year cargo sales include Argentine at 38s. for 480 lb., No. 2 South Africa 39s. 6d., and No. 3 39s., while maize meal comes at £10 3s. 9d. per ton for yellow and £9 for white.

Fruit Levy.

Regulations have been issued under the Fruit Marketing Organisation Acts to provide for a levy at the rate of 5d. per ton on all fruit and vegetables grown within a radius of 40 miles from Wallangarra, and railed from any railway station within that area. The railway stations in question will be those between Wallangarra and Dalveen (both inclusive), and from Amiens to Fleurbaix (both inclusive).

This levy will operate from the 27th February, 1928, to the 25th February, 1929, and will be collected in the first instance by the Railway Commissioner. It is to be utilised in the payment of any expenses attaching to the collection of the levy, for making financial grants to the various local producers' associations in the district paying the levy, and the balance to be paid yearly to the Deciduous Sectional Group Committee, to be used by it at its discretion.

These regulations have been approved by the Local Producers' Associations in the Stanthorpe district, by the Deciduous Sectional Group Committee, and by the Committee of Direction of Fruit Marketing.

Canada's Fur Farms.

Fur farming in Canada is developing into a major industry. A report recently issued by the Canadian Government Bureau of Statistics for the year 1926 shows that the total value of the fur-bearing animals on the 2,819 fur farms in Canada was $11,007,530, located on property valued at $14,888,705. Fox farming is the predominant leader in the industry. Of the 2,819 fur farms in Canada 2,517 are fox farms, 107 muskrat, 95 mink, 57 racoon, and 43 are raising other kinds of fur-bearing animals, such as skunk, marten, fisher, chinchilla, and rabbits.

Silver foxes are the aristocrats of Canada's fur farms. In the year under review there were 10,469 silver foxes sold valued at $2,371,480 on the farms, representing an average value of $226. The total number of all other kinds of fur-bearing animals sold was 14,211, valued at $2,276,664. The sale of pelts totalled 16,643, valued at $1,218,111, of which 14,045 were silver foxes, valued at $1,168,020. Canadian fur farmers received from the sale of animals and pelts $3,494,775 in 1926. Silver fox pelts sold for an average price of $83, but some pelts commanded three or four times that figure. Ninety-six per cent. of the total value of the animals on these farms are silver foxes, which are valued at $10,591,054.

Canada's smallest province, Prince Edward Island, leads in the fur-farming industry with animals valued at $3,304,610, on property estimated to be worth $4,305,000. Ontario is next with about half the value in animals that Prince Edward Island has. Quebec holds third place and is not far behind Ontario.

Many of the fur-bearing animals raised on the Canadian farms find a market in the United States.

Butter Pool.

Following on the notice that was issued on the 23rd December last, an Order in Council has now been issued under the Primary Producers' Organisation and Marketing Act, extending the life of the existing Butter Pool from the 1st March, 1928, to the 30th June, 1931.

The Butter Pool is administered by six representatives of growers, together with the Director of Marketing. Each of the representative members is elected by the cream suppliers of the companies and associations in his district, and the election for the Board members takes place on the 28th of this month. Three of the Board members have already been returned unopposed—namely, Mr. J. L. Wilson, of Calliope, for Division No. 2; Mr. James McRobert, of Maryborough, for Division No. 3; Mr. James Purcell, of Toowoomba, for Division No. 4; and Mr. C. H. Jamieson, of Tent Hill, Gatton, for Division No. 5. Elections are being held in the cases of Division No. 1, the candidates being Captain W. Scott, of Peeramon, and Mr. W. J. Sloan, of Malanda; and for Division No. 6, the candidates being Mr. Edwin Brabiner, of Gympie, and Mr. T. Flood Plunkett, of Beaudesert.

Electric Farm Equipment for Drying Grain.

The Swedish Export Journal of January, 1928, states that promising attempts to dry grain by means of electric power have been carried out by the Royal Waterfalls Administration during the past autumn. The method tried was invented by Mr. H. Edholm, an official of the Administration, the latter having placed the funds required for the practical tests at the disposal of the inventor.

The testing equipment had a capacity of about about 8 tons, and consisted of a fan in connection with an injector and a discharge tube, which latter at the upper end opens out on a certain number of inclined boards for the airing of the grain. The air current from the fan forces the grain gradually up through the tube and on to the boards. The latter being inclined at an angle closely approximating the friction angle of the grains, the latter descend slowly towards the silo. The air current used to raise the grain is in the meantime carried off between the boards, and therefore subjects the thin layers of grain on the boards to an effective airing. In this way the grain can be circulated once a day or oftener, according to requirements.

As to the cost, the trial operation shows the consumption of current to be from 2 to 3 p.k.w. per 2 cwt. of grain. It is considered that this method constitutes an excellent and inexpensive means for keeping the grain in good condition on small estates and middling-size farms. Under normal conditions the above operation is sufficient for drying the grain down to 16 or 17 per cent. of water. If a higher degree of dryness is wanted it is, of course, possible to install a steam coil at some suitable point. Further trials will be carried out in order to design a series of standard-size driers of this description.

Organising New Zealand's Pork Export.

An earnest attempt to overcome the marketing problems which confront the export, on a large scale, of New Zealand pork to the British market, is being made by thirteen dairies operating in the South Auckland province, which have joined the New Zealand Co-operative Pig Marketing Association.

The Association realises that the present marketing methods are unsatisfactory, in that the farmer has to accept a price arbitrarily fixed which has no relationship to the true value of the pig.

It therefore aims at marketing bacon and pork carcasses graded for quality of meat and weights to suit export buyers, and, where possible, to send these direct to the wholesale houses in the United Kingdom.

The success of the scheme will necessarily depend entirely on the support accorded by the producers. It is merely an attempt to gain the best returns from pigs, and a good supply of well-finished pigs is essential.

Under the system adopted, complete identification of the pig is established right to the time it is sold, and the producer will therefore be certain of getting his proper weight and full value. As the carcasses will be graded not only for weight, but also for quality, the breeder who feeds properly will obtain better returns than the man who relies solely on his skim milk or whey for feeding.

The Association will not deduct the usual 1s. per carcass for insurance against loss, but will accept liability, and pay for all pigs trucked. In other words, the Association is offering to pig producers a means of eliminating objectionable tactics in the trade, and replacing these by a method which will put the producers in direct touch with the consumers of bacon for no more than the bare handling charges.

Sugar and Alcohol from Cellulose.

A report has been received by the Power Alcohol Section of the British Empire Producers' Organisation of the first tests carried out in a factory in Germany on a commercial scale for using sawdust, straw, sisal waste, and bagasse as raw materials for the production of grape sugar and ethyl alcohol.

The process consists of the saturation by hydrochloric gas, in the presence of catalysts, of the raw materials, and in a period of under one hour the whole of the cellulose content is converted into glucose. This glucose is then treated for the removal of the acid, and can either be sold as cattle food, or refined as pure white glucose for human consumption, or it can be fermented into alcohol for fuel, industrial or potable purposes. As much as 60 per cent. of the weight of the dried sawdust has been obtained in pure sugar, and in the case of straws and other materials higher percentages are obtained.

The development of such a process must have a far-reaching effect in the Dominions and Colonies, where large supplies of raw materials of the kind mentioned are now being wasted, and also in those countries where abundant supplies of grasses and bamboos are available, as these materials are equally suitable for conversion into alcohol.

Various European Governments are investigating the process and the Australian Government has sent a representative. It seems probable that this process in the near future will provide countries with an alternate motor fuel supply to that of petrol.

The Rage for Milking Records.

Opinions are greatly divided among dairy farmers as to the value of forcing cows to heavy production. Many are of opinion that the yields obtained in the official tests are of no value because the heavy feeding with concentrates could not be done by a dairyman carrying on business on commercial lines. Others declare that the forcing of dairy cows in order to establish records is ruinous to the cows.

The recent performance of the Government-owned Jersey, Wagga Gladys, at the Hawkesbury Agricultural College at Richmond (N.S.W.) in yielding 20,835 lb. of milk and 1,149 lb. of butter-fat in 365 days, which is a world's official record for the breed, no doubt will act as an inspiration to breeders to "go one better."

Writing upon this subject, the "Argus" says that this will probably be the undoing of more than one good cow. Deep-milking cattle are required in the majority of Australian herds if dairying is to be made to pay, but heavy production can be, and is being, overdone. Forced feeding impairs the breeding organs, as is proved by the frequency with which cows thus treated will not breed, or abort their calf after carrying it for only a short period. In addition, it induces mammitis, with probably the loss of one or more quarters, and instances are not uncommon in Victoria where good cows have been ruined in this manner.

During the last Melbourne Royal Show, Mr. E. Griffiths, of New Plymouth (N.Z.), who judged the Jerseys, said that although heavy production was what everyone was striving for, Jersey breeders must remember that production alone would not lead to success. The ideal Jersey cow outlined in the standard of perfection was not only the most beautiful cow in the world, but she was the most evenly balanced and the most economical and profitable producer. If breeders depended upon production alone, and ignored type, the cows would quickly lose constitution and the very ideal they were striving for, namely, profitable production. Mr. Griffiths said that he was prompted to make these remarks after watching an auction sale at the show grounds and observing the tendency of the beginner to be unduly influenced by butter-fat records without giving reasonable consideration to type. Type not only depicted the symmetrical, well-balanced outline, but also a well-shaped milk vessel, a capacious body, and a head denoting constitution and nervous energy.

It appears that in the future (says the writer in the "Argus") if breeders of dairy cattle are to increase production, they must obtain constitution and try to recapture some of the hardiness of the old-time animals. Possibly in aiming at super-producers they have lost sight of the fact that to yield well at the dairy, and to keep it up, a cow must possess a robust constitution, and unless she inherits that vital attribute it can never be acquired. It is essential, therefore, to breed cattle with strong constitutions and at the same time not to disregard the importance of breed type. Although refinement of form and bone is desirable, refinement carried to the point of delicacy is to be avoided. Constitution does not necessarily imply excessive bodily development or coarseness, but no animal lacking it will make a satisfactory producer or breeder. The type of cow dairymen should aim at is one that will yield, say, about 400 lb. of butter-fat in a lactation, and produce a strong, healthy calf annually on a reasonable ration. That is the most profitable type, and a glance at the pedigrees of the cows that have been through the Government herd test will show that it is from such cows that the best bulls and heifers are bred.

The Food Value of Kurrajong—And Its Limitations.

Little scrub feeding is being carried out at present, but a sheepowner in the Rankin's Springs district recently found it necessary to resort to it, and in a letter to the New South Wales Department of Agriculture he raised a point of interest to sheepowners generally. Writing on 14th January, he stated:—"I am giving them kurrajong now, and plenty of salt and plenty of water. They are in good condition yet. Some people say kurrajong will kill them; others say it is good for them."

Commenting on the foregoing, an officer of the Sheep and Wool Branch of the New South Wales Department observes that of all scrub fodders kurrajong is the best, and in circumstances such as those indicated it should comprise a quite satisfactory feed, if supplemented by a good laxative lick. It would be preferable, however, at the same time to feed some concentrate, such as grain or linseed nuts. The statement that deaths have been traced to kurrajong would require investigation, account being taken of every possible contributory circumstance, such, for example, as the weather, the condition of the sheep, and (if ewes) their state in relation to lambing. No scrub feed can be considered ideal for ewes very close to lambing, though it is satisfactory until within a certain time of lambing and for short periods. With dry sheep, on the other hand, scrub feeding may be carried out for a much longer time.

The varieties of native scrub and trees available for feeding stock in drought depends on the districts affected. Probably the best known besides kurrajong are wilga, mulga, myall, and willow; others not so palatable but extensively used are apple, box, rosewood, boree, pine, &c. Certain drought-resistant plants, such as saltbush, &c., are not included in this category, since they are the natural sheep food of the western districts. It is a matter of regret, as some stockowners are beginning to realise, that these natural fodders should have been so ruthlessly cut out. Even when being cut for sheep it is noticed that, in some cases, instead of being lopped the trees are felled; thus destroying their future usefulness, not only as food, but as shade and shelter.

But, again let it be borne in mind that these are only emergency fodders. They do not provide a balanced ration, and, while alone they may keep up the health of stock for a limited period, eventually condition will be lost and signs of digestive disturbances will be noted.

Alcohol from Bananas.

This interesting subject is again being carefully studied with the object of discovering whether the enterprise of erecting distilleries in tropical localities where this raw material is very abundant is likely to prove successful. In the columns of "Bulletin de l'Agence Economique de l'Afrique Occidentale," the following article, written by M. Paul Ammann, appears:—

"It has been ascertained from trials made during the last few years at the Ivory Coast, West Africa, that the banana can be used advantageously in the production of alcohol. The pulp of the banana represents 70 per cent. of the weight of the fruit, and it consists of an important proportion of sugars directly fermentable, as the two following analyses show:—

	Bananas gathered at Blagueville—	
	At the close of a dry season.	During a wet season.
Moisture	71.64	79.38
Sugars directly fermentable	17.85	15.15
Saccharose	5.45	2.33
Alcohol from 100 parts of pulp	11.30	8.40

Naturally, bananas gathered during a wet season are more watery and contain less sugar than those collected ripe after a dry season, yet in both cases the yield in alcohol is important, and amounts respectively for the wet and the dry gatherings to 17.6 and 23.7 hectolitres of pure alcohol per hectare (say in British equivalents, 677.7 and 912.5 proof gallons per hectare of 2.45 acres).

In the first trials the alcohol was obtained by the direct fermentation of the pulp, without any attempt to transform the starch which the ripe bananas contain into fermentable sugar and thence into alcohol. But the subject of the complete transformation of the constituents into fermentable sugars is very important so that the maximum yield of alcohol may be obtained. For this reason further trials were instituted by M. Boulard, and by his own process. Thus some bananas from China, well ripened, have yielded at least 1 per cent. more alcohol by a mucor fermentation method than by the direct fermentation of the pulp. The composition of some bananas incompletely ripened, native to China, was found to be: Moisture, 62 per cent.;

fermentable sugars (initial), 10.76; starch, 19.80 per cent. (i.e., total sugars and starch, 32.75 per cent.). When these bananas were treated with the Boulard mucor No. 5, and with the Boulard yeast No. 21, all the starch was transformed, and the yield of alcohol was raised to 19 per cent.

Danish Egg Export Control.

Some years ago, when certain questions were raised both as to the quality and the sorting weight of Danish eggs, the matter was investigated by the Danish Ministry of Agriculture, and as a result the Act of 1st April, 1925, was passed dealing with both the export and import of eggs.

Since this Act came into force there have been significant improvements alike in regard to the quality and the sorting weight of eggs exported from Denmark. But in view of the efforts made in the same direction by other egg-exporting countries, the Danish Government has decided to take all necessary measures to maintain for Danish eggs the place they now hold in the world markets. The Act of April, 1925, expires in April, 1928, and on 2nd December the Minister for Agriculture introduced in the Landsting a Bill for its renewal with certain amendments sharpening the regulations and making the control more stringent.

Under the new proposal the Minister is to be authorised to order that all eggs exported or imported shall be marked in a way specified by him, both on the eggs themselves and on the packing. In the case of export, the marking on the packing shall, among other things, indicate the quality and the sorting weight of the eggs, and the packing itself must conform to the requirements of the Ministry.

All egg exporters must be duly authorised by the Ministry.

When intended for resale or redelivery, Danish eggs must at the time of original sale and delivery be fresh laid unless sold or delivered under other description. Dirty or washed eggs, or eggs that have been damaged by brooding, incubation, heat, or in any other way, shall be marked as "Sekunda." The Minister can order that all who buy or receive eggs for further sale or delivery shall give notice thereof to the Ministry.

Besides ordering that eggs and packing shall be marked according to his regulations, the Minister may also take any other control measures he regards as necessary.

As a test of the accuracy of the quality and sorting weight marked on the packing, the officers of the Minister may extract and examine larger or smaller quantities of the eggs, and where the marking is found to have been inaccurate the bulk may be confiscated. To cover the cost of the control, a fee is imposed on the authorised exporters in respect of all eggs exported from the country.

Offences against the regulations of the Act are punishable with fines of from 20 to 2,000 kroner unless punishment for the particular offence is provided for in any other Act. The name of the offender and character of the offence may be published by the Minister, and repetition of the offence entails cancellation of the license to export.

Breed Plus Feed—Main Factors Determining Fat Content of Milk.

The fat content of milk is, to a great extent, a question of inheritance. Different breeds are noted for high, medium, or low percentage of fat. Jerseys, for instance, have long been noted for a high percentage. Friesians had in the past a name for great volume, but with a low fat content. Recently, however, this breed is proving by records that the average fat percentage has been and is being increased. The Australian Milking Shorthorns and their full sisters, the Illawarras, are proving the same thing. Thus it is evident that the capacity to give a milk rich in fat can be bred into any breed of cows by careful selection in a comparatively short period of time. This would not be done in one or two generations, but experience shows that a gradual improvement can be made.

A cow inherits fat-producing capacity (*a*) on account of her breed, and (*b*) individually, as a result of breeding. If a cow has been well born and well reared, her records for production in after life depend to a great extent on feeding.

She should not be starved during the three or four months preceding freshening, and after calving she should be well and regularly fed. Both under-feeding and over-feeding are undesirable; too rich a ration (one containing too great a proportion of concentrates) and a ration of grainless wheat straw are both to be avoided. The digestive organs of a cow should not be out of order if she is to give good results.

During droughts, when stock are more than half starved, the fat content of their milk is lowered. This has been demonstrated by the official records obtained from both Government and private herds. Again, during the spring season, when the pastures are soft and young, while the quantity of milk given increases, the fat percentage is lowered.—A. and P. Notes, N.S.W. Dept. Ag.

Clean Milking—Important Points in Dairy Practice.

Many dairy farmers are convinced that only by careful hand-milking can the cleanest milk be obtained, and that the use of a machine results in a much-increased bacterial contamination. Many, on the other hand, have demonstrated that by the use of the machine a milk can be obtained which is comparable with, or even superior in quality to, that which can be produced under the most careful conditions from hand-milking. Clean milk production, whether by hand or machine, actually rests largely in the hands of the producer himself. It is essentially a matter of sanitary methods, based upon a knowledge of the chief sources of bacterial contamination, and the means to be used to keep this at a minimum.

The germ-content of machine-drawn milk will depend upon the care taken to keep the tubes, cups, and pails clean far more than upon any other factor. Where the machine is held responsible for failure to produce good-quality milk, the fault is usually traceable to failure to keep it clean. Highly infected milk drawn by machine is due in almost all cases, not to any fault of the machine itself, but rather to lack of knowledge on the part of the operator of the means to be taken to keep the machine parts sterile. The secret of "low-count" milk lies in having the producer appreciate the difference between a bacteriologically clean machine and one which "looks clean."

It is not sufficient to rinse out the pails, the cups, and the rubber tubes so that visible dirt or traces of milk are removed. It is necessary to destroy the bacteria which lurk in unsterilised, though apparently clean, pails, or which adhere to the moist inner surfaces of the tubes and teat-cups, and which will otherwise multiply and infect the fresh milk. Efficient sterilisation, while entailing more care, amply repays for the effort taken, and is quite essential if the producer is to obtain a milk of low germ content and good keeping quality. The whole question of caring for the machine is simplified if the producer, having once realised the importance of killing unseen germs, commences cleaning and sterilising promptly after the last milking, and makes this a practice every day in the year. Promptness and regularity make for easier and more efficient sterilisation.

Queensland—A Land of Opportunity.

"I make bold to say that there is no part of the world in which a grander opportunity is given to those in power to develop and build up the prosperity and happiness of a country than is given to our public men here. Queensland simply teems with natural wealth, and when one has made all allowances for the drawbacks of droughts and floods there is still a magnificent margin for development. I give you, for what they are worth, certain suggestions that arise out of whatever information about the actual state of things I have been able to glean.

"In order to bring about an era of progress, it is essential that both our primary and secondary industries should be encouraged and developed. The more persons engaged in secondary industries the bigger will be the home market established for primary products. A home market is always a good market, and it is essential for the well-being of a country like Australia, where the standard of living is high, and the cost of production is equally so. Now, what of the future? We are on the threshold of an era in the development of Queensland when wise legislation, suitable settlers, and expert advice must become paramount factors in bringing the State to the position which it ought to hold in the world of primary industries. The 30,000,000 acres of land becoming available for closer settlement during the next five years cannot be utilised without men and means. If advantageous settlement is to take place the financing of it must become a national concern, and the selection of settlers must depend rather on their experience and general fitness for the primary industries to be engaged in than on the amount of money they possess," said Archbishop Duhig in the course of a recent public address.

He added that he believed the Government had made a wise provision that, in future ballots for land, applicants would have to submit themselves for an examination as to their experience and financial standing. This fell in exactly with his idea that preference should be given to men with experience, particularly in Western areas. He further suggested that, all other things being equal, preference should be given to married men. Anyone familiar with conditions in the far West must have noticed the absence of children on big holdings. It would be a pity if this state of things were to continue, and, therefore, married couples ought to be encouraged to settle and bring up in those magnificent, healthy spaces children that in their generation would be one of the strongest bulwarks of our primary industries. Good immigrants would always be welcome, but let us remember that a native-born population was Queensland's greatest asset. Queensland should, therefore, grasp the opportunity of settling with this asset its magnificent Western lands.

Worms in Sheep.

Some farmers only use drenches when they see evidences of worm infestation, but experience has shown that if drenching is done at certain periods of the year the sheep are maintained in better health and condition. Stomach worms are generally evident towards the winter, and if the sheep are drenched at the right time—once a month, say, from March until May—it will generally be found that the parasites will be controlled.

All parasites thrive in an animal that is low in condition, and good management and the provision of nourishing food are, therefore, the first means of prevention. Where practicable, feed off fodder crops to sheep. In wormy country it pays to keep sheep well away from the poverty line. Many a wormy sheep has owed its life to good feeding. Keep sheep supplied with a salt lick, of which the following is suitable, namely: Sulphate of iron, 1 part; sterilised bone meal, 5 parts; coarse salt, 30 parts.

Do not over-stock, especially on succulent pastures (such as on alluvial flats) where worm larvæ are very likely to remain active in large numbers and for a longer time. Pastures carrying large numbers of sheep should, where practicable, be treated periodically with quicklime (½ ton to the acre), or burned off and spelled. Such paddocks can, if desired, be spelled by grazing horses on them.

Since the stomach worm can probably remain infective in the soil under natural conditions for twelve months, it is advisable, when spelling a pasture, to do so for at least that length of time. Fence off or reclaim boggy places, and, where practicable, dams should be replaced by troughs, which should be cleaned periodically. Keep sheep in healthy condition by strict supervision and attention to their needs—e.g., "foot-rotting" them at regular periods, crutching, &c.

Move sheep about from pasture to pasture, from low country to hilly country, from introduced grasses to native grasses, and vice versa. Very young lambs apparently are healthier and less liable to verminous infestation on sweet, hilly country and native grasses. It is well to remember that young lambs, though in good condition and wool, may suffer heavy mortality from stomach worms.

Lucerne Sowing.

Farmers generally prefer to broadcast lucerne seed where the area is small, but sowing through the grass seed attachment of the wheat drill is a useful method when the area is larger.

A method of sowing that is well suited for wheat districts is to mix thoroughly 70 lb. of superphosphate with 10 lb. to 12 lb. of lucerne seed, put the mixture into the manure box of an ordinary seed drill, and set the drill to sow about 80 lb. of manure per acre. The discs or hoes of the drill should not be set into the soil too deeply. Some drills, especially when new, cannot be set to a shallower depth than 1½ to 2 inches; in such a case a good plan to follow is not to set the lever of the drill into the first notch but to let it dangle. The cogs of the drill will be in gear, but the hoes will not go down as deeply as if the lever had been set into the first notch. In this way the seed will be sown about ¾ inch deep. Special care must be taken not to fill the manure box right up. Not more than sufficient seed and manure for 1 acre—i.e., about 80 lb.—should be put into the drill at one time. In order that the seed may be thoroughly covered, it is advisable either to improvise a brush harrow at the back of the drill or to harrow with light harrows after the sowing.

A fine, level, rolled surface is required for sowing. The seed must be covered not more than 2 inches deep, nor less than half an inch, and to secure this fineness is essential. An even distribution of the seed is required, and although some men are sufficiently expert to obtain it by hand-sowing that method is not recommended to the inexperienced. Many good machines are available which do the work satisfactorily.

If a farmer is compelled to resort to hand-broadcasting, half the seed should be sown in one direction across the paddock, and the other half at right angles across the first cast, so that strips missed the first time will receive some seed. Select a calm day or early morning, as it is hard to distribute the seed evenly on a choppy, windy day.

The seed should be covered with a light harrow, though a brush harrow is often used. Adjustable lever harrows are very effective for this work, as the depth can easily be regulated. The seed should not be covered deeply, and precautions must be taken to prevent a crust forming on the surface.

Owing to the slow growth of lucerne during the first year, many farmers are tempted to sow it with another crop, such as wheat or oats, from which some return may be obtained. Others think that the sowing of such crops will assist the young lucerne by giving it some cover. This is not a sound practice. The young lucerne plant is slow in growing, while the wheat, oats, or barley, &c., are vigorous growers which take from the soil moisture and plant food and so rob the young lucerne plants, which instead of growing sturdily become stunted and weak, and are not in condition to stand the hot weather conditions when the cover crop is taken off.

Careful preparation of the soil is required for lucerne, and this, with the cost of the seed, represents a good deal of expenditure, and it is not worth while risking the loss of this for the comparatively small return obtained from the cover crop.

Sheep Classing.

Sheep classing—the operation of grading the breeding flock and selecting the sires for use in mating, with the object of gradually raising the standard of the flock—is an annual practice on all stud properties, or where large numbers of ewes are bred from each year. But sheep classing should not be confined to the larger flocks. In every flock, no matter how small, there is room for improvement, and on account of the casual methods by which many flocks are built up the need is usually very great. The man who only requires a small breeding flock is at a disadvantage, because station owners and managers do not like selling small lines of sheep, and he is forced to accept what he can get. Then again, he may not have sufficient funds to procure a good even line of ewes. Unfortunately, too, there are some flock owners who, when buying rams, take the lowest-priced animals without considering whether they will help to "make" or "mar" their flocks.

It is recommended, therefore, that every owner of a flock of sheep should class his ewes at least to the extent of culling out all the low-grade animals. In this operation wool must not be the only consideration. In flocks which are used primarily for fat lamb production, size of frame, roominess in girth and hindquarters, good milk-producing qualities, and early maturity are points of importance, and all ewes lacking these qualities to any extent should be eliminated from the breeding flock. At the same time, these being days of good wool prices, the wool side must not be lost sight of, as a ewe can raise a satisfactory fat lamb and still produce a payable fleece of wool.

The best time to class the flock is just prior to shearing, as the sheep are then carrying full evidence of their value as producers of wool. It is hardly necessary to say that sheep classing is impossible after the wool has been removed, although it is quite possible to carry out the job any time after the sheep are carrying seven or eight months' wool.

The small flock owner who is breeding for wool should have an ideal in his mind. He must have in view the sheep that will grow the type of wool most payable and best suited to the district, and he will find it worth while to acquaint himself with the views of those who have had longer experience as to the most satisfactory type of wool to grow under local conditions. Having thus got his ideal before him, he should keep it steadily before him, striving each year when classing his sheep to bring the flock nearer the ideal by culling out all ewes that vary greatly in any of the essential qualities. The important qualities to consider are a well-shaped frame, considering the type and breed, good legs (not crooked), and wool of the desired quality (fineness), and as even and dense as possible all over the body. Regarding the frame, it may be remarked that if the flock is of Merino breed, it is not necessary to have quite such a shapely carcase as with the mutton breeds.

The most common faults are small, undersized, or weedy frame, a dip behind the shoulders called "devil's grip" (a sign of weak constitution), narrow shoulders or hips, and crooked legs or feet. Common faults in the wool growth which should also be avoided are unevenness over the body, lack of density or length, and dullness or dinginess in colour due to too much condition or to an undesirable type of yolk. There are other wool characteristics and faults which should be considered, but those mentioned are the most important.

Farm Notes for May.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

Orchard Notes for May.

THE COASTAL DISTRICTS.

In these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become specked or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ in. in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, CENTRAL AND SOUTHERN TABLELANDS.

Clean up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place as, if delayed till the pruning has been finished, the land is apt to dry out in a droughty season.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt district, as late pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will becomes sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manure—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

The Home and the Garden.

KITCHEN GARDEN.

Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean and well-prepared ground. In favourable weather plant out cabbages, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots, and, where sufficiently large, thinned out. Dig and prepare beds for asparagus, using plenty of well-rotted farmyard manure.

FLOWER GARDEN.

Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia bulbs should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snow-flakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

APPLE AND PLUM PRESERVATION.

By Miss A. KNIGHT, Fruit Preserving Expert.*

THE APPLE.

The apple is regarded by many as the king of fruits. Most of us are fully aware of its wonderful medicinal qualities, and, with few exceptions, every one finds it an agreeable and wholesome food.

It may be said that the apple family caters for all tastes, as it includes sweet, sour, crisp, firm, and floury varieties, and from these we may choose good dessert and good cooking varieties.

Hardly any fruit would be missed more than the apple. It will blend well with nearly all foods, and almost any flavouring agent will tone nicely with it.

If every housewife could make up her mind to preserve a case or more of good, juicy cooking apples, she would find them very useful during the spring and early summer when fruit is in many places unobtainable.

Any good cooking apple will preserve well. I would suggest that a quantity be preserved in the form of pulp or puree, for such makes a good foundation for many preparations suitable for the daily menu.

* In the "Journal of Agriculture," Victoria, for February.

If we think for a moment of the many ways in which cooked apples may be served at table we will realise the value of having such a foundation at hand, and always ready to use. Some of the pulp should be put up plain, that is, sweetened to taste, but with the addition of no other ingredient than sugar. It is advisable, too, that some should be flavoured with various suitable flavourings. Some may be flavoured with whole ginger, some with cinnamon and cloves, and some with sweet spice. Apples can especially be recommended for variations of this nature, and we all know that a fresh method of serving food will often have a beneficial effect on the appetite.

Some Apple Dishes.

The gingered puree is excellent for tart fillings; so also is that flavoured with cinnamon and cloves. Plain sweetened apple pulp will blend well with fresh or preserved wild blackberries, while it will also work in to advantage with other tart fillings.

The proportion of apple puree for adding to the fresh blackberries would be one cup to two cups of blackberries; to these one tablespoon of sugar (or to taste), and a little strained lemon juice should be added. Either variety of paste may be used, flaky or short, according to preference.

The plain, sweetened, apple pulp makes an excellent sauce for serving with roast pork, duck, &c. For this purpose the contents of the jar should be re-heated in an enamelled saucepan. Then, after it has boiled for a minute or two, add the strained juice of half a lemon for each cup of apple pulp. Do not *boil* the sauce after adding the lemon juice.

The flavoured apple is nice when baked in a deep dish with the surface of the pulp covered with thin slices of buttered bread, then dusted with sugar and a little nutmeg. Sometimes, if the puree is very firm, the buttered bread will need to be slightly sprinkled with a little syrup, just to moisten it slightly. When nicely baked, serve hot with a little cream.

Dutch apple cake from preserved apple can be highly recommended; also many other similar tasty variations which can be quickly prepared.

Apple Puree—"Plain."

Take any good, tart, cooking apples. Peel, core, and cut them up. Put on to cook in the preserving pan, with very little water—just enough to prevent burning. Put the lid on the pan, and bring slowly to boiling heat, then remove the lid, and allow the fruit to boil for about fifteen minutes, stirring occasionally.

Meanwhile, the containers should be made quite hot. This is best done by steaming, or immersing them in hot water. When the jars are hot, ladle the boiling pulp carefully into them, and seal air-tight at once. Stand the jars on a wet cloth, and when cold they are ready for storing.

Gingered Apple Puree.

Proceed in the same manner as for the plain, but allow about ¾ lb. of sugar to each pound of apples, and a small piece of whole ginger. Dried ginger (also green, when procurable) is suitable, and should be bruised, tied in a piece of cloth, and suspended in the mixture during the cooking, and removed before the puree is bottled.

Cinnamon Flavoured Product.

Cook the apples and sugar in the same manner as that described for the gingered puree, but instead of ginger, add about 1 inch of the stick cinnamon and three cloves to each pound of apples. When the product is cooked, remove the cinnamon and cloves from the puree, which should be bottled while at boiling heat.

Apple Marmalade.

For apple jam, or as it is sometimes called, apple marmalade, the Rokewood apple will give excellent results. The colour will be a deep red, and the flavour good if the apples are nice and fresh. A slow cooking is better than rapid boiling for apple jam.

Apple Blends.

Apple and quince in equal parts make up nicely, for either jelly or jam. Apple and rhubarb is another nice combination; also apple and mulberries.

PRESERVATION OF PLUMS.

Though plums will not, perhaps, blend in quite so many combinations in cooking as apples, they are an excellent fruit for winter use. They make good pies, and are very suitable for steamed suet puddings, and in the warmer weather they make nice chilled sweets. The plum season is not a long one, therefore it is well to have this fruit stored in the larder for winter use. The Orlean, Blue Diamond, Grand Duke, President, Yellow Gage, Green Gage, and Yellow Magnum Bonum are all good pie plums.

All plums for bottling are better for being on the firm side. The filling syrup should not be made too strong, as a very strong syrup will sometimes cause the skins to toughen. Extra sugar can always be added to them at the time of making the pie or pudding. The usual allowance of sugar when bottling the plums is 4 oz. to each pint of water. This is boiled for ten minutes, then strained, and it is ready for use.

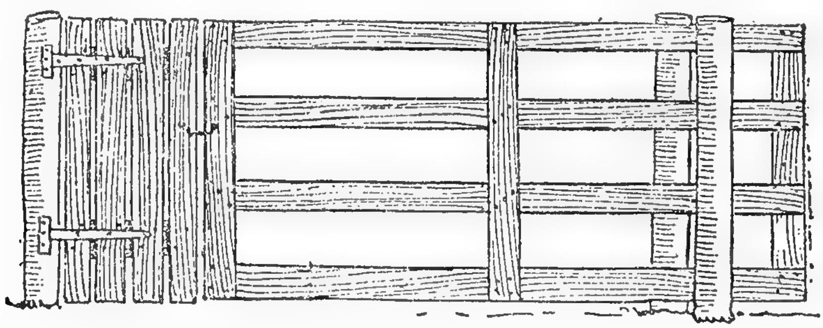
The raw plums should be packed into the preserving jars, with about a tablespoon of cold syrup, the jars then placed on the rack inside the steriliser, with sufficient water to barely reach the top of the rack, and this brought gradually to boiling heat. This heat is maintained for ten to fifteen minutes, according to size of jar. The jars are then filled with the boiling syrup from the kettle, and sealed air-tight at once.

Spiced plums suitable for serving with hot meats are appreciated by many. For spicing, firm-fleshed plums are the best to use. They should be heated through slowly by steam (but not softened too much), and the sweet spiced dressing poured over them while they are still hot. The dressing could be of any desired flavouring. The average fancy is something like this:—2 pints of vinegar; 1 oz. of cloves; ½ oz. of nutmeg; 1 oz. of cinnamon; 1 lb. or 1¼ lb. of sugar.

To make it, simmer the vinegar for a few minutes with the ingredients added. The latter, with the exception of the sugar, should be tied in a muslin bag and suspended in the vinegar. When sufficiently flavoured, remove the bag of spices. The vinegar is then ready to be poured over the plums. They should then be sealed and stored.

A HANDY GATEWAY—ILLUSTRATED.

It is awkward to open a big, heavy farmyard gate with a basket of feed on one shoulder, particularly if it must be done repeatedly at each feeding time. One Iowa farmer avoids this effort by arranging his gate as shown in the sketch, which is



reproduced from "Hoard's Dairyman." The smaller gate is wide enough for a man to walk through comfortably, but it is too narrow for cattle to get through should it be left open.

Both gates hook to the same post. The smaller is hung from the side of the barn or feed storeroom, and the larger slides between two posts. Since the narrow gate is used many times to the few times it is necessary to open the large gate, making the change has saved this farmer considerable time and effort.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April, 1928.		May 1928.		MOONRISE. April, 1928.	MOONRISE. May 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.4	5.49	6.20	5.18	p.m. 3.52	p.m. 3.36
2	6.4	5.48	6.21	5.17	4.31	4.6
3	6.5	5.47	6.22	5.16	5.2	4.34
4	6.6	5.45	6.22	5.16	5.32	5.4
5	6.6	5.44	6.23	5.15	6.2	5.37
6	6.7	5.43	6.23	5.15	6.32	6.12
7	6.7	5.42	6.24	5.14	8.2	6.51
8	6.8	5.41	6.24	5.13	7.36	7.37
9	6.8	5.40	6.25	5.12	8.11	8.26
10	6.9	5.39	6.25	5.11	8 53	9.20
11	6.9	5.38	6.26	5.11	9.40	10.15
12	6.10	5.37	6.26	5.10	10.30	11.15
13	6.10	5.36	6.27	5.10	11.26	...
14	6.11	5.35	6.27	5.9	...	a.m. 12.16
15	6.11	5.34	6.28	5.9	a.m. 12.24	1.17
16	6.12	5.33	6.29	5.8	1.25	2.20
17	6.12	5.32	6.30	5.7	2.29	3.24
18	6.13	5.31	6.31	5.6	3.33	4.31
19	6.13	5.30	6.32	5.6	4.38	5.41
20	6.14	5.29	6.32	5.5	5.45	6.52
21	6.14	5.28	6.33	5.5	6.53	8.2
22	6.15	5.27	6.33	5.5	8.4	9.8
23	6.15	5.26	6.34	5.4	9.18	10.11
24	6.16	5.25	6.34	5.4	10.20	11.6
25	6.16	5.24	6.35	5.3	11.24	11.54
26	6.17	5.23	6.35	5.3	p.m. 12.21	p.m. 12.33
27	6.17	5.22	6.36	5.3	1.12	1.8
28	6.18	5.22	6.36	5.2	1.54	1.39
29	6.18	5.21	6.37	5.2	2.32	2.7
30	6.19	5.21	6 38	5.2	3.3	2.40
31			6.38	5.2		3.6

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

6 April	○ Full Moon	1 38 p.m.
13 ,,	☽ Last Quarter	6 8 p.m.
20 ,,	● New Moon	3 24 p.m.
27 ,,	☾ First Quarter	7 41 a.m.

Apogee 8th April, at 10 12 a.m.
Perigee 21st April, at 5 12 a.m.

Omega Orphiuchi will be occulted on the 10th from about 1.30 at Mackay and somewhat later in Southern Queensland.

On the 10th at 11 p.m. the Moon will be passing Saturn, slightly to the south of it. A small star in Orphiucus between Scorpio and Saggitarius will be occulted by the Moon, commencing about a quarter past three in the morning. A small star in Saggitarius (Magnitude 5.8) will be occulted by the Moon about a quarter past ten on the evening of the 12th. In the south-east of Queensland this will form an interesting object for observation on its reappearance on the bright side of the Moon, about half an hour after it has risen. This occultation will require binoculars or telescope.

The occultation of Eta Leonis (Magnitude 3.6) will take place only in the Northern part of Queensland at such places as Charters Towers and Cairns, a little before half past nine on the evening of the 28th. At Brisbane, Toowoomba, Warwick, etc., the star will be seen to skirt the southern edge of the Moon without being occulted.

The conjunction of Venus and Jupiter at 6 p.m. will occur when both are below the horizon, but they will be visible in the early morning before sunrise.

Omega Virginis (Magnitude 5.4) will be occulted on the 30th, before half past seven at Warwick and seven or eight minutes earlier at Townsville. The reappearance of the star on the western side of the Moon will occur at Warwick about forty minutes later.

5 May	○ Full Moon	6 11 a.m.
13 ,,	☽ Last Quarter	6 50 a.m.
19 ,,	● New Moon	11 14 p.m.
26 ,,	☾ First Quarter	7 11 p.m.

Apogee 5th May at 2 30 p.m.
Perigee 19th May at 3 36 p.m.

On the 3rd, Mercury will be on the farthest side of its orbit and will pass behind the Sun.

Beta Scorpii, a star of about the third magnitude, will be occulted by the Moon soon after half-past six on the evening of the 6th, at Brisbane, Toowoomba, Warwick, and other places in Southern Queensland where the Moon rises before that time. The star will reappear on the western side of the Moon an hour later. At places in Northern Queensland the time of disappearance will be somewhat later and of reappearance earlier.

The conjunction of Saturn with the Moon, about 3 o'clock in the morning of the 8th, will take place in the part of the sky between Scorpio and Saggitarius, which affords no other brilliant object. Saturn will be about four diameters of the Moon to the northward.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Anzac.

WITH Australians the name of Anzac has grown into a great tradition, and the anniversary of the landing on Gallipoli (25th April) was fitly commemorated throughout the Commonwealth. In every town and hamlet Australians gathered to pay a tribute of respect and reverence to the memory of brave men who fought and died for a cause they believed, and we believe, to be true and just. Reverence for their memory we must feel, or else be recreant to the best within us, and as a people we cannot afford to be recreant to any high ideal—that was the spirit of the nation-wide commemoration. Just thirteen years ago the Australian citizen soldiers went into the real business of war—a war which in the light of events that are now history was for us absolutely inevitable—with undefeatable courage. They made a name for themselves and for their country, and through their service and their sacrifice added a new and brilliant chapter to the story of our race. And what sort of men were they, and what was the dominant motive that impelled them?

Mr. Bean, the Australian war historian, in simple and noble language, gives us the thrilling answer:—"It lay in the mettle of the men themselves. To be the sort of man who would give way when his mates were trusting to his firmness; to be the sort of man who would fail when the line, the whole force, and the allied cause required his endurance, to have made it necessary for another unit to do his own unit's work; to live the rest of his life haunted by the knowledge that he had set his hand to a soldier's task and had lacked the grit to carry it through—that was the prospect which these men could not face. Life was very dear, but life was not worth living unless they could be true to their idea of Australian manhood. Standing upon that alone, when help failed and hope faded, when the end loomed clear in front of them, when the whole world seemed to crumble and the heaven to fall in, they faced its ruin undismayed.''

The Sugar Position.

"I THINK it is necessary that the Australian public should be fully advised of the sugar position, as statements are appearing in the Southern Press which are not accurate,'' the Premier (Mr. W. McCormack) informed the Press recently.

Referring to the sugar duties in Britain, he declared that subsequent advices had confirmed the opinion of the cabled information expressed in his statement of 24th April. ''I stated there,'' he added, ''that the Australian industry had avoided a loss of 30s. per ton, or over £250,000, by the acceptance of the 99 per cent. instead of the Empire Federation's original proposal. However, whilst we have gained that advantage over the original proposal, it must not be taken as an added advantage over the previous tariff. The reduction of duty on foreign sugar under 98 per cent. without the reduction on foreign 99 per cent., as stated previously, reduced the competition on foreign refined; but Queensland's higher class sugar must of necessity face the competition of foreign raws, on which the duty has been reduced. The added preference to Queensland's sugar over 99 per cent. is, therefore, nominal and ineffective. The Queensland sugar industry will benefit by the increased demand by British refiners for raw sugars, but to what extent the admitted advantage of the new tariff will operate remains to be seen. Undoubtedly, there appears to be a slight advantage, but to what the advantage will be can only be determined when the actual results of competition become operative.''

The Coming Northern Cane Harvest.

RECORD crops are expected to be harvested in the Herbert and Tully cane areas in the coming season. The cane is in a satisfactory condition, and it is probable that the crushing will be continued for several weeks of next year. In a report to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby), the Northern field assistant (Mr. A. P. Gibson) states that the cane crop forecast for 1928 is 230,000 tons for Macnade and 237,000 tons for Victoria, or a total of 467,000 tons for the Herbert River district. This estimated tonnage is 105,000 tons greater than that milled last year, when 361,628 tons yielded 49,637 tons of sugar. Although it was difficult to give an estimate of the crop, except in approximate terms, of such a new and ever-increasing area as the Tully district, the probable harvest will be something like 210,000 tons, as against last season's crushing of 202,856 tons.

The Banana Industry—Beetle Borer Investigation.

THE Minister for Agriculture and Stock (Mr. W. Forgan Smith) has announced that he is arranging for Mr. J. L. Froggatt, of the Entomological Staff of this Department, to visit Java this month, for the purpose of making inquiries there with a view to procuring the necessary stock to breed up the insects known to be natural enemies of the banana beetle borer. It is estimated that the banana industry has a value to this State closely approaching £1,000,000 sterling per annum, and it is capable of further expansion. The banana beetle borer has proved to be a serious pest to the industry, and the Entomologists of the Department, and Mr. Froggatt in particular, have given close attention to this pest. The Committee of Direction is offering a reward of £5,000 to any private citizen who discovers a means whereby the beetle borer may be effectively controlled, and the fact that the fruitgrowers of this State are prepared to offer such a substantial reward is indicative of the damage done to their industry by this pest. The beetle borer is known to exist in Java, but in that country it is not considered an insect of economical importance; and it is possible that it is there kept under subjection by natural native enemies known to exist in Java, one being a beetle and the other a fly. There is no conclusive evidence available, however, to indicate that this possible means of control of the beetle borer would be efficacious in Queensland, but it does appear that biological control offers more promise of success than that likely to be achieved by any other means; besides the results in Java are most encouraging. Apart from his main mission, Mr. Froggatt will, while in Java, investigate the insect pests of crops common to both Java and Queensland. At the same time, he will make a note of tropical crops, such as tea and coffee, now raised in Java, that might also be useful in Queensland.

Transport of Bananas.

"EFFICIENT transport of bananas by railway is a problem that a special committee is being appointed to deal with," said the Acting Premier and Minister for Agriculture and Stock (Mr. W. Forgan Smith) recently in the course of a Press interview. He added that the matter will be dealt with in conjunction with the system of establishing banana experiment stations for research in cultivation and pest problems. On the transport committee the Commissioner for Railways (Mr. J. W. Davidson) will have a representative, and the body will recommend improvements that might lead to the better transport of bananas by rail. Consideration of this phase is made necessary by the expansion of the industry in the North, and the increasing crop now being marketed in Southern areas.

School of Instruction in Pig Husbandry.

ARRANGEMENTS have been made to hold a School of Instruction in Pig Husbandry at the Queensland Agricultural High School and College from Monday, 11th June, to Saturday, 23rd June, and applications to attend the school are being invited from those who are desirous of improving their knowledge of pig raising. Theoretical and practical instruction will be given in the breeding, cross-breeding, feeding, marketing, judging, diseases, and care and management of pigs. It is proposed, in addition, that, in the course of the currency of the school, to arrange visits to bacon factories so that those attending may have the opportunity of studying all the operations involved in the treatment of bacon pigs of varying ages and weights. Schools of Instruction in Tractor Management and Butter Factory operation have already proved their practical value, and it is anticipated that the School in Pig Husbandry will be equally popular and instructive. The fee for the complete course has been fixed at £2 13s. 6d. for each student, exclusive of the additional cost entailed in the visits to bacon factories, which is expected to be about £1 4s. Both men and women may attend the school. Officers of the Department of Agriculture and Stock will assist the Principal and the regular staff of the College. Applications from those desirous of attending should be sent to the Principal, Queensland Agricultural High School and College, T.P.O. South, Queensland, as early as possible, in order to facilitate arrangements for the course. All inquiries concerning the school, cost, railway fares, and the like should be addressed to the Principal.

Bureau of Sugar Experiment Stations.

PLANT PATHOLOGY AND SUGAR TECHNOLOGY.

APPOINTMENT OF INVESTIGATION OFFICERS.

The Minister for Agriculture, Mr. W. Forgan Smith, has informed the Press that at a recent Executive Council Mr. Arthur Frank Bell and Mr. Norman Bennett were appointed Investigation Officers in Plant Pathology and Sugar Mill Technology respectively. These two officers will be attached to the Bureau of Sugar Experiment Stations.

Both gentlemen were sent early in 1924 by the Department of Agriculture and Stock to visit the chief canegrowing centres of the world, and have just returned to Queensland after a tour extending over four years.

After leaving Brisbane, Mr. Bell's first stopping place was Honolulu, where he spent a short time. He then proceeded to California, where he remained for eighteen months attending lectures and doing research work in the University of California. During the summer vacation of 1925 he joined Dr. H. W. Kerr, another of the Department's sugar scholars, and they made a tour of Louisiana, Florida, and Cuba. A comprehensive study of the sugar-cane agriculture of those places was made. Mr. Bell then returned to the University of California for a further year's work, and in the summer of 1926 he made an extensive tour, which included visits to Central America, Porto Rico, and the British and French West Indies, returning to the United States to attend the International Botanical Conference.

He then crossed to England, and did a year's research in the Royal College of Science in the University of London. During the vacation of the College he visited a number of research centres in Holland and Germany. From England he returned to Hawaii, and through the courtesy of the Hawaiian Sugar Planters' Association spent some four months as an honorary member of the staff of the Experimental Station.

Leaving Honolulu in December of 1927, he went viâ Japan and China to the Philippine Islands, where he spent a month. Here he was joined by Mr. Norman Bennett, and they proceeded to Java together and spent a month in various parts of the island.

From the point of view of scientific sugar production, Mr. Bell is of the opinion that we have much to learn from Hawaii and Java, although we compare very favourably with the other sugar countries. Both the Javan and Hawaiian stations employ some forty to fifty scientists, and are doing some remarkably fine work. Incidentally, these stations have been responsible for the breeding of P.O.J. 2878 and H. 109 respectively, both of which have been of incalculable value to the sugar industry of these two places.

From an agricultural point of view, these two countries have three outstanding policies. The first of these is the careful planning of a breeding programme for some years ahead, and taking all precautions to ensure a complete knowledge of the parentage of the canes produced. P.O.J. 2878, which has increased the Javan yield per acre by some 20 per cent., did not arise in a haphazard fashion, but is the culminating point of several years of carefully planned breeding.

The second line of policy is the use of the "checkerboard" system in all experimental work. This consists in laying out all comparative experiments in the manner of a checkerboard, with about ten repetitions of each experiment. This ensures against errors on account of variations in soil, and also allows of the results being examined mathematically to determine whether any differences between treated and controlled plots are significant.

The third point is the recognition of the desirability for unrestricted interchange of knowledge between all persons engaged in the sugar industry. In both Java and Hawaii one may have access to any figures in both the sugar houses and the field, and men from neighbouring plantations are always welcome to any information. These people have realised that working behind closed doors is out of date, and that the greatest benefits to both the individual and the State are only obtained by the mutual dissemination of knowledge.

Mr. Norman Bennett, the Investigations Officer for Sugar Mill Technology, first went to Java and spent three months in the island visiting factories and studying the various methods of control and manufactures carried out by the mills and estates. The elaboration of these methods has been worked out by the Dutch scientists of the Proefstation over a period of thirty years.

From Java he went to Scotland, where he spent nine months with a Scotch engineering firm before visiting the English refineries and machinery manufacturers.

In September, 1925, he proceeded to the canegrowing State of Louisiana, in the United States, which at that time was busily engaged in the reconstruction of an industry that had come to the verge of ruin owing to adverse seasons, insect pests, and diseases of the local cane varieties. He spent fifteen months in Baton Rouge at the Louisiana State University under Dr. G. E. Coates, Dean of the Audubon Sugar School. As the university is operated by State funds, the experimental station staff was brought into close relationship with the university, and Mr. Bennett was able to do university work under the direction of the station officers in the chemical department of the university.

While in Baton Rouge he was able to obtain good practical experience at the model factory on a large scale, and experiment on the possibility of beet culture and beet sugar manufacture in Louisiana. He had also the opportunity of getting further experience in the manufacture of sorghum syrup and plantation white sugar manufacture.

In 1927 he spent the cane season in Cuba, and whilst there attended the second meeting of the World's Cane Sugar Technologists' Association as the representative of the Queensland Department of Agriculture and Stock. Returning to Louisiana he visited the refineries and machinery manufacturers on the east coast, and then went to San Francisco, where he visited a few beet sugar factories before proceeding to Hawaii, where he spent a month visiting factories on the different islands of the group.

He then left for the Philippine Islands and Java before returning to Queensland.

The third travelling scholar is Mr. H. W. Kerr, who is now a doctor of philosophy. Mr. Kerr has been appointed Investigation Officer for Soils, but he will not actually take up his duties here until about August next, as he is now in Hawaii. Since he has been away, Mr. Kerr has been in Java, the Philippines, Hawaii, Louisiana, Florida, Cuba, the University of Wisconsin, and the Rothamstead Experiment Station in England.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Importance of Collecting Cane Grubs.

During this month grubs will probably be much in evidence in many canefields which last season were comparatively free from serious infestation. Wherever possible, these should be picked up from behind ploughs, while at the same time every encouragement should be given to insectivorous birds, such as the Ibis, Pewee, &c., to take active part in this useful work.

Grubs of the greyback cockchafer will be mostly in the second and third stages of growth (width of head about 3/16ths to 5/16ths of an inch), and those of *Lepidiota frenchi*, our smaller dark-reddish cane beetle, are in the third instar, and having finished feeding will soon be transforming to the pupal condition.

It should not be forgotten that this common-sense method of control is recognised as being beneficial, and systematically practised as a matter of course in other sugar-growing countries.

Assuming that 50 per cent. of the grubs collected in this way would, if left in the field, have produced female beetles (which is a very fair estimate), it follows that by picking up only a dozen grubs, one prevents the laying during the following season of about 216 eggs; which, if deposited in cane land, would produce enough grubs to completely destroy forty-three stools of plant cane.

Green Muscardine Fungus Attacking Cane Grubs.

At this time of year we may expect to find specimens of our primary scarabæid cane grubs victimised by the vegetable parasite *Metarrhizium anisopliæ*, which is generally present in our canefields from March to June. When attacked by this entomogenous fungus the body of the grub becomes quickly filled by the roots or mycelium, and gradually hardening turns at first white, and finally an olive-green colour, the latter condition being the fruiting stage of the fungus, which consists of a thin crust formed of chains of spores. Grubs affected in this manner do not decompose, but become mummified, and like a mouldy piece of cheese can be broken into pieces.

Growers can, if desired, extend the sphere of usefulness of this parasite by collecting all such green crusted-looking grubs, breaking them into powder, and thoroughly mixing this with about 100 times the quantity of moist, finely sifted soil, rich in organic matter. This spore-infested earth should be sprinkled or sown as thinly as possible in the plough furrows when planting any areas of cane land known to be liable to become grub affected.

How to Fumigate Cane Grubs.

Growers desiring to obtain full information regarding soil fumigants, such as when and how to apply them, together with descriptions of same and cost per acre for material and labour, should write to the Director of the Bureau of Sugar Experiment Stations, Department of Agriculture, Brisbane, for a copy of a pamphlet published last month, dealing with the merits of paradichlorobenzene, carbon bisulphide, and calcium cyanide as efficient fumigants for combating the ravages of soil-frequenting grubs of cockchafer beetles. This separate issue is a reprint of an article which appeared in the February number of the "Queensland Agricultural Journal," vol. xxix., Part 2, pp. 97 to 113.

CANE PEST COMBAT AND CONTROL.

The Entomologist (Mr. E. Jarvis) at Meringa, near Cairns, has submitted the following report for the period March to April, 1928, to the Director of Sugar Experiment Stations, Mr. H. T. Easterby:—

Acetylene Light Attractive to Greyback Cockchafer.

In a leading article appearing recently in the "Australian Sugar Journal" (vol. xix., p. 645) the editor, when commenting on results obtained by the Assistant Entomologist at Bundaberg with regard to the very unimportant phototropic reaction manifested by females of our southern cockchafer (*Pseudoholophylla furfuracea* Burm., concludes by remarking: "It is recognised that these observations apply only to one variety of cane beetle, and it will be interesting to learn from our entomologists the bearing, if any, which the facts now established may be regarded as having upon the control of the other varieties, and particularly those so damaging to northern canefields." In view of the fact that several of our Cairns growers, chancing to read the report published by Mr. R. W. Mungomery in the February number of the above journal (vol. xix., pp. 656-657), have thoughtlessly taken his remarks to apply to cane beetles in general, including our northern "greyback cockchafer," it becomes advisable to briefly enumerate the various experiments carried out here in connection with the phototropism of *Lepidoderma albohirtum* Waterh.

When first entering upon the study of cane insects at the Gordonvale Entomological Laboratory in 1914, I was told by those who had preceded me in this scientific work, that it was no use attempting experiments with light-traps against our cane beetle, as this cockchafer was not attracted by artificial light.

Deciding, however, to obtain definite proof as to the correctness of such statements before setting aside this control method, an experiment was accordingly started during December, 1914, in a canefield on the "Carrah" Estate with a light-trap specially designed by the writer for studying the phototropic reaction of this species towards acetylene light ("Queensland Agricultural Journal," vol. v., p. 226). During the first three evenings of 14th to 16th December the following definite results were secured, proving conclusively that *albohirtim* is strongly attracted to white light:—

SKY CLEAR; NO WIND; NO MOON.			*L. albohirtum.*		
Date.	Average Temperature.	Hours.	Beetles Caught.	Male.	Female.
Dec. 14	70 deg. F.	8 p.m.—11 p.m. ..	51	40	11
Dec. 15	76 deg. F.	8 p.m.—9 p.m. ..	57	46	11
Dec. 16	77 deg. F.	8 p.m.—10 p.m. ..	62	45	17
			170	131	39

Further observations made about a couple of weeks later yielded additional information, proving that this beetle, without doubt, continues susceptible to artificial light long after the emergence from the ground. Acetylene light was found to be equally attractive to both sexes of this cane beetle throughout its aerial existence. The proportion of females captured at light about the middle of December varied, as shown above, from 20 to 25 per cent.; but three weeks later, early in January, catches during two consecutive evenings yielded 47 and 75 per cent. of female beetles (see Bulletin No. 17, p. 11). These differences accorded with expectations, as although male specimens are known to predominate for a week or so after the first emergence, the sexes can generally be met with in about equal proportions by the beginning of January, while towards the end of that month conditions are often reversed and females become the more numerous.

During the 1927-28 season, for instance, Mr. J. H. Buzacott (Assistant to Entomologist) carried out an experiment on 21st December with an acetylene lamp placed on uncultivated open forest country, about six chains distant from the nearest cane land.

It was interesting to note that while the light was too near the ground and enclosed in the trap, no beetles were caught, but directly the light was placed on top of the trap, bringing the acetylene flame about 5 feet above ground level, "it was immediately assailed by greybacks from the neighbouring shrubs, 31 being trapped in less than half an hour." These specimens, when examined later, were found by Mr. Buzacott to compromise 15 males and 16 females. On the same evening the present writer exposed a larger Millar lamp on the corner of a veranda within a few feet of a small "weeping fig" tree (*Ficus benjamani*), hanging a white sheet on one side of the lamp to act as a reflector. No less than 146 greyback cockchafers were captured by this method in less than an hour, 91 being males and 55 female specimens.

The predominence of the former sex may in this case have been due to the fact that the fig tree had been harbouring, for several days previously, feeding beetles which had been amongst the first to emerge from the soil. Later on, about the beginning of January, however, 169 greybacks, when captured in a similar manner from the same fig tree, were found to comprise 93 females and 76 male cockchafers.

With reference to the behaviour and mode of reaction manifested by *albohirtum* while under the phototropic influence, data in this connection will be found in Bulletin No. 17 of this office, pp. 8-11, 19, 20, 41, 42, and 66.

It will be seen from the foregoing details that, unlike the southern cane beetle, *P. furfuracea*, both sexes of our northern species, the notorious "greyback" cane beetle, are strongly attracted to artificial light.

Phototropic response of either a positive or negative stimulus varies greatly in different groups of insects. Various moths, beetles, or bugs, for instance, react negatively towards sunshine, or lamp light; that is to say, being lovers of darkness are repelled by such conditions. Common examples of this class are cockroaches, clothes-moths, bugs, grain weevils, &c.

Nearly all the butterflies, on the other hand, fly only during sunny weather (positive phototropism), while moths prefer the hours of darkness. Some insects will react positively towards artificial light up to a certain point, upon reaching which they may either become negatively phototropic and fly directly away from the source of illumination; or orientation may suddenly cease, and they may settle down close to the flame and remain quite motionless. Others, again, rush straight for the point of attraction and are burnt, or else will spin helplessly around the flame for a few minutes before meeting their fate.

In many dipterous or coleopterous insects phototropic reaction is displayed by the males only. The southern cane beetle, *Pseudoholophylla furfuracea*, affords an excellent example of the latter class, experiments carried out recently in Bundaberg by Mr. R. W. Mungomery having demonstrated the fact that only about 1 per cent. of specimens of this species taken in light-traps are of the female sex.

As an illustration of the manner in which phototropism may vary in species of closely related genera of the family *Melolonthidæ*, it will be of interest to mention that field experiments conducted about twenty years ago in America against beetles belonging to the genus *Lachnosterna*, showed that both sexes are readily attracted to light-traps, some species of this genus, however, displaying far more positive reaction than others. These beetles closely resemble in size, colour, and general appearance those of our southern cochchafer, *P. furfuracea*.

Eight or more species of *Lachnosterna* are known to be injurious to the roots and foliage of various economic plants in Illinois. Of these, *L. implicita*, perhaps, flies most freely to artificial lights, the number trapped in this manner in the year 1906, for instance, during field tests carried out at Urbana, extending over a period of twenty-six days (14th May to 28th June), being 2,517 specimens. Of these beetles 834 were found to be males and 1,683 females.

Dusting versus Spraying as a Control for Codling Moth in the Stanthorpe District.

By H. JARVIS and S. M. WATSON, Entomological Branch.

Introductory.

Considerable loss has been caused by codling moth in the apple orchards of the Stanthorpe district during the last few seasons, more particularly in 1926-27, and although the periodical spraying with arsenate of lead has been generally adopted throughout the district as the recognised means of control, yet the results achieved by orchardists have been disappointing, so much so that in many orchards last season loss from codling moth was greater than that sustained from fruit fly. Growers who applied as many as three or four successive sprays failed to adequately control codling moth.

There has, in consequence, therefore been a growing dissatisfaction with the wet-spray method, and numerous inquiries regarding the efficacy of dust mixtures containing arsenate of lead have been received.

Previous work in America would appear to indicate that a fairly satisfactory control of codling moth can be obtained there by the use of dusting mixtures containing arsenate of lead.

The experiment herein detailed was made for the purpose of obtaining information regarding the local use of dusting, as compared with wet spraying in regard to cost and efficiency, as a control for codling moth.

It is realised that the degree of the annual local infestation of codling moth is governed by seasonal weather conditions, and the encouraging results secured this season may not obtain next year; it is therefore considered desirable to repeat the experiment for at least three years in succession, and the work so far accomplished must be considered as being only of a preliminary nature.

The Experimental Plot.

The orchard chosen for the experiment was situated at the Summit, which is the highest point of the Granite Belt area, and is acknowledged to be the principal apple-growing centre in the district.

The plot used in the experiment covered an area of approximately one and three-quarters acres, and consisted of seventeen rows of trees having eleven trees to the row. The trees, which were planted 20 feet apart, were from six to seven years old and were of the variety "Granny Smith," which is one of the most extensively grown late varieties.

The trees had been pruned for wood production rather than for fruit, but notwithstanding this they set a heavy crop of fruit, as was the case in most apple orchards throughout the district.

During November and December there was a heavy fall of fruit, a not unusual happening with young vigorously growing trees, and the resulting crop was considered by the owner to be a very light one.

The spraying and dusting arrangements were as follows:—Of the seventeen rows comprising the plot, numbers one to five and seven to nine were treated with the dust mixture, leaving row number six untreated as a check row. The remainder of the rows, numbers ten to seventeen, were treated with the wet spray.

It will thus been seen that the number of dusted trees was equal to the number of wet-sprayed trees—viz., eighty-eight trees in each case.

Materials Used and Method of Application.

The spray mixture used in the experiment was applied with a power-spraying outfit at a pressure of 225 lb. The machine was driven by a gasoline engine rated at 2 horse-power. One man and one horse were used to operate the sprayer.

The dust mixture was applied with a one-man hand dusting gun, having a capacity of about 9 lb.

Four treatments in all were made with the dust mixture, the first of these coincided with the usual calyx spray, the second was applied nine days later, the third seventeen days after the second, and the fourth forty-six days after the third.

All dustings were made at dawn, which was considered to be the most suitable time. The dust mixture used was the Cloudform Dust A.P. No. 1, as supplied by its manufacturers. The mixture contained 15 per cent. arsenate of lead, and 85 per cent. reducer.

Three treatments only were given with the wet spray, the first application was the calyx spray, the second a cover spray eighteen days later, and the third spray sixty-two days after the second. The material used was arsenate of lead in powder form.

All applications of dust and spray were made from at least two sides of the trees, which were thoroughly covered, and in applying the wet spray the spraying nozzle was held at least 3 feet from the tree, thus giving a well distributed spray and also reducing the amount of drip to a minimum. Practically no spray was wasted.

The dates of application, strength at which materials were used, and cost figures are shown in the accompanying Table No. 1.

The cost figures for the dusted plots are calculated on skilled labour at 2s. 6d. per hour, the cost of dusting material being at the ruling local price of 29s. 6d. per 56 lb. The cost of treating the wet-spray plot is based on the rate of 30s. per day of eight hours, this being the price locally charged for the hire of man, horse, and spraying apparatus. The cost of arsenate of lead is at the rate of 1s. 9d. per lb.

Codling Moth Infestation of the Season.

The codling moth infestation throughout the district was not heavy—in fact, it was the lightest for some years—hence the number of treatments given was considered to be sufficient. The time of application of both dust and spray was necessarily governed by weather conditions, and it was not practicable owing to heavy winds and rain to make all the applications at what was considered to be the most critical time. Only one dusting was made in a still atmosphere. During the later dustings, there was a slight breeze from the south-east, thus a drift of dust was occasioned from the treated to the untreated trees, possibly to a slight extent reducing the infestation in the check row, which, as shown in Table No. 2, was only slightly over 7½ per cent. of the final crop.

It is, however, noteworthy that the orchards surrounding the experimental area did not all share to the same extent the comparatively light infestation experienced in the experimental orchard, and in one or two instances loss from codling moth in these adjacent orchards was not inconsiderable.

Summary.

The results so far obtained indicate that codling moth can be satisfactorily controlled by the application to the trees of a dust mixture containing 15 per cent. arsenate of lead and 85 per cent. reducer. It is also demonstrated that dusting, as carried out in this experiment, is slightly cheaper than wet spraying, for, although the actual cost of the dust is more than that of the spray material, this is more than equalised by the great saving of time and labour in dusting, as the dust can be applied more than four times more quickly than the spray, and this quickness of application should prove of much value when trees have to be treated at critical or unusual times in order to meet special weather and other conditions.

The best time to apply dusts appears to be when the atmosphere is still. This condition often occurs at dawn. Dust applied in a still atmosphere hangs suspended in the orchard like a white cloud completely enveloping the trees.

In both dusting and spraying for codling moth thoroughness of application at the most critical time is of the utmost importance, and failure to control codling moth by spraying is often due to hasty treatment at the wrong time. In the calyx spray it is essential that the spray be forced well into the calyx at a good pressure, and this can only be accomplished by a good spraying apparatus. It is noteworthy that the first application of both dust and spray in the experiment under discussion was made in a still atmosphere and at the most critical time.

One of the greatest advantages of dusting is that the dust is carried by the air right into the trees, covering almost every portion of the tree.

It will be seen from Table No. 2 that the percentage of loss from causes other than codling moth in the experimental plot has been remarkably small. Loss from other causes includes apples unsound or cracked, and individual fruits affected with bitter rot (*Glomerella cingulata*), Queensland fruit fly (*Chætodacus tryoni*), corn ear worm (*Heliothis obsoleta*), and fruit marked by "dead stings."

The term "dead stings" refers to apples in which injury by codling moth is only skin deep. It often happens that the young codling grub after gnawing through the skin of the fruit perishes, either from a dose of the poison or from other causes. The injury remains on the fruit, causing a permanent disfigurement, and is generally referred to as a "dead sting."

Seasonal Weather Conditions.

The season was the wettest experienced for seven years, and as will be seen from the rainfall table there was a good fall of rain almost immediately after the first two dustings and also after the first and third spraying, but in spite of the almost continuous wet weather traces of both dust and spray were observed on the fruit at the time of picking.

Acknowledgments.

The writers desire to express their appreciation of the opportunities afforded for carrying out this investigation by the owner of the orchard, Mr. W. Maggs, Inspector under the Diseases in Plants Acts, and for his very valued observations and co-operation throughout the experiment.

TABLE NO. 1.

DATA ON TIME AND COST OF APPLICATIONS.

Date of Application.	No. of Trees Treated.	Material used and Strength.	Quantity.	Time Required.	Cost. Labour.	Cost. Material.	Cost. Total.	Cost per Tree.
			Lb.	H. Min.	s. d.	s. d.	s. d.	d.
19th October, 1927 ..	88	A. P. No. 1, Cloudform dust	$14\frac{1}{2}$	0 30	1 3	7 $7\frac{64}{100}$	8 $10\frac{64}{100}$	$1\frac{21}{100}$
28th October, 1927 ..	88	A. P. No. 1, Cloudform dust	19	0 39	1 $11\frac{4}{10}$	10 $0\frac{8}{100}$	11 $11\frac{48}{100}$	$1\frac{63}{100}$
14th November, 1927 ..	88	A. P. No. 1, Cloudform dust	18	0 37	1 $10\frac{3}{10}$	9 $5\frac{70}{100}$	11 $4\frac{6}{100}$	$1\frac{55}{100}$
30th December, 1927 ..	88	A. P. No. 1, Cloudform dust	14	0 30	1 3	7 $4\frac{48}{100}$	8 $7\frac{48}{100}$	$1\frac{17}{100}$
		Totals	$65\frac{1}{2}$	2 16	6 $3\frac{7}{10}$	34 $5\frac{96}{100}$	40 $9\frac{66}{100}$	$5\frac{56}{100}$
			Galls.					
19th October, 1927 ..	88	Arsenate of lead, 4 lb. to 80 gals. of water	110	2 45	10 $3\frac{3}{4}$	9 $7\frac{1}{2}$	19 $11\frac{1}{4}$	$2\frac{72}{100}$
6th November, 1927 ..	88	Arsenate of lead, $2\frac{1}{2}$ lb. to 80 gals. of water	72	1 48	6 9	3 $11\frac{1}{4}$	10 $8\frac{1}{4}$	$1\frac{47}{100}$
18th January, 1928 ..	88	Arsenate of lead, $2\frac{1}{2}$ lb. to 80 gals. of water	92	2 20	8 9	4 $0\frac{3}{8}$	12 $9\frac{3}{8}$	$1\frac{74}{100}$
		Totals	274	6 53	25 $9\frac{3}{4}$	17 $7\frac{1}{8}$	43 $4\frac{7}{8}$	$5\frac{93}{100}$

TABLE NO. 2.

SHOWING CODLING MOTH INFESTATION AT TIME OF PICKING.

Treatment.	No. of Trees.	Total Quantity in cases.	Sound.		Unsound.		Codling Moth.		Dead Stings.		Other Causes.	
			No. of Cases.	Per Cent.	No. of Cases.	Per Cent.	No. of Apples.	Per Cent.	No. of Apples.	Per Cent.	No. of Apples.	Per Cent.
Dust ..	88	150	147	98	3	2	74	·7	20	·19	116	1·1
Wet spray	88	193	188	97·36	5	2·64	59	·5	31	·26	219	1·87
Untreated	11	18	16	88·9	2	11·1	92	7·56	6	·49	37	3·05

TABLE NO. 3.

CODLING MOTH INFESTATION DURING WHOLE SEASON, INCLUDING INFESTATION OF WINDFALLS.

Date of Examination.	Check Row.	Dusted Trees.	Wet Sprayed Trees.
12th December, 1927	58	5	9
5th January, 1928	41	4	3
28th January, 1928	18	11	4
28th February, 1928	31	18	8
At time of picking	92	74	59
Totals	240	112	83

TABLE No. 4.

RECORD OF RAINFALL DURING PERIOD OF EXPERIMENT.

Date.	Precipitation. (Points.)
11 October	35
13	60
21	86
22-24	51
28	26
4 November	62
10	18
21	100
26	72
27	85
1 December	26
3	20
4	34 (Hailstorm.)
5-12	56
13	25
14	5
15	5
17	6
19	36
20	86
24	6
27	11

TABLE No. 4—RECORD OF RAINFALL DURING PERIOD OF EXPERIMENT—*continued.*

Date.	Precipitation. (Points.)	
3 January	7	
6	20	
9	5	
13	7	
14	55	(Heavy storm with hail.)
19	25	
23	61	
24	11	
3 February	10	
4	20	
5	22	
6	80	
8	45	
11	46	
12	10	
13	8	
14	82	
15-17	510	
20	435	
16 March	130	
20	30	
28	48	

EMPIRE INDUSTRIES.

BRITISH CAPITALISTS' QUEST FOR PROFITS FROM FOREIGN TRADING.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, announced recently that his notice had been called to a statement that appeared in the cable news of the Melbourne "Age" of the 20th March to the effect that the Union Cold Storage Company had entered into a contract for the marketing of all Russia's dairy produce in Great Britain.

Sir Edmund Vestey, one of the directors, had stated that the company had traded satisfactorily with Russia for some time and was now extending to the Soviet a credit of £500,000, as well as 70 per cent. of the value of dairy products as soon as they are shipped. The Soviet would utilise these credits on dairying developments in Siberia and the Urals.

Mr. Forgan Smith added that in the event of the cable being substantially correct it was manifest that the British capitalists are much more interested in the quest for profits from trading than they are in the conservation of the industries within the Empire. The purchase from foreign countries of products that are being raised in abundant supplies within the British Dominions did not seem to be a policy that was likely to advance or cement trade relations between Great Britain and the Dominions. The Imperial Government has set up the Empire Marketing Board in order to foster trade within the Empire, and it appears that efforts in that direction will be abortive of real value until the capitalistic section generally is prepared to give wholehearted support to the objectives of the Board.

It has been the practice of Great Britain to draw largely from Denmark for dairy produce, and the output of butter and cheese during this season, both from New Zealand and Australia, will be quite up to the average in quality and tonnage. Any improved facilities that are now being offered by British capitalists for the intake of dairy supplies from Russia cannot do other than increase the keenness of the competition amongst sellers on the London market, with the possible result of an unhealthy slump in prices.

The expansion of primary industries in Australia and New Zealand is dependent largely on the prices realised for the resultant products on overseas markets, and in this connection Great Britain is legitimately looked upon as a centre for absorbing a proportion of the increased production. The maintenance of a stable market overseas has also its effect in enabling our primary producers to keep their place on the land, a condition of affairs which is desirable in the interests of the Empire generally as well as of Australasia.

THE BANANA IN QUEENSLAND.

By GEORGE WILLIAMS, Director of Fruit Culture.

Since the publication of the 1919 edition of "The Banana in Queensland," the industry has materially increased in most districts, including the northern part of the State. Unfortunately, the banana weevil borer has similarly extended its ramifications, so that few districts are now free from its presence. Bunchy Top also made its appearance in the Southern district, and has been responsible for serious losses and decreased output in that area. Fortunately, it is confined south of the Maroochy River, so that the main producing centres are not influenced. The Gympie district has shown the greatest advancement, and can reasonably be expected to provide the main supplies for some time to come. The possibility of much expansion in the Northern district exists, but much care is essential in new districts that plants free from disease only are introduced. Though the effect of beetle borer is much minimised under purely tropical conditions, thrips responsible for spoiling the appearance of the fruit are fairly general, and the banana fruit fly is also apt to make its presence felt. The latter can be excluded by netting the bunches with joycenet, and, in suitable soil under generous and regular rainfall, thinning of suckers can be so arranged as to gauge the season of maturity and eliminate fruit maturing during the most unfavourable months of the year—a most important factor which cannot reasonably be applied in the Southern and Central districts. It will be admitted that the recent season's influence has been against the general production of first-quality fruit, but other influences may also be cited. The land selected is not always of the best quality, and the tendency is to plant a larger area than can satisfactorily be worked by the labour available. In many plantations, de-suckering is not practised to the extent which it should be, and the application of fertilisers where required is not general. Various factors may operate against the application of most efficient means in the plantation, among which the extortionate prices or rentals for banana lands is not the least. Just what area of bananas can be satisfactorily worked by one man varies somewhat according to local circumstances, but 5 acres may be accepted as a fair estimate, and his energies restricted to that area will, if intelligently applied, command a better return than if distributed over twice that extent. Where tall-growing varieties are cultivated, the area may be extended, as a much wider space between rows and plants is allowed.

Owing to the possibility of the introduction of further disease, no new varieties have been introduced since the introduction of the Gros Michel, which is reputedly responsible for being accompanied by the beetle borer—though there is ample evidence to suggest that this pest was also introduced amongst the plants occasionally brought from the South Sea Islands by the labourers recruited from those parts. Its existence in the indigenous banana of the North may indicate the possibility of its being indigenous, but an examination of numerous plants in different districts some years since failed to reveal any indications of its presence which, being now freely evidenced, discounts such possibility; as also does the fact of large areas being under cultivation in different parts of the North where the wild banana was present and no trace of the pest was noted.

PLATE 83.—ON A QUEENSLAND PLANTATION, NORTH COAST LINE—CAVENDISH BANANAS AND PINEAPPLES.

Varieties.

Among the varieties commercially grown, Cavendish takes precedence. On account of its dwarf habit it is much less liable to injury by heavy wind, and though its fruit may not carry quite so well as that of the Gros Michel, its advantages in other respects fully compensate for this deficiency, more particularly in the Southern part of the State. It is successfully grown on the coast lands from the Southern border to Cooktown, and the heavy shipments originally made from the North were entirely made up of this variety. The bunches carried up to 30 dozen excellent fruit, which was mainly shipped in the bunch; bunches under 14 dozen were cut into hands and crated and carried by sea satisfactorily. The bunches received a more or less rough handling, and the only occasion for surprise was that the losses were not much greater than recorded.

PLATE 84.—BRINGING NEW LAND UNDER TRIBUTE—A BANANA PLANTATION IN QUEENSLAND

Sugar bananas were also exported from North Queensland in quantity, but invariably cased after being cut into hands, the cases being of 2 bushels capacity. Owing to its liability to the Panama disease this variety, which was at one time largely grown in the South, is now seldom seen, though in odd districts the plants are reported to have continued healthy. The growth being comparatively tall and slender, the foliage was subject to wind injury.

The Lady's Finger, of somewhat similar growth but more robust, is partially resistant to Panama disease and much less liable to affection by frost. It is almost entirely confined to the Brisbane district. The slightly angulated fruit, possessing a piquant flavour, is said not to be favoured in the Southern markets.

The Gros Michel is the tallest grower, attaining under most favourable conditions in North Queensland a height of 30 ft. Plants were some years ago distributed to various banana districts, but the

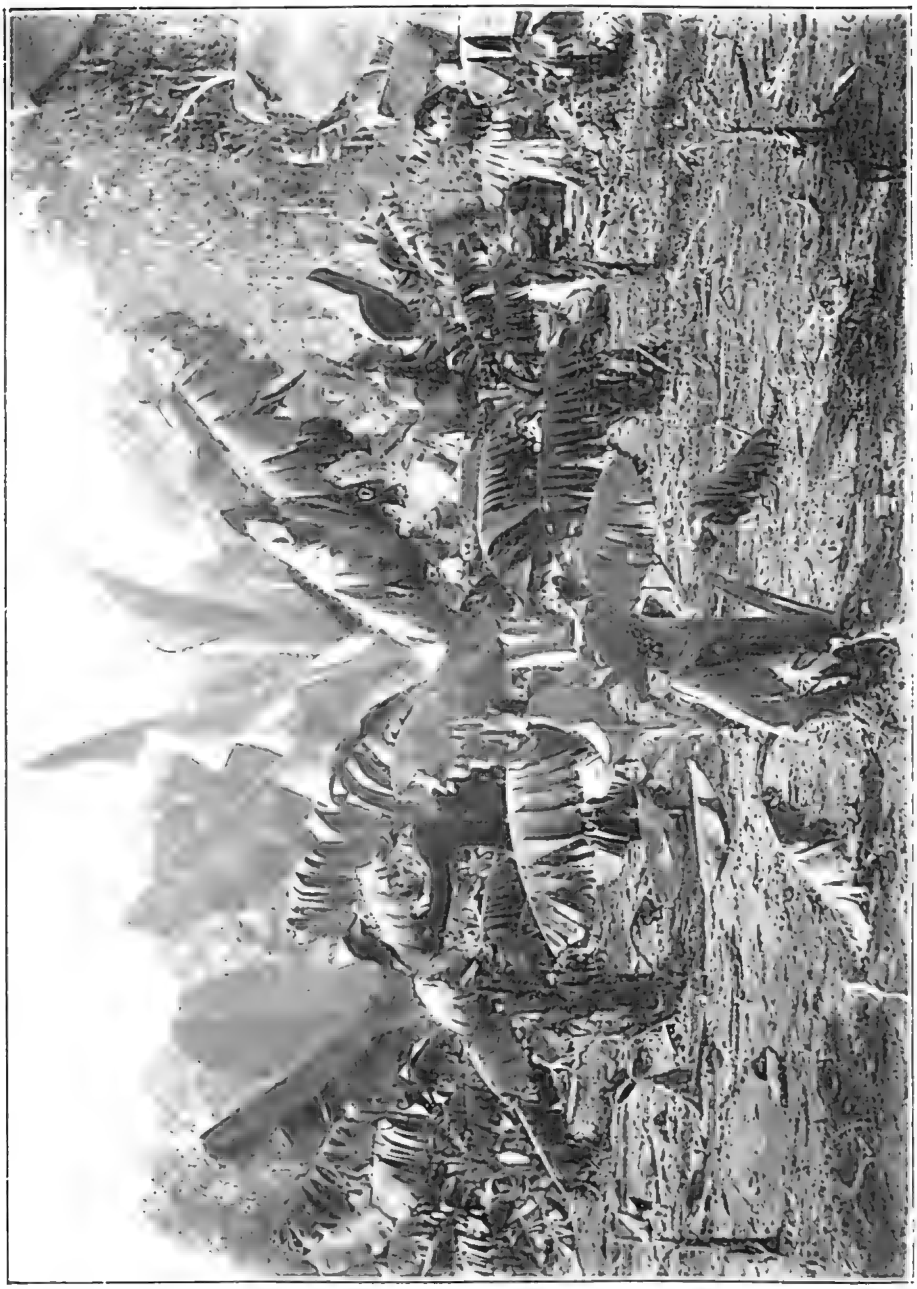

PLATE 85.—CAVENDISH BANANAS AT WOOGUMPAH, FIVE MONTHS AFTER PLANTING.

variety was recognised as not being well adapted to the Southern division. It luxuriates in the wet belt of the North, and where planted in well-sheltered localities can be expected to be satisfactory. It is claimed that the flavour of the fruit is not equal to that of the Cavendish, but as a marketable product the Gros Michel has the advantage in size.

PLATE 86.—"LADY'S FINGER" BANANAS GROWN AT PINKENBA, NEAR BRISBANE.

The fruit is produced on long bunches with much wider interspaces than those of the Cavendish. It is usually much less curved, which is an advantage in packing under the system now practised. Specimens of this variety recently received from Mr. W. Nott, Kennedy, were $10\frac{1}{2}$ in. in length and $6\frac{1}{2}$ in. in circumference.

Other less-known tall growers are the Dacca and Red Dacca (also called Claret and Ruby). Specimens of Red Dacca from the same grower were 8 in. in length and 7 in. in circumference. A variety also known under various names but principally Mons Marie, really a taller-growing type closely allied to the Cavendish, is included in small quantity. Various claims as to its local origin and superiority in various respects are ill-founded as it has no advantage over the original Cavendish, except in height attained, which is not a desirable one. Several less-known varieties are represented in odd specimens in parts of the State. The Plantains, of which three kinds were available some years since, have practically all gone out of cultivation.

Unfortunately, all our tall-growing varieties are subject to Panama disease—the Lady's Finger being the least susceptible. In districts where thrip is present, a disadvantage with the tall kinds is the difficulty in making application against this pest, which in infested bunches spoils the appearance but does not affect the quality of the fruit. Dusting the bunches in their earliest stages (the bracts being removed to give access) with a mixture of pyrethrum powder and finely sifted wood ashes is successfully applied in Fiji and has also given good results here, but calcium cyanide applied with a bulb duster is said to give equal results. The latter, however, loses its efficacy in less than half the time that the pyrethrum does, and the calcium dust is liable to seriously deteriorate even in air-tight containers when a portion of the contents have been removed. This is a most important detail which must be taken into account by growers who have adopted the use of cyanide dust. On account of its dwarf habit and consequent accessibility, and the fact of its being less subject to injury from heavy winds, the Cavendish variety is recommended for general planting. The Lady's Finger will, however, flourish under conditions which would be fatal to the Cavendish, though it is recognised that to obtain the best results most fertile soils reasonably well drained are indispensable.

Essentials of Success.

The initial and most essential features of successful banana culture are that the site selected is above frost level, that the soil is suitable, and the situation favourable, aspect and shelter being incidental to the latter. In the Southern and parts of the Central district high land is selected, generally of volcanic origin, though rough, stony, fertile ranges are fairly satisfactory. Steep slopes, offering difficulties in collecting the fruit, otherwise suitable, are freely availed of. They, however, present the disadvantage of being unsuitable for other forms of agriculture or horticulture after being deprived of their original fertility by the banana. Shelter is provided by the native timber where this is allowed to remain around the boundaries of plantations; the clearing of large areas is deprecated. One has only to glance at the general appearance of the plants in a sheltered part of an otherwise exposed area to observe the benefit. It is recognised that in a very narrow fringe of scrub growth much of this succumbs, but suitable land in the State is not so restricted that a fair margin of "cover" could not be allowed.

In the Northern district soil conditions are dissimilar. The coastal volcanic hillside soil is mostly of a loose, open nature, not capable of the retention of sufficient moisture, without which bananas will not flourish, and the effect of a dry spell in this class of soil is disastrous. The fertile

PLATE 87.—CAVENDISH BANANAS—A SPECIMEN HAND.

alluvial lands give very much better results. The growth is even and fairly continuous, and under such conditions de-suckering can be practised to the extent of determining within six to eight weeks when bunches will be in suitable condition for the market. It must, however, be remembered that a fairly accurate gauge as to the time of fruiting can only be applied to suckers in the sword leaf. On first appearances the sucker displays no foliage, subsequently it develops the narrow or sword leaf, and later its full foliage. After the latter stage has been in existence its age cannot readily be determined. The preliminary preparation of scrub lands is confined to merely felling the timber at a suitable time, firing, followed by logging—that is, cutting up the smaller unburnt branches or trunks up to 6, 8, or 10 in. or even larger diameter into suitable lengths and stacked for burning, heavier timber being allowed to remain where it fell. Although what is called a good burn—that is the destruction of a good percentage of the heavy branches in addition to small branches and foliage—is no advantage to the plant but rather the opposite, as to ensure it the surface soil must be in a dry condition and much of its most important ingredient, humus, destroyed. In tropical America the general practise is to first plant the sets or bits and fell the timber afterwards and leave it without burning, but in the dense growth of our vine scrubs this method is not applicable.

Planning and Planting.

Following clearing, marking out land according to distance which rows and plants are to be spaced will be attended to. Much has been written regarding the most profitable distance—one advocate stressed 6 ft. intervals with one follower to each plant; others 9 ft., 10 ft., and 12 ft. The latter distance has found the most favour where the Cavendish is planted, three followers being permitted in the first instance, and these in turn by one each. It should be recognised that a given weight is procurable from an acre, and the object is to attain that weight in the least number of fruit; also that overcrowding in addition to reducing the size of its product tends to materially shorten the profitable life of the plant. With tall-growing varieties, 16-ft. to 18-ft. spaces are favoured, and five to six stems allowed to develop as they take longer in coming into bearing than the Cavendish.

Removing the soil to form a hole of the required size and depth for the reception of the plant butt or part of a butt which is to be planted is the next operation. Diversity of opinion exists regarding the depth of planting which gives the best result, and returns are quoted in support of the various depths advocated, but the influence of soil, drainage, and location, also local conditions, each of which have an important bearing, are generally overlooked, and no hard-and-fast rule can be laid down. The depth of hole must be decided by local factors. In the deep alluvial soils of the Northern district, 18 to 20 in. would not be excessive; in some of the shallower Southern soils 12 in. would be sufficient—dependent on the size of the plant to be received. It would be detrimental to plant deeply where the subsoil is of a close nature, and though bananas could not be expected to give best results under such conditions their inclusion is much too frequent. It is generally accepted that whatever plant is selected—whether suckers, butts, or bits—the base should not be covered by more than 6 in. of soil. The deeper holes are not nearly refilled but are left for the complete filling to be gradually accomplished by other agencies, including the development of the plant. In refilling to whatever depth practised,

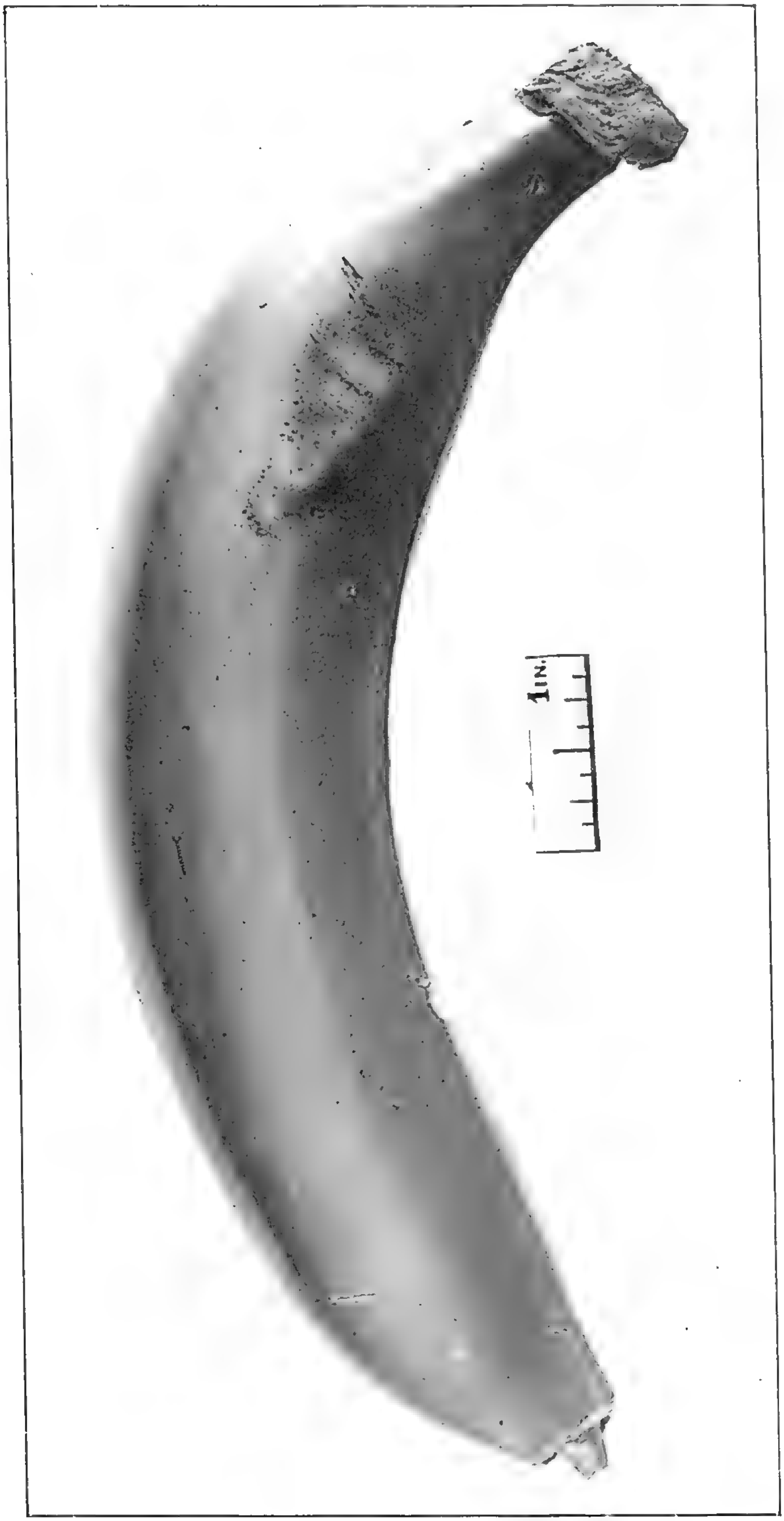

Plate 88.—The Cavendish Banana.

instead of utilising the soil which has been removed the general practice is to break down with the mattock the surface soil immediately surrounding the hole, which, in addition to providing friable earth for the young roots to start in, forms a shallow basin which generally assists in the complete refilling being gradually effected. On hillsides or slopes, particularly where the fall is very marked, preparation for the reception of the plant offers more obstacles, but the same principles apply throughout. The most desirable seasons for planting vary according to latitude and rainfall, and, whilst in the Northern district it may be practised during the greater part of the year, it is desirable in Southern banana areas to confine to the early warmer months—some growers averring that planting after the end of December is inadvisable, others consider that the end of February is not too late—but early planting has the advantage of summer rains, which, aided by humidity, very materially assist growth. A result of late planting frequently is that a good hold of the soil is not obtained nor a robust constitution developed before the depressing influences of winter are felt.

Plants.

In tropical America planting is confined almost entirely to sections of butts called "bits"; in this State suckers (young offshoots) are almost entirely used, mainly on account of their availability and convenience for transport. Butts are rarely used. Almost every banana grower is acquainted with the most suitable type of suckers for planting, but the generality of planters are not, and are obliged to rely upon what is available. Size is not such an important feature as vigour, which is indicated in the diameter of the sucker and its length. A short tapered shape in young ones which have not developed foliage is most desirable. When the first leaves, which are very narrow in comparison with their length (hence are known as sword leaves, have developed, practically the same shape of sucker should be maintained. In the later stage, when the developed foliage is shown, the pseudo stem should be enlarged to correspond with the butt. In the first stages of full foliage, should suckers in this stage be utilised for planting, the stem should be cut off well below the foliage. If used at a further stage of development, the stem should be removed close to its base, and the centre gouged out sufficiently to prevent further growth from that source. The butt will be found to contain several more or less developed buds or eyes distributed over its surface, and two or three of these situated as near equidistant around the butt as possible are selected to remain, the others each having their "eye" gouged out to prevent growth other than from where it is intended to originate. The advantages of butts are that two or three (according to "eyes" permitted to develop) first bunches of good quality will be produced against a single bunch of generally second quality from a sucker; also the followers (the suckers which in time show up) are more readily controlled. The disadvantages are, difficulty of procuration and transportation, preparing and planting, and in districts where borer is present the impossibility of reasonably detecting its presence. The system of planting bits, wedge-shaped sections cut from a fairly well developed corm or butt each part containing one or more eyes, has more to commend it. Cutting the corm or butt into sections offers the greatest facility for determining whether beetle borer infestation is present. Whichever method is adopted either by planting butts, bits, or suckers, the greatest care is necessary to ensure the borer not being introduced with the plants, which should be unpacked and carefully prepared at some distance

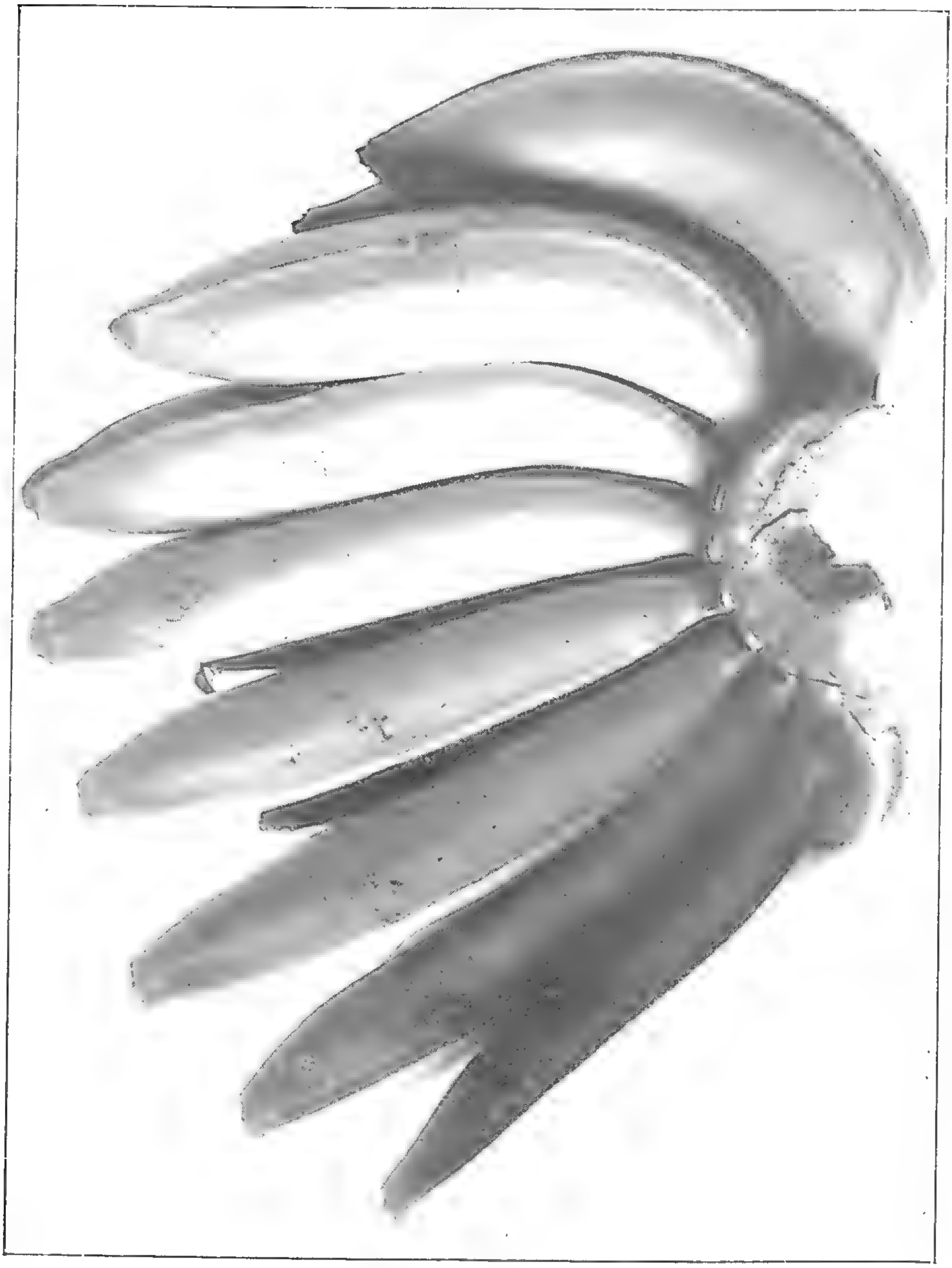

PLATE 89.—GROS MICHEL BANANAS GROWN BY W. NOTT, KENNEDY, NORTH QUEENSLAND.

from where it is intended they are to be planted. The material in which they are contained should be immediately burned following unpacking, which receives first attention on arrival.

Each plant should be carefully trimmed, roots cut close in to their bases, and the removal of all superfluous parts systematically performed; the removal of the lower extremity of the base of a sucker is often desirable, and the light paring of the external covering of the remaining part of the base advantageous. The immersion of plants for two hours in a solution of 1 oz. of corrosive sublimate in 6 gallons of water before planting has been recommended, and much could be said in its favour. Against thrips, immersion in a solution of tobacco sulphate has also been practised, yet by far the safest practice is to procure plants from a district free from such pests. But this does not remove the occasion of the trimming of plants to obviate the introduction of nematodes, an insidious pest working in and destroying the roots of plants and established more or less throughout the State, in respect of which the following extract by Henry Tryon from the 1919 edition is worth including:—

"This account of the disease as being due to the attacks of a parasite nematode, named *Heterodera radicola*, shows further that it is identical in origin and nature to a plant affection of very wide occurrence in the vegetable kingdom. This, Dr. A. B. Frank informed us already in 1896, as the outcome of his own observations and those of other inquiries, affected fifty different plant-species distributed in no less than thirty families—a statement that, as we now know, does not cover the full range of its distribution. According to this, the literature that has a bearing on the banana disease under consideration is very comprehensive indeed.

"The subject of the nature and cause of the disease is as fully treated of as is necessary for the purpose of this Bulletin; but it may be added that its virulence is not dependent on the number of nematodes attacking the root system so much as on the occurrence of such soil conditions as may contribute to the decay of parts already infested, and exhibiting the structural injuries that they are wont to determine, as fall to the well-being of the various organisms that promote this decay.

"Again, it may be remarked also that the parasite persists for a considerable period in the soil, during which it lives a free life or may remain there dormant in the egg; and that, in consequence of this, it can be disseminated by any agency by which soil or its particles are transferable—e.g., by flood water, horse implements, &c., and even occasionally by the wind.

"It may, too—as we have seen—establish itself in the root systems of many different plants, both weeds as well as cultivated ones; and hence not only can it be conveyed from spot to spot by their agency, but these various plant hosts offer the opportunity for its multiplication. Commonly, plots of bananas grown in Southern Queensland become infested with nematode gall worms by planting in land they occupy seedling tomato or tobacco plants already harbouring them. Accordingly, it is important that the agriculturist should study to recognise this disease in all plants liable to its attack, even in the earliest phases in which it betrays its presence in them.

"Again, banana plants become affected by it through being planted in soil in which nematode worms are already prevalent through having grown plants victimised also by this 'Root Gall.'

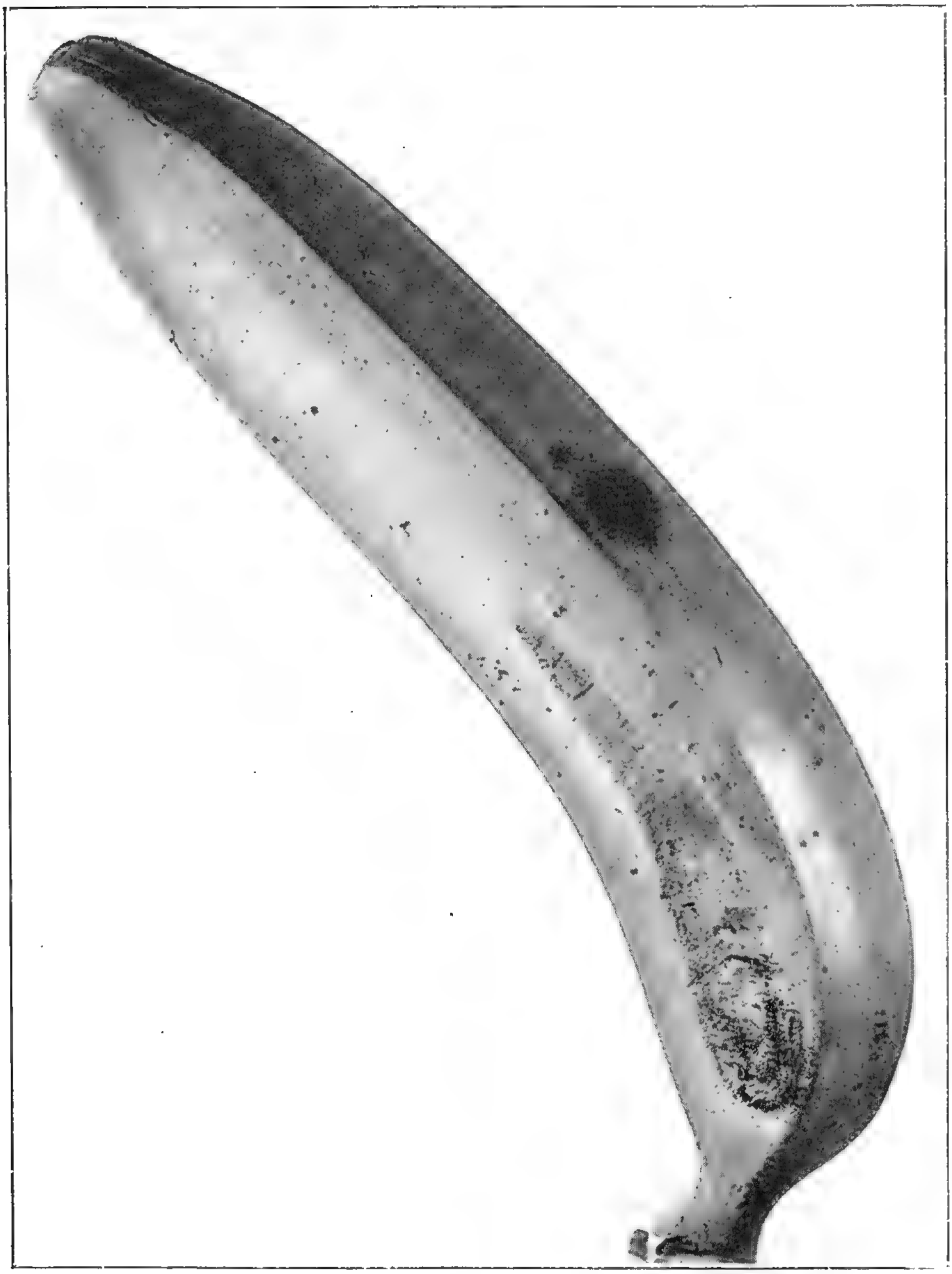

PLATE 90.—A SPECIMEN GROS MICHEL BANANA ($10\frac{1}{4}$ in. x $6\frac{1}{2}$ in.) GROWN BY W. NOTT, KENNEDY, NORTH QUEENSLAND.

"REMEDIES.

"With regard to the question of remedies, it may be pointed out that the nature of the malady is such that, as is obvious, direct applications to the plant will be of no avail. Nematode-affected plants sooner or later die, even though in dying they may yield fruit, and when they do not die, ill-health soon renders them unremunerative.

"As to treating the soil in order to rid it of root-destroying nematodes already present therein, measures that are available are not practicable under the circumstances of banana plantation in Queensland, and perhaps of those elsewhere also; and even so, were the cost connected with them not too excessive to admit of their application. These measures consist in sterilising with steam or high temperatures otherwise attained, or by the use of chemicals—themselves harmless to the soil. When the nematodes are prevalent in the soil, their number may doubtless be reduced to harmless proportions by the use of trap crops. This method involves planting some crop that the nematodes are specially partial to, and therefore will soon infest, and removing this carefully with its root system entire, before sufficient time has elapsed for mature eggs to arise, and these or the young worms issuing therefrom to gain access to the soil, and on such extirpation being perfected, introducing the cultivation of the plant to be raised.

"[*Note.*—From experiments conducted by Strubell in connection with the allied gall-worm of the Beet Root (*Heterodera schachtii*), this degree of development will take place in as short a period as five weeks.] This costly method has been found practicable and efficacious in dealing with so valuable a crop as the Sugar Beet. In practice the use of the trap crops has to be repeated several times, and the soil, in the intervals of successive planting, kept well tilled and free from weeds.

"It is, however, essential to adopt every means that can be suggested for excluding the parasitic nematode from land as yet 'clean,' and to especially provide that suckers employed to establish the banana plantation are quite free from disease and have been derived from plants that are themselves similarly healthy; but, since the detection of the disease is not always readily effected, this is a matter of no small difficulty.

"In Egypt, attention has been concentrated on procuring a banana that, whilst possessing the high qualities of the Cavendish variety, is highly resistant to nematode attack. Some success has already, it is stated, followed efforts in this direction; but these have not, in our opinion, so far produced results of any material value."

With the exception of isolated districts, the presence of beetle borer in varying degree is noted, and no practical means have been found for its eradication. Control to a great extent may be applied by dusting freshly cut surfaces of corms with Paris green and flour, or a mixture of Paris green and borax, and the labour entailed in providing and maintaining a supply of fresh baits is well expended. De-suckering is practised throughout the season when beetles are most active, and the cut surfaces of suckers offer a ready medium of applying the poison. Though the beetle was considered incapable of flight, late events have demonstrated its ability to cover long distances. Where its presence in isolated stools or plots is noted in otherwise clean plantations, digging out and burning all stools suspected of being infested should receive immediate attention and poisoned baits liberally applied in the vicinity.

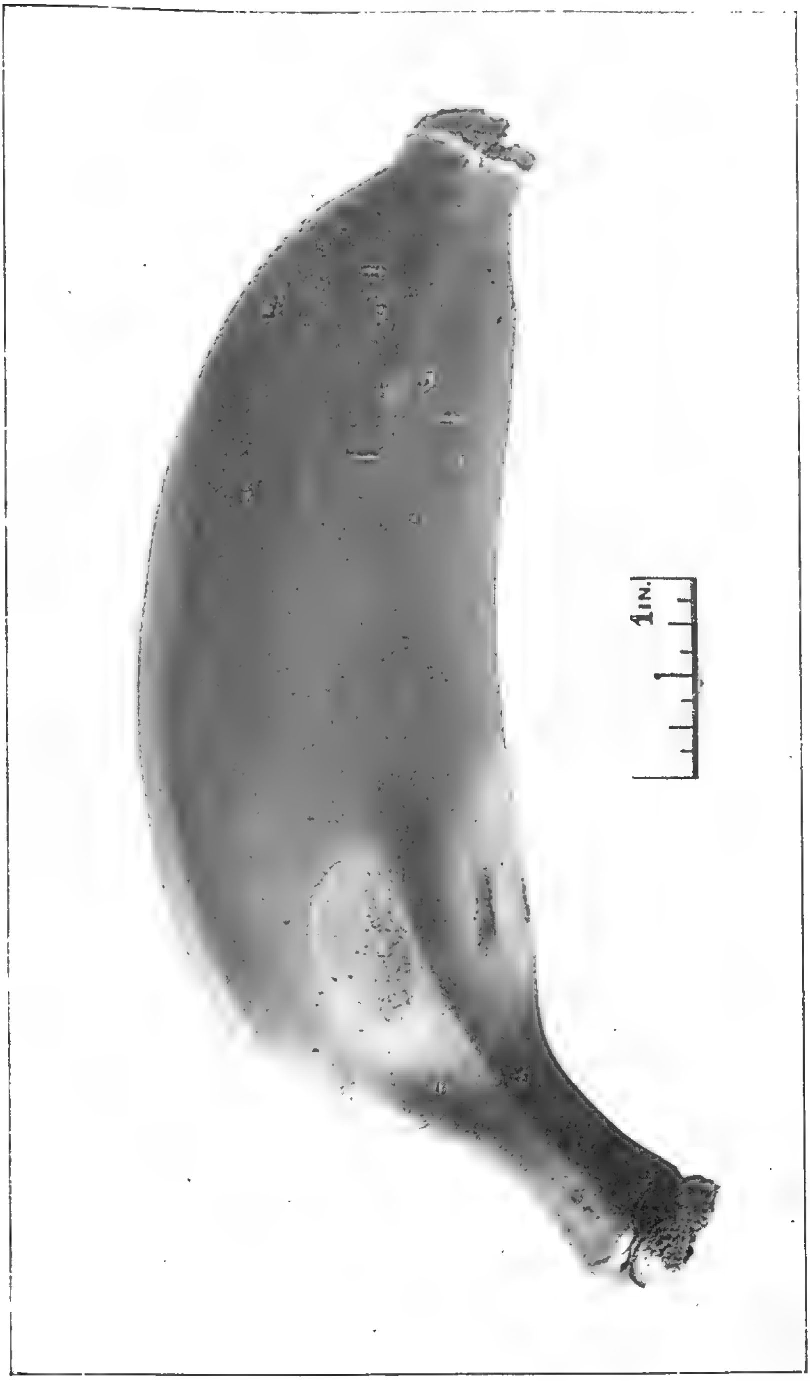

PLATE 91.—THE "LADY'S FINGER" BANANA.

Spacing.

The distances to be allowed between plants of the Cavendish variety has been a contentious subject, one literary grower persistently advocating 6 ft. as being quite sufficient for the Cavendish variety, each original plant being allowed one follower. For most obvious reasons the idea never caught on, 12 ft. being generally accepted with 9 ft. and 10 ft. in some localities. In good soil favourably situated, 12 ft. is considered a good average distance. This admits of the development of three stalks, each with one follower, which has been found more economical than lesser spaces where two or one follower only had room for development. Overcrowding in any sense is reflected in the size of the fruit.

Given fair conditions with the soil firmly trodden immediately around it, the young banana plant will require but little attention for some time, but weed growth will often be sufficient to warrant regular attention. Weed crops vary according to soils and districts, but all are treated alike and removed in the earliest stage possible. In isolated localities the introduction of new weeds, or rather permitting them to seed when introduced, requires attention. During continued wet weather keeping plantations reasonably clean, particularly where weed growth has secured a good preliminary hold, is practically impossible. On hillsides where the soil is liable to wash, the chipping of weeds is often undesirable, but planting the interspaces with cow-pea prior to the wet season will go a long way toward smothering the average weed, whilst serving the purpose of holding the land against wash. Two rows between each row of bananas will form a useful cover. Beans have been recommended, but their volubile habit entails much time in removing them where ascending the plants. Where land is most liable to erosion, and particularly where interspaced with stone, spraying to destroy weeds may be preferable to chipping. A satisfactory weedicide is obtainable on the Brisbane market at a reasonable rate, but, for the benefit of those who prefer making their own, the following formula may be given:—$\frac{3}{4}$ lb. of arsenic, 2 oz. of caustic soda boiled in 4 gallons of water. The addition of $\frac{1}{4}$ to $\frac{1}{2}$ lb. of soap will assist adhesion, and is essential in dealing with several forms of glossy foliage. Care should be taken that the fumes are not inhaled in boiling. Beyond weeding little can be done in a young plantation, particularly where situated in new scrub land, and intercropping is seldom practised, and, where given effect to, due regard should be given to the fact that the nutritive properties of the soil absorbed in the process are only lent and should be returned with interest. Beans, peas, and dwarf vegetables may be included, but planting tomatoes amongst bananas is at all times deprecated.

Cultivation.

Regarding cultivation of the soil in banana plantations, most of this must be done by hand; more often it is left undone. The land is frequently cropped until no longer profitable, and the old stools allowed to remain to breed and disseminate disease, if present. Where cultivation is possible it should be practised, and fertiliser as required to maintain the output worked into the soil. The energy required may be laborious but is profitable, and a light hoe-fork, where horse implements cannot be used, is the most suitable tool for the job. During winter months it will be found that the majority of banana roots are practically

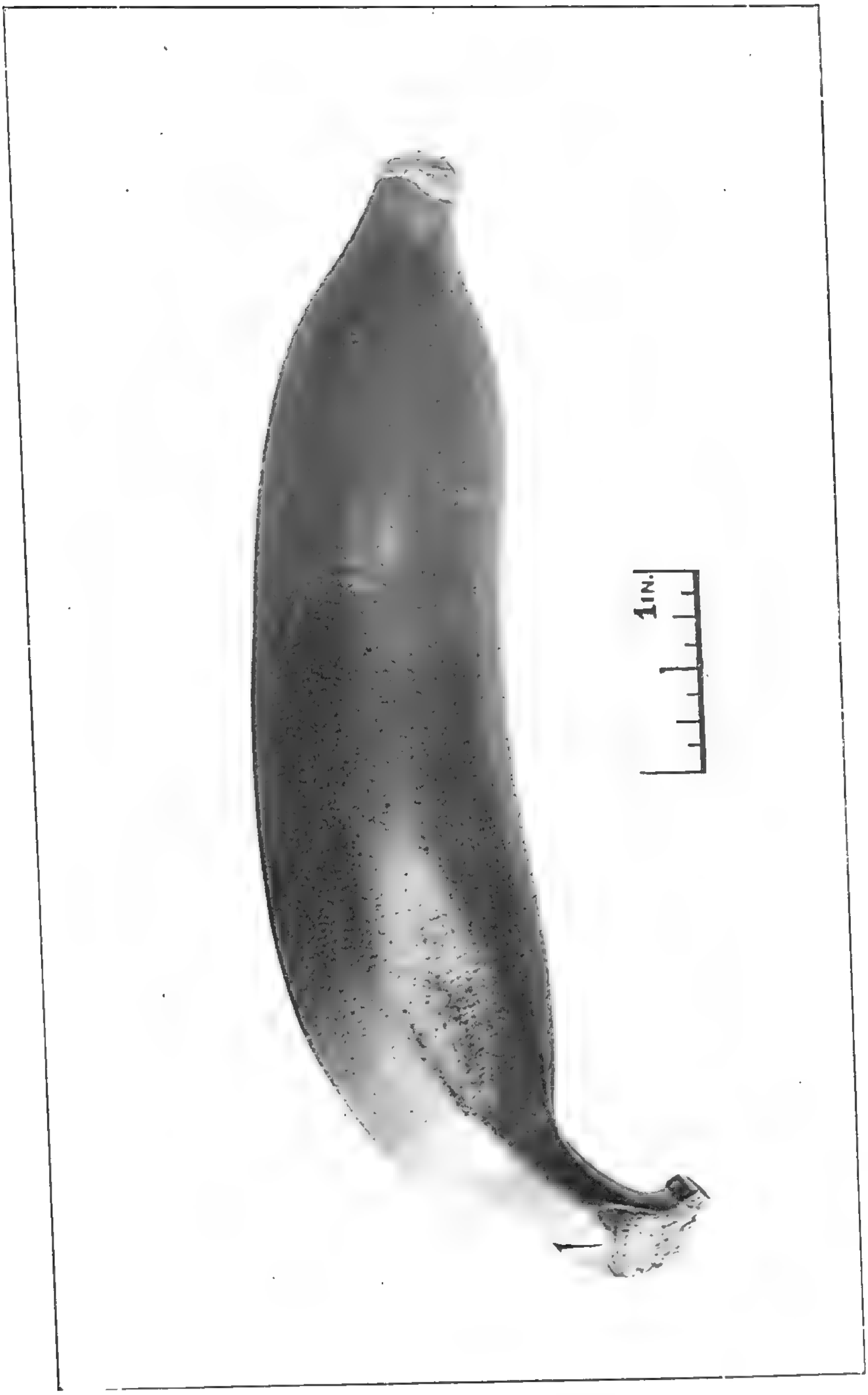

PLATE 92.—THE SUGAR BANANA.

dead or useless for absorbing sustenance, consequently working the land at this season will have no appreciable detrimental effect on the plant but the benefit evidenced in the spring growth most pronounced. The question of subsoiling by explosives for bananas is favoured, and where judiciously carried out during the drier winter months, also where charges have been exploded where plants are to be placed, has shown excellent results. Though the plant is usually looked upon as a surface rooter, given reasonable facility, roots will be found several feet beneath the surface, hence the reason for the finest Northern fruit being produced on a deep, free loam.

Following the growth of the original sucker—the feature no less noticeable in butts or bits—as it develops young suckers will in turn appear around its base, and the advocate of any system of de-suckering is sure to meet opposition even to the extent of advocacy of allowing all such to develop. A prevalent idea is that no suckers should be removed from the original plant until this has produced a bunch. Under some conditions this may be applicable, but the removal of the surplus is admittedly desirable if it could be effected without root injury. This raises the question of the most suitable tool for the purpose; the mattock, crowbar with a special bend for the purpose, grafting or draining tool, each has advocates, also the narrow gouge made under local patent. This is practically identical with the tool in use in the principal plantations in other parts of the world and is considered superior to anything else that can be applied. Desuckering should be effected in early stages, and cutting out the sucker with a wide blade severs the roots at a time when their whole energies are required for the sustenance and development of the productive plant. Injury to the main plant's base is cited against applying the method in the first instance, but the fact that the growth of the banana is from the interior and not the external layers minimises the possibility of effect of light external injury other than that applied to the roots.

Fertilising.

As would be expected from plants yielding such heavy crops, there is a constant drain on the fertility of the soil, and no matter how freely this may be present in the natural state, the effect of gradual depletion will be exhibited by the plant and also in its fruit as the process proceeds. A rather general belief is that fertilising need not be resorted to until the plants indicate its requirements, but this is false economy. Upon the maintenance of fertility, which includes humus, the life of a plantation under fair conditions much depends. The fertilisers recommended by the Agricultural Chemist (Mr. J. C. Brünnich) are as follow:—

"The humus content of the soil must be kept up by mulching with green manure crop, leaf mould, stable manure, &c., and any acidity in the soil must be overcome by liming with lime in the form of carbonate of lime, as limestone, shell sand, limestone screenings, &c.

"Even on exhausted soil, as long as the soil is in good physical condition and contains humus, bananas may be successfully grown by the aid of artificial fertilisers, applying from 5 lb. to 10 lb. of complete mixed fertiliser, 4-8-10, to each stool twice a year.

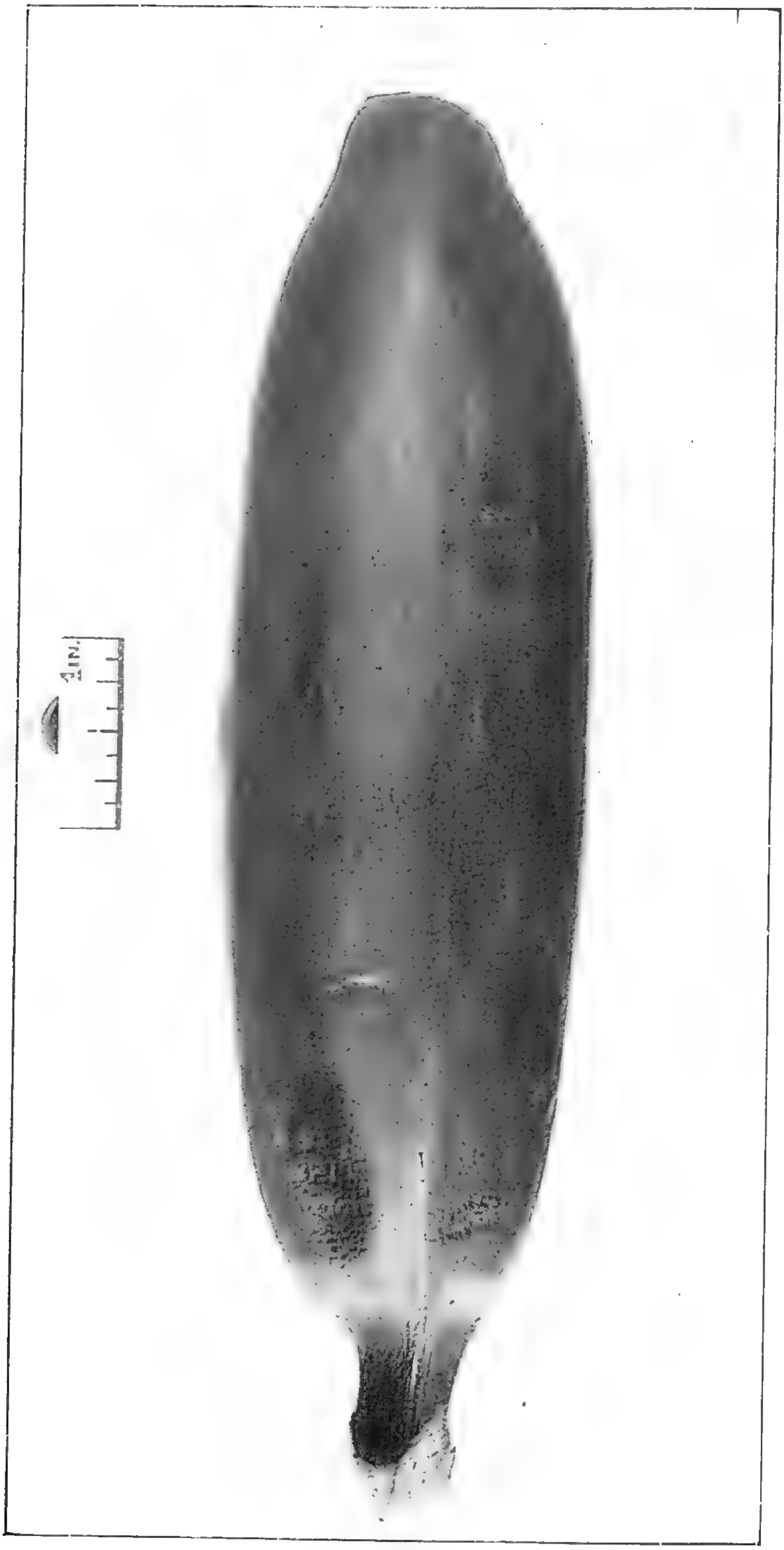

PLATE 93.—THE DACCA BANANA.

"The following mixtures will be found beneficial and will pay the grower by better returns of large bunches:—Use per acre—

Nitrate of soda, 2 to 3 cwt.;
Nauru phosphate and superphosphate mixed, 3 to 4 cwt.;
Sulphate of potash, 2 to 3 cwt.;

higher or lower amount according to age and quality of soil; or

Nitrate of soda, 2 cwt.;
Superphosphate, 1½ cwt.;
Sulphate of potash, 2 cwt; or
Dried blood, 2 cwt.;
Nauru phosphate and superphosphate mixed, 3 cwt.;
Sulphate of potash, 2 cwt.

"The artificial manure to be applied in two dressings—one towards the end of the summer, at the end of rainy season, and the other at the end of winter. Some soils contain a very small amount of salt, and in that case bananas will benefit by a slight dressing of common salt, up to 1 cwt. per acre, or by using muriate of potash in place of sulphate of potash."

Experiments conducted by the ex-Director of Fruit Culture in conjunction with the Agricultural Chemist at Buderim forcibly illustrated the practicability of bringing what were considered worn-out banana land to a stage of production equalled by its original cropping, but as much of our banana lands does not admit of applying the necessary cultivation and subsoiling, other means would be necessary where it was considered desirable to allow for future replanting. The advantages of a dense growth of lantana for reviving soil are well recognised, and though the process may be slow it is certainly effective. In the Mount Cotton district, an old cultivated area was abandoned to lantana for some years during which it grew profusely. More recently it was again put under bananas and has yielded most satisfactory returns. Adjoining scrub lands of similar formation, felled and planted for the first time failed to give equal results, though various fertilising formulæ have been applied to different small sections. For more rapid growth, and in many soils, probably equal effect would be obtained by planting the tree of Indian pea, though it would be necessary to keep the young plants reasonably free from weeds during the first few months.

Pests and Diseases.

Unfortunately, introduced pests and diseases have very materially added to the labour and trouble in banana culture, and the advantages of the maintenance of vigour in the plants is evidenced in respect of beetle borer in the North where the growth is fairly continuous and damage occasioned by the pests comparatively light. In the Southern district, abandoned plantations serve as a breeding ground, rendering the possibility of control much more difficult than if eradication of such was general. Fortunately, bunchy-top has been confined to the south of the Maroochy River, and its elimination, now that the origin of dissemination has been discovered, is a reasonable proposition. The information contained in the pamphlet on bunchy-top should be studied by every banana grower, so that he may recognise the disease on first appearance and promptly eradicate it. In parts of the Northern and a small area in the Southern district, thrips are responsible for causing injury resulting in the appearance of the fruit to the extent,

PLATE 94.—COPPER OR RED DACCA BANANAS (8 in. x 7 in. circumference) GROWN BY W. NOTT, KENNEDY, NORTH QUEENSLAND.

by discoloration, of its being practically unsaleable. This minute insect attacks the fruit in the earliest stages; the result, a browning of the skin, varying from slight indications between the fingers to the whole exterior of the fruit developing later. Various applications have been made to keep it in subjection, and in the North notings are being made as to whether its presence is general or seasonable. In Fiji, where the banana trade was a big item, a mixture of finely powdered wood ashes and pyrethrum powder was regularly blown by a hand duster amongst the young fruit, the bracts being removed for the purpose. Satisfactory results followed this method in Central Queensland. Calcium cyanide has been recommended, and a fair test under exactly the same conditions is being conducted.

What is widely known as leaf spot has, by a Fijian authority, been classified as identical with the Sigatoke disease, but a local authoritative pronouncement is awaited before accepting the identification as complete. Where disease is present it must receive attention; where apathy is shown it will attain the upper hand. The collecting, handling, and packing fruit are details to which most particular care and attention should be applied. Just at what stage to cut the bunch from the plant at the different seasons can only be determined by experience and observation, but the longer it is allowed to remain, consistent with reaching its destination in suitable condition, the better. It will be recognised that, during the cooler months, a much further stage of advancement can be allowed than under warmer conditions; accuracy can best be gauged by carefully noting the prominence in angles of the fruit, which become less noticeable as growth and development advance. The condition of heat and humidity (or its absence) prevailing during the growth of fruit also exercises influence on its keeping qualities.

Being of a soft nature with a particularly sensitive exterior, careful handling of the fruit in removing and transporting the bunch is most essential, also in the subsequent handling, though it is less subject to injury after being cut for twenty-four hours—particularly where dehanded—than at the time of immediately following the gathering. The market requirements of the Southern States are stated to be better met by fruit packed in 1½ bushel cases, either singly or in twos or threes, than by packing in hands or parts of hands, or in individual bunches. Whether the two former are the most efficient means of landing fruit in the best condition is disputed in favour of the third; but given suitable transport facilities, the bunch is the most effective method. Where any doubt exists as to the keeping quality of the fruit on the bunch it can readily be removed by partially disconnecting by bending several odd fruit on a bunch so that the fibres only retain them, and awaiting result. A straw wrapper, samples of which have been submitted by Mr. Skerman, is calculated to avoid much damage that would otherwise be inflicted on bunch shipments, but the disadvantage of rough roads and other difficulties encumber the adoption of bunch transport for the present.

Summary of Essentials.

The essentials to successful banana culture are:—Suitable soil in a sheltered situation free from frost, healthy suckers (or bits) for planting, that these be properly planted and that the necessary attention in weeding, working (where practicable), and especially desuckering be applied throughout the plantation. A most important recommendation is not to plant a larger area than can be efficiently worked.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar. 1928.	Mar., 1927.
North Coast.	In.		In.	In.
Atherton	9·08	26	7·69	6·48
Cairns	18·06	45	21·83	9·72
Cardwell	16·25	55	9·76	8·21
Cooktown	15·37	51	24·78	8·12
Herberton	8·17	40	6·72	6·27
Ingham	15·78	35	6·89	8·59
Innisfail	26·33	46	34·50	20·08
Mossman	18·07	14	15·47	10·37
Townsville	7·61	56	7·16	3·03
Central Coast.				
Ayr	6·77	40	5·84	3·48
Bowen	5·71	56	14·36	3·39
Charters Towers ...	3·65	45	12·15	4·35
Mackay	12·11	56	23·19	18·44
Proserpine	11·92	24	17·13	23·00
St. Lawrence ...	5·67	56	4·77	2·22
South Coast.				
Biggenden	3·93	28	1·78	8·24
Bundaberg	5·33	44	0·74	9·26
Brisbane	5·73	77	2·14	7·88
Caboolture	7·65	40	2·44	14·21
Childers	4·74	32	2·07	6·88
Crohamhurst ...	11·74	35	3·15	22·78
Esk	4·86	40	2·63	7·08
Gayndah	3·17	56	0·22	4·45
Gympie	6·21	57	2·13	17·01
Kilkivan	3·90	48	1·37	11·29
Maryborough ...	6·19	55	2·79	7·75
South Coast—continued:	In.		In.	In.
Nambour	9·32	31	3·58	18·24
Nanango	3·35	45	0·50	7·94
Rockhampton ...	4·71	40	2·92	5·66
Woodford ...	8·01	40	2·34	16·46
Darling Downs.				
Dalby	2·73	57	1·28	4·85
Emu Vale ...	2·45	31	1·56	3·82
Jimbour	2·54	39	1·11	6·40
Miles	2·67	42	0·39	5 85
Stanthorpe ...	2·69	54	1·86	3·24
Toowoomba ...	3·83	55	1·61	5·20
Warwick	2·58	62	1·19	2·05
Maranoa.				
Roma	2·73	53	0 78	1·06
State Farms, &c.				
Bungeworgorai ...	1·68	12	0·76	1·54
Gatton College ...	3·33	27	1·44	2·88
Gindie	2·61	27	1·95	6·51
Hermitage ...	2·33	20	0·88	2·56
Kairi	8·66	12	10·16	4·75
Sugar Experiment Station, Mackay	11·08	29	22·52	14·53
Warren	2·63	12	...	3·60

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

FRUIT AND VEGETABLES.

"*The Fruit and Vegetables Act of* 1927," which was passed last session, came into force on the 5th April, 1928, and Regulations have been issued under the Act.

These Regulations are similar to those issued under the Fruit Cases Acts, which this Act supersedes, with such alterations as have been found necessary. They prescribe standards for the cases to be used and grade standards for pineapples, grapefruit, tomatoes, apples, pears, bananas, oranges, and mandarins, and also make special provision for fruit intended for factory use. Maturity standards have also been prescribed, and these must be complied with before fruit is offered for sale.

PASTURE NOURISHMENT.

By providing grasses and other pasture plants with food in the shape of fertilisers, the quality of the herbage is greatly improved. The use of superphosphate stimulates the growth and seed production of legumes, which are extremely valuable plants in a pasture. The amount of mineral matter in the grasses and clovers is also increased, particularly the elements lime and phosphorus, which are essential for the animals' health and development. Where there is a marked increase in the lime content, the percentage of nitrogen present in the pasturage is also increased.

The main reasons, therefore, why sheep prefer top-dressed to unmanured portions of a paddock are that—

1. The percentage of mineral ingredients is higher in the former, and the animals' needs for such substances as lime and phosphorus are being supplied.

2. The top-dressed pasture is more palatable and contains a greater amount of protein, due mainly (*a*) to the increased growth of clovers, (*b*) to the increased percentage of nitrogen present in the pasturage as a whole.

An ample supply of protein is most important, as this is the chief supply of nitrogen available to the animal. Protein is required for the production of flesh, blood, muscles, tendons, ligaments, brain matter, wool, horns, hoofs, &c. Young growing animals, females producing and rearing young, and animals being prepared for mating, require feed which is well supplied with protein, in order that they may function properly. The amount of fertility removed from the soil by sheep grazing on pastures corresponds to the quantity of the marketed product, whether it be wool or mutton, or both, and to make up for this withdrawal, the material should be returned to the soil in some other form.

It will be seen, therefore, that by nourishing the pastures through the application of fertilisers, not only is the quantity of feed increased but a considerable gain in the nutritive value of the plants takes place. The universal use of superphosphate as a top-dressing for pastures is mainly due to the following facts:—

1. It stimulates the growth of leguminous plants, such as clovers, which are particularly relished by stock on account of their palatibility and high feeding value.

2. It encourages the growth of most of our palatable introduced grasses, and also many of our rapid-growing, nutritious native species.

3. It is an economical fertiliser to use, and the residual effect is apparent for more than one season.

Top-dressed pastures remain greener and consequently are more palatable to stock than unmanured areas, and by not drying out readily the danger from bush fires is lessened.

MORE HINTS FOR THE SMALL SHEEP MAN.

Reference was made in these notes recently to the operation of sheep classing and its importance to the owner of even the smallest flock. It was pointed out that in every flock there is room for improvement, and on account of the casual methods by which many of them are built up the need in the case of the small flock is usually particularly great. It was recommended that every sheep owner should periodically class his ewes at least to the extent of culling out all the low-grade animals, and some general directions were given as to the lines on which selection should be practised by the small flock owner from both the fat lamb and wool production points of view.

Culling.—When breeding for wool, states the Sheep and Wool Expert of the Department of Agriculture in the article quoted, the proportion to be culled will depend on the evenness of the foundation flock, and how drastic the owner is prepared to be. After the first culling, there will not be so many to remove from the original lot of ewes, although it will be advisable to examine the flock each year, as some animals may deteriorate quickly. As soon as the teeth become faulty it is well to cull such sheep out on account of age—"cast for age" as it is termed. The class of country and the amount of risk the owner is prepared to run if a dry season follows will decide at what stage it is wise to cull for age. Under dry conditions the aged ewes, especially if in lamb, are naturally the first to feel the pinch.

Each year the ewe hoggets will come up for inspection, and here judgment is required. On numbers of station properties, as high as 33 per cent. of the ewe hoggets are culled each year. This keeps the flock at a high standard and allows for a percentage of the cull hoggets to be fairly attractive and worth good prices in the market as breeders. When classing, the fact that the ewes are rearing lambs must be considered, as ewes with lambs at foot cannot be expected to be in the pink of condition; they should not, therefore, be culled because of lack of condition alone. If hoggets have encountered severe conditions after being weaned they may not be well grown, and it may be advisable to hold them over till a later period before passing judgment upon them."

When culled for any reason except for age, a distinguishing mark should be put in the plain ear so that they can be easily recognised in the yards, and on no account should they be bred from, as their faults are likely to be intensified in the progeny. The wisest plan is to try to fatten all the culls and dispose of them to the butcher at the earliest opportunity.

Comebacks and Crossbreds.—In a flock of comebacks, if breeding for wool, care should be taken that the size of frame necessary in a sheep of this type is not sacrificed to the production of a superfine class of wool. If the comeback flock is used for lamb raising, roominess of frame, milk production capacity, and early maturity must be specially considered.

These remarks concerning frame and conformation apply equally to a crossbred as to a comeback flock, though to a lesser degree. The main consideration in regard to the wool is to make the flock as even as possible, and because of the greater value attaching to the finer classes of crossbred wool, it is advisable to cull the coarser-woolled animals with the object of getting a flock that will cut a fairly even clip of medium to fine crossbred wool.

The Ram.—In selecting the ram for wool-growing purposes, the small flock owner is advised to go to some reputable breeder where he can be sure of procuring a pure-bred animal. If he is satisfied with his purchase—satisfied that improvement is being made in his flock by the introduction of this particular type—he should continue to use the same strain, as he will not get such even results if he buys from different studs even though the animals are apparently similar in shape, class of wool, &c. When buying a ram, or rams, it is well to have in mind the type of the ewes that it is intended to breed from, especially any faults or weaknesses they possess, for these may be corrected in the progeny by the judicious selection of a ram strong in those points in which the ewes are weak. For example, if the ewes are lacking in density, a ram with plenty of density should be selected.—Agricultural and Pastoral Notes, New South Wales Department of Agriculture.

QUEENSLAND SHOW DATES.

The following show dates have been listed by the Queensland Chamber of Agricultural Societies for the present year:—

MAY.	
Beaudesert	2-5
Taroom	2
Maleny	2-3
Longreach	2-3
Kalbar	2
Charleville	2-3
Wondai	3-5
Oakey	4
Mitchell	8-9
Mundubbera	9-10
Boonah	9-10
Murgon	10-12
Blackall	8-10
Roma	15-16
Gayndah	16-17
Ipswich	16-18
Springsure	16-17
Wallumbilla	22-23
Biggenden	24-25
Toogoolawah	25-26
JUNE.	
Marburg	2-4
Childers	2-6
Lowood	8-9
Bundaberg	7-9
JUNE—*continued.*	
Wowan	7-8
Miriam Vale	13-14
Gladstone	20-21
Mount Larcom	22-23
Gatton	28-29
Rockhampton	27-30
JULY.	
Mackay	3-5
Kilcoy	5-6
Esk	13-14
Townsville	10-12
Woodford	12-13
Nundah	14
Charters Towers	18-19
Caboolture	19-20
Ingham	20-21
Rosewood	20-21
Charters Towers	18-19
Laidley	25-26
AUGUST.	
Bowen	1-2
Royal National	6-11
Crow's Nest	22-23
Coorparoo	-25

WINTER FODDER CROPS AND FERTILISER TRIALS, CENTRAL DISTRICT, SEASON 1927.

By G. B. BROOKS, Instructor in Agriculture.

Winter Fodder Demonstration Plots.

During the past ten years it has been the practice of the Instructional Branch to arrange with farmers in suitable localities to plant various fodder crops in order to demonstrate the best varieties to grow either for dairying or pig raising purposes.

Largely as a result of these activities, the growing of winter fodders has become so universal in several districts here that it was decided to decrease the number of demonstration plots to four and to give increased attention to summer growing crops, mainly sorghums. The farms on which the plots were located are as follows:—J. R. Adsett, Jambin; H. Wolff, Ambrose; S. Hoare, Alton Downs; and J. Lindley, Wowan.

Providing Green Material for an Extended Period.

Although several varieties of cereals were sown in the respective plots, this was not done with the view of carrying out comparative trials, but to demonstrate the value of making provision for a supply of green material during the months when the natural grasses have lost their succulence. Owing to the climatic conditions invariably experienced during the winter in the Central district, the keeping up of a supply of green feed for the dairy herd by successive sowings of one variety cannot be profitably carried out. Given a supply of soil moisture, advantage has to be taken to sow a number of varieties which will mature at widely different periods. Planting is carried out as soon as the hot humid summer weather has passed, so that feed may be available during early winter. April has been found to be a suitable month in which to sow.

Varieties to Plant.

The following varieties were sown, maturing in the order given:—Skinless Barley, Cape Barley, Florence Wheat, Huguenot Wheat, Ruakura Oats. The oats invariably mature much later than the other cereals mentioned, consequently if not required for green feed can be converted into hay. Field peas were mixed with all cereals at the rate of half a bushel to the acre. This mixture not only gives greatly increased weights of green fodder, but adds very materially to its feeding value.

Rate of Seeding.

The rate of seeding per acre was as follows:—Wheat and Skinless Barley, 1 bushel; Cape Barley and Oats, 1½ bushels.

Seasonal Conditions.

There was sufficient moisture present in the soil at the respective places to ensure a satisfactory germination. Prior to coming into ear, however, a long, dry spell was experienced, more particularly at Alton Downs, where the soil is a heavy basalt. This had the effect of decreasing the returns, more particularly of the early maturing varieties.

Another feature that has an important bearing upon green weights is that, owing to the different periods of maturity, it was not always possible to visit the plots at the time when each sort was at its stage of maximum development. As already mentioned, it was not, however, a matter of comparative trials, but an effort to demonstrate to surrounding farmers the particular type of varieties to grow.

Yields of Green Material.

The weights of green fodders recorded at the respective places are as follows. Unfortunately, circumstances did not permit of the weights of the crops being secured on Mr. J. Lindley's farm, Wowan.

Winter Fodder and Fertiliser Trials.

Areas on which combined fodder and fertiliser trials could be carried out and extending over several years were arranged for in two districts, viz., Boyne Valley and Wowan. The crops grown were similar to those in the demonstration plots with the exception that field peas were omitted. As a result of the prolonged drought there was practically no subsoil moisture, consequently the crop had to depend almost entirely upon isolated showers. The trials at Wowan were carried out on the farm of Mr. A. E. G. Barnard, the soil being a brown Brigalow scrub loam and fairly representative of the district.

In the Boyne Valley the plot was located on the farm of Mr. A. J. Turner, Ubobo, the soil being a sandy, alluvial loam. Dry conditions were experienced shortly after germination, causing the respective varieties to come into ear very early, the result being low yields. The following table gives the quantity of the various fertilisers applied, together with yields of green material secured per acre.

It will be noted from the results that practically no benefit was obtained from the fertilisers applied. Any difference in weight would appear to be due to slight variation in soil.

WINTER FODDER AND FERTILISER CROP TRIALS WITH A. E. G. BARNARD, WOWAN.

Planted, 11th June, 1927—Tons per acre.

Plot.	Fertilisers—Cwt. per acre.	Florence Wheat.	Skinless Barley.	Ruakura Oats.	Hugenot Wheat.	Total.
A.	Unmanured	4·86	6·48	13·67	6·47	31·48
B.	1 cwt. sulphate ammonia 2 cwt. Nauru superphosphate 1 cwt. sulphate of potash	5·04	6·48	13·5	6·47	31·49
C.	1 cwt. sulphate of ammonia 2 cwt. Nauru superphosphate 1 cwt. muriate of potash ..	4·86	6·12	13·5	6·84	31·32
D.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	5·04	6·12	13·67	6·3	31·13
E.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate 1 cwt. muriate of potash ..	5·04	6·3	13·86	6·47	31·57
F.	2 cwt. dried blood .. .. 4 cwt. Nauru superphosphate 2 cwt. sulphate of potash ..	5·04	6·47	13·67	6·47	31·65
G.	Unmanured	5·22	7·02	14·4	6·84	33·48
H.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	5·04	6·12	13·5	6·47	31·13
I.	½ cwt. dried blood .. .. 1 cwt. Nauru superphosphate ½ cwt. sulphate of potash ..	5·22	6·47	13·5	6·47	31·66
J.	2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	4·86	6·47	13·67	6·3	31·30
K.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate	5·04	6·47	13·67	6·12	31·30
L.	1 cwt. dried blood .. .. 1 cwt. sulphate of potash ..	5·04	6·66	13·14	6·47	31·13
M.	Unmanured	5·04	6·66	13·32	6·47	31·49

Rainfall.—Previous month, 12 points; during growth, 800 points.

WINTER FODDER AND FERTILISER CROP TRIALS WITH A. J. TURNER, Ubobo, Boyne Valley.

Planted—8th June, 1927—Tons per acre.

Plot.	Fertilisers—Cwt. per acre.	Algerian Oats.	Skinless Barley.	Florence Wheat.	Hugenot Wheat.	Total.
A.	Unmanured	2·63	2·55	2·98	3·87	12·93
B.	1 cwt. sulphate of ammonia 2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	3·00	2·98	3·37	4·33	13·68
C.	1 cwt. sulphate of ammonia 2 cwt. Nauru superphosphate 1 cwt. muriate of potash ..	3·09	2·82	3·43	4·52	13·86
D.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	3·02	2·55	3·34	4·23	13·14
E.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate 1 cwt. muriate of potash ..	2·8	2·47	3·09	4·07	12·43
F.	2 cwt. dried blood .. .. 4 cwt. Nauru superphosphate 2 cwt. sulphate of potash ..	3·57	3·05	3·66	4·57	14·85
G.	Unmanured	2·98	2·25	2·78	3·64	11·65
H.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	3·14	2·47	2·91	3·86	12·38
I.	½ cwt. dried blood .. .. 1 cwt. Nauru superphosphate ½ cwt. sulphate of potash ..	3·11	2·47	2·97	4·02	12·57
J.	2 cwt. Nauru superphosphate 1 cwt. sulphate of potash ..	2·74	2·61	2·59	3·66	11·60
K.	1 cwt. dried blood .. .. 2 cwt. Nauru superphosphate	2·61	2·32	3·14	3·87	11·94
L.	1 cwt. dried blood .. .. 1 cwt. sulphate of potash ..	2·46	2·44	2·94	3·59	11·43
M.	Unmanured	2·28	2·27	2·55	3.34	10·44

Rainfall.—4th June, 4·23 points; total (on crop), 2·93 points.

DEMONSTRATION CROPS SUITABLE FOR PIG RAISING PURPOSES—CENTRAL DISTRICT, SEASON 1927.

While fodder crops previously mentioned provide for the dairy herd, the root crop plots are intended to demonstrate the advantage of making provision for a supply of pig feed for a period of some six months from planting. In order to carry this out, it is essential to utilise a number of crops that will mature in rotation, say, from the latter end of May to December.

The varieties included in the following list can be planted in the Central district during the latter end of March. There is considerable risk in planting prior to this date on account of aphis attack. Although Swede turnips may be sown somewhat earlier, there is little advantage to be gained by doing so, as the yellow variety, even if planted three weeks later, will be the first ready for use.

Varieties.

The crops selected, together with the time they become available for use (provided they are all sown during the latter end of March) are as follows:—

Rape—Available end of May and June—in a favourable season several cuttings are secured.

Yellow and Green Top Aberdeen Turnips—June and July.

Swede Turnip, Cabbage—July-August.

Silver and Sugar Beet, Field Carrots, Chow Moulier—August-October.

Long Red Mangels—October-November.

Yellow Globe Mangels—November-December. The Globe variety withstands the hot weather much better than the Long Red.

Method of Planting.

Sugar and silver beet, carrots, turnips, and rape were sown in rows about 2 feet 6 inches apart, sufficiently wide to permit of scuffling. All other varieties in 3-feet rows. The rape and silver beet were sown in a continuous row, the turnips and beet thinned to about 8 inches, the carrots from 4 to 6 inches, the Chow Moulier and mangels to 15 inches, while the cabbage was spaced somewhat wider apart.

It may be mentioned that, in the event of an indifferent germination of mangels and sugar beet, the blanks can be filled in by transplanting, preferably during dull, moist weather. On account of the enormous yields secured from mangels, the time spent in this work will be well repaid.

The following is a list of the growers, showing location and yield of the respective varieties:—

DEMONSTRATION ROOT CROPS, ETC., PLOTS—SEASON 1927.
Results—Yields in Tons per acre.

Crop—6.	J. Hales, Rosedale.	J. J. Kelly, Mount Larcom.	A. P. Lawton, Wowan.	S. Larson, Miriam-vale.	S. Larson, Colosseum.	A. Rake, Marlborough.
Rape, first cut	5·11	14·57	5·11	23·97	4·11	22·00
Rape, second cut ..	..	15·13	..	7·12	..	..
Silver Beet—						
First cut	15·72	17·28	6·28	13·75	15·22	14·00
Second cut	..	16·22	..	..	..	..
Chow Moulier	17·28	8·64	9·03	20·43	6·68	25·00
Pt. Aberdeen turnip ..	29·12	40·00	19·04	23·17	Not planted	Not computed
Gt. Aberdeen turnip ..	..	..	18·46	83·34	Not planted	Not computed
Field carrot	7·86	12·88	11·78	20·43	Not planted	19·00
Swede	31·07	40·15	21·12	39·82	Not planted	Not computed
Drumhead cabbage ..	21·22	25·53	6·28	22·00	Not planted	21·00
Sugar beet	34·72	22·41	16·00	40·20	22·40	Not computed
Long red mangel ..	33·50	33·50	28·39	53·14	31·11	29·11
Yellow Globe mangel ..	31·54	31·72	26·03	50·79	34·47	18·11
Planted	14–7–27	17–5–27	13–6–27	6–5–27	20–8–27	2–5–27

Pt.—Purple top.

Gt.—Green top. (This crop was not true to variety, being a white, soft, poor-keeping sort.)

IMMATURE ORANGES ON SOUTHERN MARKETS.

AN UNWISE POLICY.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, stated to-day that he had received a telegram from the Victorian Department of Agriculture to the effect that consignments of Queensland oranges were arriving in Melbourne in a green and immature condition.

The Victorian Department further intimated that the despatch of this fruit should cease or it will not be allowed to be sold in Victoria.

In commenting upon the above, Mr. Smith stated that it would seem that some of our growers, in their anxiety to catch the early market, are forwarding their oranges at least three weeks too soon. Apart from the injury this is likely to do to the citrus-growing industry of Queensland generally, the wisdom of such a policy, even for the individual, is very doubtful, as the green oranges in question have to compete with the ripe Valencia late oranges from New South Wales orchards that are now on the Melbourne market.

CONTAGIOUS MAMMITIS IN CATTLE.

METHOD OF VACCIN TREATMENT.

This serious disease is continually being brought under notice through outbreaks occurring in dairy herds, and its spread may be attributed partly to the carelessness of the dairy farmer and partly to the want of proper hygienic methods of controlling it.

The disease is a catarrhal affection and is limited, in most cases, to the delicate mucous membrane lining the milk ducts of the mammary gland. As a rule there is very little heat or swelling; moreover, the affected parts are not particularly painful.

The disease is caused by a tiny chain-forming micro-organism, or streptococcus, which attacks the mucous membrane and, by the development of its poisonous products or toxins, causes a rapid destruction of tissue cells and leucocytes (or white blood corpuscles) which are attracted to the spot. These dead cells produce that peculiar feature of the disease—a yellowish, purulent discharge, or pus, which can be withdrawn from the affected quarter.

Symptoms.

In the acute form the first symptoms are a diminution in the milk yield (usually in but one quarter of the udder); a definite acidity of the milk, and a tendency for it to become rapidly coagulated. Gradually the milk assumes a dirty, brownish colour and becomes more curdly, the amount of secretion from the affected quarter diminishing owing to the thickening of the milk ducts, which finally become impervious and the whole quarter is rendered useless. The lesions develop slowly, and first one quarter then another of the udder becomes involved, and later the milk secretion is liable to stop entirely. It will be observed in some cases of slight infection that the milk does not appear to be curdled, and the deposit when settled is so very small as to be overlooked.

Methods of Transmission.

Undoubtedly the transmission of the disease from cow to cow is through the agency of the hands of the milker or the cups of the milking machine. This appliance, which was designed to enable the farmer to produce cleaner milk than by any other method, must be kept scrupulously clean, and the cups should be sterilised after each milking by means of repeated washings with boiling water.

Before and after each milking of an affected animal, the hands of the milker and the teats and udder of the cow should be washed with some reliable disinfectant solution, such as Hycol, Kerol, or Cyllin diluted in the proportion of 1 part of disinfectant to 250 parts of water—that is, 1 teaspoonful to 1 quart. Care must be taken not to allow any of the milk or cream from healthy animals or any of the dairying utensils to become tainted with the disinfectant, as the flavour and odour might be detected in the butter. To obviate this the disinfectant, after being allowed to act for ten minutes, should be washed off with sterilised water—that is, water that has just previously been boiled and allowed to cool.

Once the disease has appeared in a herd, the owner should personally examine minutely every cow's udder before milking and note carefully the character of the first small quantity of milk drawn. Any cow that shows signs of the disease, or that is in any way suspicious, should be held over to the last for hand-milking, and on no account should the cups of the milking machine be used on her.

Milk from an affected cow must be considered dangerous. The animal should be milked last into a vessel kept specially for the purpose, and the milk scalded so as to destroy the mammitis germs. When it is cooled down it may be fed to the pigs.

Treatment.

Both preventive and curative treatment have been successfully carried out by means of vaccin prepared at the Stock Experiment Station, Yeerongpilly. When used as a preventive the vaccin confers a period of immunity to contagious mammitis which varies very considerably in individual animals, and in no case is it thought that this period exceeds twelve months. The most opportune time to use the vaccin for protective purposes is just before or after calving, when the cow is usually most susceptible.

A "stock" vaccin may prove useful as a curative, but the best results are usually obtained from an autogenous vaccin—that is, one prepared from the particular strain of germ affecting the animals it is proposed to treat. To prepare such a vaccin it would be necessary for the Government Bacteriologist, Stock Experiment Station, Yeerongpilly, to receive a few teaspoonsful of strippings from the affected quarter of a cow, forwarded with as little delay as possible in a clean bottle with no preservative added. A few days are required to prepare the vaccin, which will remain potent for about six months.

Directions for Use.

The vaccin is injected into the loose subcutaneous tissue behind the shoulder in the same manner as tick fever inoculation is performed, and the ordinary 10 c.c. tick fever inoculating syringe and needle are necessary to carry out the work. These may be obtained from Surgical Supplies Ltd., Queen street, Brisbane, for about 25s. complete.

The full dose of vaccin in ordinary cases is 4 c.c., injected in two doses of 2 c.c. each, with an interval of forty-eight hours between the injections. Two injections of 2 c.c. each will usually effect a cure, but in cases of long standing it might sometimes be found necessary to continue the treatment.

Before the injections are commenced the syringe and needle, with the parts loosened, should be sterilised by boiling in water for ten minutes, and the skin of the animal at the proposed site of injection should be washed with a solution of Hycol, Kerol, or Cyllin—1 teaspoonful to 1 quart—for ten minutes.

CONTAGIOUS MAMMITIS VACCIN—SCALE OF CHARGES.

No. of Animals.	Charge. s.	d.
1	2	6
5	6	3
10	10	0
20	16	8
25	20	0
40	30	0
60	40	0
80	46	8
100	50	0

JUVENILE POULTRY CLUBS.

SUGGESTIONS FOR THEIR FORMATION.

By P. RUMBALL, Poultry Expert, Department of Agriculture.

Briefly the objects of a Juvenile Poultry Club are the education of club members and the distribution of purebred stock which will naturally follow the formation of such clubs throughout Queensland's farming districts.

By young people being encouraged in the keeping of purebred stock, not only will they become impressed with the advantages of such stock over those of a nondescript nature, but they will demonstrate by example to parents and others the increased profits to be derived from such stock correctly managed; this will have the effect of building up flocks of good birds throughout Queensland. As many club members are the future agriculturists of Queensland, the imparting of the knowledge necessary to ensure poultry being kept at a profit is perhaps the most important feature of club work, as it means that any club member starting out in life in the future will commence the poultry section of his farm correctly, due to the early training that had been received. The advantages of club work, however, will not end with the poultry section of the farm. The principles necessary for success in this direction are similar to those necessary for the correct care for any class of live stock, or, in fact, any agricultural pursuit.

Several clubs were formed during 1927 at rural and other interested schools throughout Queensland on lines similar to those that are to be suggested. The stock in all cases was procured from the Queensland Agricultural College and High School, Gatton, but if clubs grow to any extent, it is anticipated that in many cases stock will have to be procured from private individuals. In any case, however, it will be necessary to commence the formation of a club fairly early to enable the necessary stock being ordered.

Suggestions for the Formation of Clubs.

Poultry clubs, to be of any value, will have to extend over several years, and in order to give them some degree of permanency it is suggested that a committee of management be formed, consisting of the head teacher and two interested parents.

When it is ascertained how many students are likely to join such a club, the committee should make arrangements for the supply to each club member of six pullets of the same breed about eight weeks of age. These could be procured for about 4s. per head, but it will be necessary to make arrangements for the delivery of chickens several months before the commencement of a club, as breeders would have to hatch and rear birds especially for such purpose.

Prior to the delivery of pullets to club members, sealed wing bands should be attached to each bird to prevent any suggestion of exchange of stock. The birds being of the same breed, price, and age, all club members would be on an equal footing at a start of any club.

The committee should arrange for a series of lectures by Government instructors or local breeders on such subjects as are seasonable, and that will assist in the successful rearing of stock, also organise visits to local poultry farms where possible.

As the period July to September is accepted as being the most suitable period for hatching stock from which the maximum egg production may be expected, a start in any club could not be made with pullets eight weeks old until August, nor should any club be commenced later than the middle of November.

Provision will have to be made by club members for the suitable housing of their birds some time before it is anticipated a start will be made with a club. A leaflet on this subject is at present available, and may be had free on application to the Under Secretary, Department of Agriculture and Stock, by the chairman of the committee of management of any club. Similar leaflets on other subjects could be obtained from time to time as necessary.

In order to encourage the interest of club members in their work contests must be arranged. In this direction two distinct contests are possible—(1) the development of the pullet, and (2) egg laying. In both contests allowance must be made for records as to cost, while in the latter contest provision could possibly be made in some public egg-laying trial for a special section for juvenile club members. The suggested lines for each contest are as under.

Pullet Development Contest.

From the time a club member receives his birds until the termination of this contest a complete record of foods used and their cost must be kept; a Club Show to be held four months after receipt of birds, where they will be judged on development; a report to be made by each club member on the completion of the contest, giving reasons why the various foods were used and his general observations. Prizes to be awarded to students gaining the greatest number of points, allowing 40 points for development, 20 points for records, and 40 points for report.

Laying Contest.

On the completion of the development contest a laying contest will commence, extending over such period as the committee of management thinks fit. This, however, should be continued until a short time before schools break up in December. This would mean an eight or nine months' test.

Here again complete records as to cost of feed and method of feeding would form a feature of the contest. The average numbers of eggs produced per bird of various grades would form another, while a report on general observations and reasons for the action of club members in the use of certain feeds would form the third. Points could be allowed on the following scale:—30 each for records and egg production and 40 for report.

The question of marketing of the product of club members could well occupy the attention of the committee. Club members should be encouraged to co-operate in the marketing of their product, and it may be possible for the committee to assist by arranging for all the eggs produced being received one day a week by a storekeeper or agent, packed and forwarded to the best market available.

The work of poultry clubs could be further extended by arranging for breeding contests. This work could follow the second contest, as it is undesirable to encourage the breeding from pullets, as fully twelve months' knowledge of a bird is necessary prior to judging her as being fit for breeding purposes.

General Notes.

Arrowroot Board Election.

The recent election of members to the Arrowroot Board resulted as follows:—

Percival Pitman Outridge (Redland Bay)	115 votes
Johann Friedrich Wilhelm Sultmann (Pimpama Island)	104 ,,
Robert Stewart (Ormeau)	101 ,,
Hans Nickolaus Grantz (Norwell)	93 ,,
Benjamin George Peachey (Ormeau)	91 ,,
Alexander Clark (Dayboro)	84 ,,
Carl Brumm (Pimpama Island)	82 ,,
Peter Skopp	57 ,,
Wilhelm August Schipplock (Norwell)	48 ,,

The first five members will, therefore, be appointed and will hold office for a period of three years as from the 15th April, 1928.

Proposed Queensland Maize Board.

A notice has been issued of intention to create a Maize Board for the whole of Queensland with the exception of the Petty Sessions Districts of Atherton, Herberton, and Chillagoe for a period of five years as from the 1st March, 1928.

The State has been divided into three districts—viz., No. 1, Pastoral District of Moreton; No. 2, Pastoral Districts of Darling Downs and Maranoa; and No. 3, the rest of Queensland, with the exception of the Petty Sessions Districts of Atherton, Herberton, and Chillagoe. Two representatives will be elected from each district, and will hold office until the 28th February, 1930.

Nominations for membership on the Board must be signed by at least ten persons who have had growing intended for sale maize (grain) on areas of not less than 10 acres since the 1st October, 1927, and must reach the Returning Officer, Department of Agriculture and Stock, Brisbane, before 5 p.m. on the 10th May, 1928.

Any petition for a poll to decide whether the Board shall be created must be signed by at least fifty such growers, and must reach the Minister on or before the 26th May, 1928.

Broom Millet Board Election.

Growers named as follows have nominated for election as growers' representatives on the Broom Millet Board:—George William Harberger, Coalstoun Lakes; Hans Niemeyer, Hatton Vale; and Erich Max Schneider, Binjour Plateau.

As only two members are required, an election by postal ballot will take place on the 16th May, and the successful candidates thereat will hold office for a term of one year.

Queensland Canegrowers' Council—Defence Fund Levy.

The question of making a further levy by the Queensland Canegrowers' Council on growers of sugar-cane at the rate of ¼d. per ton on sugar-cane harvested during the season ended 29th February, 1928, such levy to be utilised for the purpose of augmenting the defence fund created by the levy on the 31st July last, has been answered in the affirmative by the canegrowers. The ballot was conducted by the Department of Agriculture and Stock, and the counting of votes took place at that Office with the following results:—

For the levy	1,371 votes
Against the levy	1,313 ,,

The proposal for the making of a further levy has therefore been approved of by the growers.

Staff Changes and Appointments.

Messrs. P. P. Outridge (Redland Bay), J. F. W. Sultmann (Pimpama Island), R. Stewart (Ormeau), H. N. Grantz (Norwell), and B. J. Peachey (Ormeau) have been appointed members of the Arrowroot Board, as from 15th April, 1928, to 14th April, 1931.

Mr. H. St. J. Pratt, Inspector under the Diseases in Plants Acts at Stanthorpe, has been appointed Assistant Instructor in Fruit Culture.

Messrs. T. R. E. Mitchell (Manager, State Nursery, Bribie) and J. Hall (of Innisfail) have been appointed Inspectors under the Diseases in Plants Acts.

The non-commissioned officer in charge of the Longreach Police Station has been appointed an Acting Inspector of Stock.

Constable Thomas Smith, of Laidley, has been appointed an Inspector of Slaughter-houses.

Messrs. J. A. Goode, J. Shanks, and J. Malcolmson, of Mackay, have been appointed officers under the Animals and Birds Acts.

The following have been appointed representatives on the Kalamia Local Sugar Cane Prices Board:—

Millowners' representatives—Messrs. R. H. Farrar and B. E. Toll.
Canegrowers' representatives—Messrs. W. J. Ferguson and T. P. Olsen.
Chairman—Mr. R. A. Tait.

Mr. W. M. Kennedy, of Tanby, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Mr. E. S. Smith has been appointed a member of the Central Sugar Cane Prices Board during the absence through illness of Mr. John Smith, millowners' representative.

Mr. W. T. M. Penhallurick, of Coorumbene, Rolleston, has been elected a member of the Leichhardt South Dingo Board, vice Mr. W. L. Leslie, deceased.

The Officer in Charge of Police, Talwood, has been appointed Acting Inspector of Stock.

Mr. F. C. Shaw, Coolangatta, has been appointed Inspector of Slaughter-houses until the 25th May, 1928.

Mr. H. J. Campbell, who has recently been appointed an Inspector of Slaughter-houses, is to be attached to Ingham.

Mr. V. A. Rafter, police constable stationed at Nebo, has been appointed an Inspector under the Slaughtering Act as from the 2nd instant.

Mr. W. H. Robinson, of Nambour, has been appointed an honorary Inspector under the Diseases in Plants Acts as from the 24th instant.

The transfer of Mr. L. P. Doyle, Inspector of Stock, from Cloncurry to Urandangie, has been cancelled, and in lieu thereof, Mr. Doyle is being transferred to the Camooweal District.

Mr. J. C. Pryde, of Spring Bluff, has been appointed Inspector of Stock as from 4th April, 1928, to 2nd May, 1928.

The following Police Constables have been appointed Inspectors of Slaughter-houses:—S. J. S. Carnell, P. H. Wiles, J. S. V. Gill, M. R. Anderson, and G. F. Bauer.

Messrs. Thomas Salisbury (of Cedar Creek) and Wm. J. Millar (of "Renfrew," Mooloolah) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. A. F. Bell, Investigations Officer (Plant Pathology), Bureau of Sugar Experiment Stations, has been appointed an Inspector under the Diseases in Plants Acts.

The appointment of Mr. H. F. Sibley as Inspector of Slaughterhouses has been confirmed as from 19th September, 1927. Mr. Sibley is stationed at Charters Towers.

The resignation of Mr. H. C. Russell, Inspector of Accounts under the Dairy Produce Act, has been accepted as from the 31st March, 1928.

Mr. James Purcell, of Toowoomba, has been appointed Chairman of the Butter Board.

The following have been appointed Representatives on the undermentioned Cane Pest Boards:—

Lower Burdekin Cane Pest Board—
Millowners' Representatives—Messrs. Charles Samuel Wynter and Reginald Hales Farrar.
Canegrowers' Representatives—Messrs. Arthur H. Land, Hans Victor Hansen, and Wm. Ewart Gladstone Smith.

Plane Creek Cane Pest Board—
Millowners' Representatives—Messrs. Alexander Innes and John Christopherson Nicholson.
Canegrowers' Representatives—Messrs. Robert Arthur McKie, Alexander Patterson, and Sidney Tremble Dent.

Mackay Cane Pest Board—
Millowners' Representatives—William Begg Fordyce and Phillip Hector McLean.
Canegrowers' Representatives—John James Hedrick, F. J. Stevens, and G. F. Williams.

A Gladstone Sanctuary.

Facing Island, near Gladstone, has been declared a sanctuary for animals and birds, and Messrs. J. Paine, B. J. Adams, and A. E. Adams have been appointed officers under the Animals and Birds Acts to act as rangers for the sanctuary.

The Royal Society of Queensland.

The Annual Meeting of the Society was held in the Geology Lecture Theatre of the University at 8 p.m. on Monday, 19th March, 1928.

His Excellency the Governor, Sir John Goodwin, occupied the chair.

The Annual Report and Financial Statement were adopted.

The following officers were elected for 1928:—

President: Professor T. Parnell, M.A.

Vice-Presidents: Professor E. J. Goddard, B.A., D.Sc. (*ex officio*), and Professor J. P. Lowson, M.A., M.D.

Hon. Secretary: Mr. D. A. Herbert, M.Sc.

Hon. Librarian: Dr. J. V. Duhig, M.B.

Hon. Treasurer: Mr. E. W. Bick.

Hon. Auditor: Professor H. J. Priestley, M.A.

Members of Council: Professor R. W. Hawken, B.A., M.E., M. Inst. C.E., Dr. T. G. H. Jones, A.A.C.I., Dr. E. O. Marks, B.A., B.E., M.D., Professor H. C. Richards, D.Sc., and Mr. C. T. White, F.L.S.

Dr. O. S. Hirschfeld was unanimously elected as an ordinary member.

Dr. T. A. Williams and Mr. W. W. Bryan were proposed for ordinary membership.

Professor T. Parnell was inducted to the position of President for 1928, and Professor E. J. Goddard delivered his Presidential Address entitled "Virus Diseases: Their Bearing on the Cell Theory and other Biological Concepts." On the motion of Mr. H. A. Longman, seconded by Dr. J. V. Duhig, a vote of thanks was accorded the retiring President for his address. A vote of thanks to His Excellency the Governor was carried on the motion of Professor H. C. Richards, seconded by Mr. J. B. Henderson.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sandpit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Orchard Notes for June.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit tree are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case or peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as, if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

The Home and the Garden.

THE BABY'S FOOD—ADVICE TO MOTHERS.

A mother called at a baby health centre recently with a six weeks' old baby and asked advice on how best to wean her little one. "But why wean the child?" inquired the sister. "Cannot you feed it naturally, and afford it the greatest blessing a mother can give her baby?"

"Oh! My baby was premature, and everyone tells me that a premature baby cannot be breast-fed," replied the mother. "I have very little milk, and am afraid I could never feed my baby naturally. Already I have buried three premature babies, and I am anxious about this one."

"All the more reason why he should be breast-fed," said the sister. "If you want to rear him, then you should do all in your power to breast-feed him."

That conversation (writes Dr. E. Sydney Morris, Director of Maternal and Baby Welfare (New South Wales), illustrates the ignorant and sometimes fatal advice frequently proffered to young mothers who are in difficulties, by relatives and friends, whose intentions are no doubt good, but who lack knowledge. It also shows how necessary are the facilities for disseminating sound mothercraft knowledge, which is the object of the baby health centres.

When first brought to the centre, this baby was six weeks' old, and weighed 6½ lb.; he was breast-fed at intervals of three hours, but was very cross and difficult to handle; a test-meal disclosed that he was only receiving 1¼ oz., and therefore the mother was advised to supplement the breast supply by giving her baby extra food after each feed. The mother was also shown how to stimulate the breast by hot and cold sponging, and was advised to visit the centre to receive massage.

Further inquiry elicited the fact that if the mother had been badly informed regarding the feeding of her baby, she had equally bad ideas as to her own diet. A "friend" had volunteered the information that fruit and green vegetables would upset the baby, and as a result the mother was denying herself the most important items in the nursing mother's diet. The sooner such ridiculous notions are banished, the better it will be for everyone. As continually pointed out, the nursing mother requires a normal, wholesome diet; she should have three good meals a day, and should drink plenty of cold water, including a glass before feeding her baby; she should also have plenty of fresh air, rest, and sufficient out-door exercise to maintain her general health.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist springtime to prepare them for the trial of heat they must endure laer on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor one. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors. plant bulbs such as anemones, ranunculus, freesias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May 1928.		June, 1928.		MOONRISE. May 1928.	MOONRISE. June, 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.20	5.13	6.38	6.38	p.m. 3.36	p.m. 3.36
2	6 21	5.17	6.38	5.1	4.6	4.13
3	6 22	5 16	6.39	5.1	4.34	4.47
4	6 22	5.16	6 39	5.1	5 4	5.30
5	6 23	5.15	6.39	5 1	5 37	6.20
6	6 23	5.15	6.49	5.1	6.12	7.10
7	6.24	5.14	6.40	5 1	6.51	8.6
8	6.24	5.13	6 41	5.1	7 37	9.4
9	6.25	5.12	6 41	5.1	8 26	10.4
10	6 25	5.11	6 41	5 1	9 20	11 5
11	6.26	5.11	6.42	5.1	10 15	...
12	6 26	5.10	6.42	5.1	11.15	a.m. 12.5
13	6.27	5.10	6.43	5.1	...	1.7
14	6.27	5.9	6 43	5.1	a.m. 12.16	2.11
15	6 28	5.9	6.43	5.1	1.17	3.16
16	6.29	5.8	6.44	5.1	2.20	4.24
17	6 30	5.7	6 44	5.2	3.24	5.35
18	6 31	5.6	6.44	5.2	4 31	6.45
19	6 32	5.6	6 44	5 2	5.41	7.51
20	6.32	5 5	6 44	5.2	6.52	8.52
21	6.33	5.5	6.44	5.3	8.2	9.46
22	6 33	5.5	6.44	5.3	9.8	10.28
23	6.34	5.4	6 45	5.3	10.11	11.5
24	6.34	5.4	6.45	5.3	11.6	11.39
25	6.35	5 3	6.45	5.4	11 54	12.6
26	6 35	5.3	6.45	5.4	p.m. 12 33	12.37
27	6.36	5 3	6.45	5.4	1.8	1.11
28	6.36	5.2	6 45	5.5	1.39	1.39
29	6 37	5.2	6.45	5.5	2.7	2.14
30	6.38	5.2	6.46	5.6	2.40	2.47
31	6.38	5.2			3 6	

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

5 May ○ Full Moon 6 11 a.m.
13 „ ☽ Last Quarter 6 50 a.m.
19 „ ● New Moon 11 14 p.m.
26 „ ☾ First Quarter 7 11 p.m.

Apogee, 5th May at 2 30 p.m.
Perigee, 19th May at 3 36 p.m.

An occultation of Epsilon Kapricorni by the Moon will occur in the morning on the 13th; about 1·45 in the latitude of Mackay and only a few minutes before 2 at places further south in Queensland; the reappearance of the star taking place about half an hour later at Mackay and a less number of minutes at places further south.

Kappa Kapricorni will be occulted on the same morning, about two hours and a quarter later.

This month will be remarkable for the number of phenomena which will be unobservable in Queensland. These will include the total Eclipse of the Sun, near midnight on the 19th; also the apparent conjunctions of Mars with the Moon on the 15th; of Uranus on the 16th, of Jupiter on the 17th, of Venus on the 19th, of Mercury on the 20th, and of Neptune on the 26th. Mars and Uranus, though in orbits many millions of miles apart will appear, in binoculars or telescope, to be very near to one another, especially on the 25th.

In May practically the only evening star will be Saturn, rising about one hour after sunset on the 1st and soon after sunset on the 15th. Mercury will be too insignificant, being on the far side of its orbit, beyond the Sun.

Venus and Jupiter will be visible in the east before sunrise and Mars higher up in the north-east.

7 June ○ Full Moon 10 13 p.m.
11 „ ☽ Last Quarter 3 51 p.m.
18 „ ● New Moon 6 42 a.m.
25 „ ☾ First Quarter 8 47 a.m.

Apogee, 1st June, at 6.6 p.m.
Perigee, 16th June, at 11.54 p.m.
Apogee, 29th June, at 9.42 a.m.

The occultation of a small star in Libra (magnitude 5·8) will occur on the 2nd at about half-past 7 p.m. and may be conveniently observed from such places as Brisbane, Toowoomba, Warwick, and other places in Southern Queensland. At more northern parts of Queensland this occultation will occur some minutes earlier.

A star of about the 3rd magnitude in the Scorpion will be occulted by the Moon soon after half-past 12 on the night of the 2nd. A telescope will be necessary to observe it on account of the brightness of the full Moon.

Mercury will be at its greatest elongation, 23 degrees east on 3rd June; but its luminosity will be a good deal less than it was three weeks earlier.

The principal astronomical event of the month will be the total eclipse of the Moon on the night of 3rd June, between 9·31 and 10·47.

Lamda Sagitarii (magnitude 2·9) will be occulted by the Moon on the 5th so soon after rising at Warwick that both will be very near the eastern horizon.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

What is a Living Area?

AT the annual interstate Ministerial Conference on agricultural subjects at Perth, the Minister for Agriculture and Stock, Mr. W. Forgan Smith, in moving that the Conference should give consideration to the establishment of a Bureau of Agricultural Economics, said that the importance of this matter could not be stressed too strongly. There was no co-ordination between the States in regard to their activities, and no co-operation or exchange of thought in regard to the building up of industries. In connection with land settlement, one often heard the phrase, "living area." What was a living area for the farmer? This would depend on the land, the locality, and the man, but first it was necessary to find the living flock or living herd. Once this was established, land settlement could be simplified. Market control and organisation necessary to prevent violent fluctuations in price were, said Mr. Smith, absolutely essential. The bureau would investigate marketing costs, new markets, and produce available for that market, besides building up lines of marketing, and suggesting the lines of production that should be followed by farmers.

Proposed Bureau of Agricultural Economics.

AT the Perth Conference, Mr. Forgan Smith, after a discussion on a proposal to create a Federal Bureau of Agricultural Economics, submitted the following definite resolution:—

"(1) That the Commonwealth Government be asked to constitute an agricultural economic division of the Council for Scientific and Industrial Research, and that a skilled agricultural economist be retained as a permanent executive officer; each State Government, with the Commonwealth Government, to nominate a representative to sit on the agricultural economics committee of the Council of Scientific and Industrial Research.

"(2) (*a*) That it be recommended from this conference that each State Department of Agriculture should establish an economics division which would maintain the closest possible contact with the Commonwealth organisation previously mentioned; (*b*) that State Parliaments should provide such legislation or amending legislation as may be necessary to establish or facilitate the work of the division contemplated.

"(3) That the Commonwealth Government should be asked to provide for free franking through the mails of all agricultural papers and documents in trust from or to State and Commonwealth agricultural economics divisions."

In the course of the ensuing debate a doubt existed as to whether effective machinery could be set up for putting the ideas embodied in the motion into practice. There is always a difficulty, it was contended, in States formulating a policy in conjunction with the Commonwealth authorities. The desirability of establishing such a bureau, however, was generally approved, and further discussion was deferred until a later stage in the Conference proceedings.

Beef Shorthorns on Gindie State Farm.

FOR some years the Department has been engaged in the establishment of a beef shorthorn stud at the Gindie State Farm, in the Central district, with the object of breeding bulls of good, early maturing quality to effect an improvement in the Central district herds, and the results to date have been distinctly encouraging. With a knowledge that a higher standard of quality is necessary in the foundation animals of a stud, some excellent Shorthorns of both sexes have from time to time been placed at Gindie. Fresh infusions of blood, however, must obviously be made, so the Minister, Mr. W. Forgan Smith, informed the Press recently. Queensland's cattle industry is a most valuable one, and too much attention cannot, in the opinion of Mr. Forgan Smith, be paid to the question of using prepotent sires in an endeavour to breed early maturing, good quality stock. About the same time he inspected a yearling bull and three young heifers at Yeerongpilly Stock Experiment Station, which, after tick fever inoculation, are to be sent on to the Gindie Stud. These animals, after being subjected to the tuberculin test, were purchased quite recently, and they represent some of the best and the most fashionable families of Shorthorn blood extant. The heifers, "Milton's Actress 3rd," "Lovely 7th of Milton," and "Milton's Prunella," came direct from Mr. Anthony Hordern's Milton Park Stud, Bowral, New South Wales, and the bull, "Coonong Masterstroke," was bred by Mr. D. Roy McCaughey, of Narrandera. The consensus of opinion amongst well-known Shorthorn breeders is that the animals in Mr. Hordern's stud are equal in quality to anything available in the world to-day, and no expense has been spared in importing the males and females to build up this famous stud. The present little group for Gindie are very well-bred animals, and in each case their blood is redundant with that of Mr. Hordern's well-known imported sires, "Masterkey" and "Doone Monarch," also with that of imported cows. At Gindie two young bulls of fashionable blood have latterly been in use, one sired by "Masterkey" (imp.) and the other by "Donnington Count" (imp.) with the progeny of some other very good quality animals. If the seasons continue favourable for breeding operations, the Gindie Shorthorns should soon rank with the best in Queensland, for it is intended to carry on with animals only of the best possible type and quality.

Disposal of Cotton Plants after Harvest.

IN his recent report on cotton experimental work the Cotton Specialist, Mr. W. G. Wells, points out that the removal of cotton plants after the picking operations are completed, prior to the preparation of the land for another cotton crop, has constituted something of a problem under the conditions in Queensland. In many of the districts only light frosts, which kill the leaves and tops of the plants and hasten the opening of the crop, may be experienced. Under such conditions the stalks and branches are green and sappy, and would not be in a suitable condition for being cut down with the "stalk cutting" types of machines which are usually used in the cotton fields of the United States of America. With these machines a series of revolving blades chop the stalks into short lengths which can be ploughed under in the usual ploughing operations.

In Queensland, growers have attacked the problem in several ways, but nearly all their methods have had serious defects. The system which has generally been used the most has been to plough out the stalks with the plough set so as to skim just under the ground. The stalks are then raked up either by means of the horse-drawn hay-rake or, if in small plots, forked up by hand into piles to dry sufficiently for burning. In some of the districts where the plants make only a moderate growth, ploughing is done without any previous treatment. In some instances, plots have been observed where the plants were chopped out by hand with sharp, heavy hoes, especially where the plants had grown to heights of 5 to 6 feet, with stalks of 1 to 1½ inches in diameter at the butt.

None of these methods is satisfactory, however. Where the plants are ploughed out, the ploughed soil not only covers some of the plants, but also covers up a considerable number of the fallen bolls of the top crop. In many of the districts in Queensland the pink boll-worm (*Platyedra gossypiella*) exists, and in the coastal areas the peach grub (*Conogethes punctiferalis*) as well. Both of these insects may be found in the top unopened bolls at the end of the season, and any system of destroying the plants which does not assist in properly eradicating these pests is faulty. Where the plants are ploughed under in the usual ploughing operations, not only is there no attempt to destroy the insects, but also the seed-bed is badly prepared. The general experiences of the growers throughout the Cotton Belt indicate that a firm compact seed-bed offers the most insurance for the young seedlings to withstand the dry conditions which usually exist during the early period of their development. Under the normal winter conditions, little rain falls in most of the districts. Where large quantities of cotton stalks are ploughed under, it can be seen that, without winter rains, the seed-bed must be of an open nature with so much refuse mixed in it. Therefore, seed-beds prepared in such a manner will require very heavy planting rains, or frequent rains during the early growth of the seedlings, to enable them to withstand periods of dry weather of any length. The system of removing the plants by hand chopping is, probably, the most efficient method of any as regards the destruction of the top crop of bolls which may contain insect pests. The general experience is that an acre a day is good chopping for one man, so that it can be seen that this is an expensive operation.

The system used on the Research Station has been to plough out the plants and then rake up by means of a large horse-drawn rake which has long wooden teeth running along the ground in a nearly horizontal position. This rake gathers the plants, but, unfortunately, leaves a lot of the bolls. In the season of 1925-26 an adaptation of the old slide maize cutter was used to cut the stalks, and proved to be a decided improvement on the method of ploughing out the whole plant. The cut plants were raked up by the horse-drawn rake again, and with much less refuse left behind.

During the season of 1926-27, several modifications have been effected on the slide cutter which have developed it into an efficient machine, which should be used by all growers with an acreage larger than that which can be cut by hand. Some further improvements, which may lessen the draft, are contemplated for working out in the coming season, but it is believed that the describing of the machine in this report is justifiable. The photographs, which are included, are of the machine used at the Station this past season.

It was found that with two horses hooked in tandem, eight acres could be cut in an 8-hour day, in cotton planted in rows 650 feet long and spaced 4½ feet apart, with the plants spaced 20-24 inches apart. The plants averaged around 5 feet tall, and from 1 to 1½ inches in diameter at the section where cut. Where the cotton was taller and of greater diameter, it was necessary to use three horses in tandem, but this cotton was ranker than usually is encountered.

A departure from the use of the large horse rake in piling up the bushes also was made. An experiment in using a three-section lever spike-toothed harrow, drawn by a Fordson tractor, proved to be faster and more efficient; accordingly, the whole of the crop was cleaned up in this manner. It was found that the harrow raked up the plants in such a way that the field was partially swept, thus preventing most of the fallen bolls from being left behind. The harrow automatically dumped itself by riding over the accumulated pile of plants when too many were gathered under it to allow the back teeth to remain on the ground. This left the plants in rows and bunches over the field, where they could be forked up easily and burned when dry. An ordinary horse hay-rake was used to clean up after the burning operation, which left the field in a much cleaner condition than had been possible with any other operation except hand chopping. Eleven acres a day could be covered in this manner, and about another day was required to clean up with the horse rake after the first burning off of the piles of dry plants. The manager, in reporting on the use of the harrows, suggests that horses may be used instead of the tractor. He also suggests that harrows with long spikes may be preferable, and that the back of the harrow should not be too heavily weighed down or it will not ride over the piles of plants.

It is thought that every grower should equip himself with a slide cutter. It is a comparatively cheap machine and will enable the cotton crops to be removed quickly after the harvesting is completed. This allows the seed-bed to be prepared in time to take advantage of the first planting rains, which, in most seasons, enables the production of a profitable crop of cotton.

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

A Vegetable Parasite of Cane-grubs.

During this month a certain percentage of cane grubs will be killed by an entomogenous parasite known commonly as the Green Muscardine Fungus (*Metarrhizium anisopliæ*).

When attacked by it, the body of the grub, instead of decomposing, retains its original shape, and after gradually hardening to a cheese-like consistency (owing to the internal organs and juices being absorbed and replaced by the mycelium or rooting portion of this parasite) turn at first white, and a day or so later an olive-green colour; the latter condition being the fruiting stage and consisting

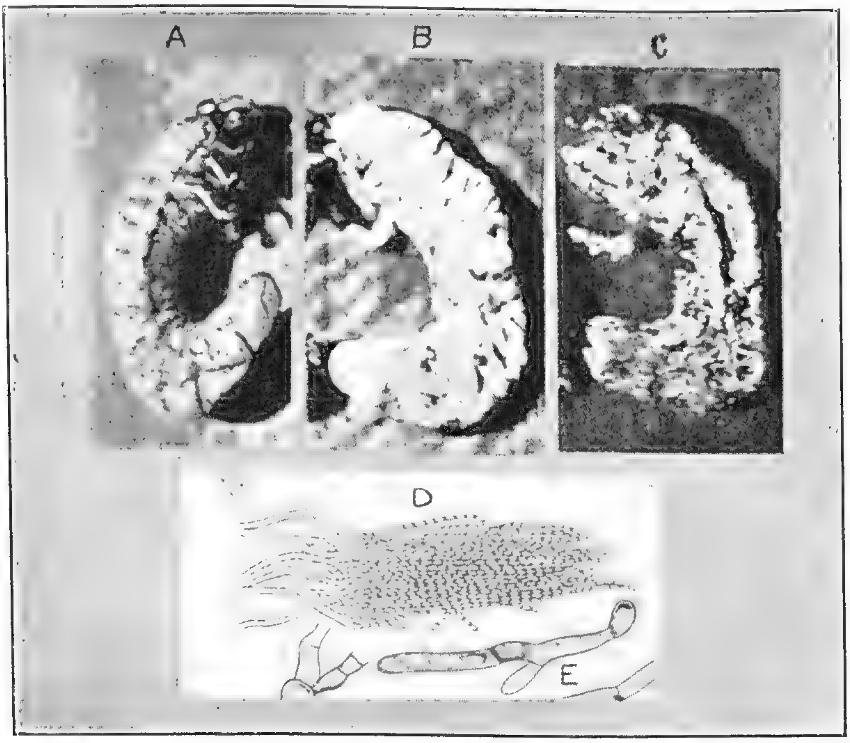


PLATE 95.—GRUBS OF THE GREYBACK CANE-BEETLE KILLED BY GREEN MUSCARDINE FUNGUS.

A. Stage 1.—Body filled with roots of the fungus; hardened internally.
B. Stage 2.—Body covered with white fungus growth of hyphæ.
C. Stage 3.—Body encrusted with green masses of spores.
D. A prismatic mass of spores, × 160.
E. Spores germinating, × about 700.

of a thin irregular crust formed of chains of microscopically minute spores (see illustration). In the event of samples of these greenish mummified grubs being noticed in ploughed furrows, growers are asked to communicate at once with the Entomologist at Meringa Experiment Station, either by letter, addressed—Meringa, Private Bag, Cairns; or by 'phone No. 95 Gordonvale.

Owing to favourable rains having fallen recently, the fungus in question should be more in evidence this season than has been the case during the last few years.

Deal Promptly with the Weevil-borer.

Watch the growth of cane on river flats, where beetle-borers are likely to occur, and if finding evidence of this pest having commenced to attack the basal portions of canes, advise the Entomologist without delay. Tachinid parasites of this weevil-borer will be released by the Sugar Bureau free of cost on such affected areas, on condition that the grower will agree to leave about a quarter of an acre of borer-infested cane sticks for these useful parasites to breed in. This cane should be allowed to stand for about three months, and during that period must not be burnt. Do not neglect to enlist the services of the above-mentioned Tachinid fly, which is one of the most effective natural enemies of this formidable cane-beetle.

Common-sense Methods for Combating Wireworms.

1. See that the land be well worked and thoroughly drained.

2. Plough deeply, and at the same time collect as many wireworms as possible by hand before planting the crop.

3. Use organic instead of chemical manures.

4. Increase the humus content of the soil by the use of green manures.

5. Apply a liberal dressing of lime.

6. Intensive cultivation of wireworm-affected land is highly recommended. Stir the land as often as possible.

7. Keep the land free from weeds, as the beetle form of this insect prefers land thickly covered with vegetation in which to oviposit.

8. The use of finely ground kainit, applied at the rate of about 4½ cwt. per acre and ploughed into the soil, has been recommended for controlling wireworms infesting beet fields.

CANE PEST COMBAT AND CONTROL.

The Entomologist (Mr. E. Jarvis) in charge of the Meringa Station, near Cairns, has submitted the following report for the period April to May, 1928, *to the Director of Sugar Experiment Stations:—*

Sulphur as a Grub Repellant.

During January last, a series of laboratory experiments with flowers of sulphur was carried out here, in order to test its insecticidal value against our root-eating scarabæid grubs. Fifteen cages, each containing 38 cubic inches of moist soil, were used in the first experiment, a single third-stage grub of *Lepidiota frenchi* being placed in each, and covered with four inches of earth. Before putting in the grubs, doses varying from ½ oz. to 2½ oz. were thoroughly mixed with the soil. In ten of these cages a bean leaf was buried about a quarter of an inch above the grub, to ensure that while eating the leaf, sulphur-coated particles of soil would also be ingested at the same time. The cages were examined at intervals of four to five days between the dates 20th January and 20th February, and all the grubs—excepting one in a 1-oz. dose cage, and one in a 2-oz. dose cage—being found alive and quite healthy, these two grubs, however, having apparently succumbed for want of sufficient moisture in the soil.

On 30th January six additional cages were prepared, similar to the above in size, but three having doses of 6 oz., and the others of 9 oz. of flowers of sulphur mixed with 38 cubic inches of soil. When looked at nine days later, these six grubs were alive and healthy.

An examination on 20th February (twenty-one days from commencement of experiment) showed that all the grubs were still active and normal, except for a slightly blackened appearance of the anal segment in some specimens; caused, possibly, by some chemical action having taken place, due, perhaps to such ingested soil containing a large percentage of sulphur.

A final inspection of these cages was made on 2nd May (about three months from treatment of cages), when a grub in one of the 9-oz. cages was found to be still alive but suffering from want of moisture; while all the grubs in the 2½-oz. cages were alive, and one grub in a cage with a 3-oz. dose, these latter grubs having been living in soil treated at the rate of about 9½ tons of sulphur per acre, for nearly four months.

Summary.—Results obtained indicate that fully grown grubs of *Lepidiota frenchi* Blkb. are able to remain alive in soil containing flowers of sulphur applied at the rate of about 36 tons per acre. It need hardly be stated that such an excessive quantity would be out of the question in field practice, and was merely tried at our laboratory as a crucial test.

Manurial Value of Sulphur.

When used in canefields at the rate of 200 to 2,000 lb. per acre, sulphur has been found to increase germination of the sets; such treated cane, when about a foot high, "having a remarkable green appearance, with only one or two non-germinated stools in a hundred." When treating ratoons the trash is burnt after harvesting, and the sulphur immediately applied and harrowed into the soil, the effects of such application being shown in the quick growth and green appearance of the cane shoots.

It may be of interest to mention in this connection that experiments conducted in the year 1913 by M. E. Boullanger in the West Indies, tend to show that the application of small quantities of flowers of sulphur to the soil results in a very considerable increase in the crops. This was very noticeable in such vegetables as celery, beet, beans, spinach, potatoes, &c.

He found, for example, that a crop of celery, treated with sulphur only, gave more than ten times the yield obtained from a similar check plot which had no manure at all, and nearly twice the yield of a plot which had received a complete manure but no sulphur. It is interesting to note that by means of a series of experiments with sterilised and non-sterilised soils, Mr. Boullanger discovered this beneficial effect of the sulphur to be due to its action on certain soil bacteria.

Paradichlorobenzene Again Successful.

Canegrowers and horticulturists will doubtless be interested to learn that larvæ of the "White Stem Borer" (*Authores leuconotus* Pasc.) have recently been brought under effective control by means of the fumigant which has proved so deadly to our cane-grubs. An up-to-date method of dealing with the larvæ of the above pest—which work for about two years in the stem and roots of the coffee plant—was discovered during 1927 by the Government Entomologist of the Department of Agriculture, Nyasaland, who reports as follows:—"A good way of dealing with the larvæ is to remove the plug of grass extruded from the cavity where each is situated, and insert a few crystals of paradichlorobenzene, subsequently covering the hole with mud or clay. Grubs so treated were dying within six days and had completely disintegrated in three weeks, while the bushes seemed to be uninjured. This method is simpler than the use of carbon bisulphide. . . ." Lead arsenate, sodium fluoride, and zinc sulphate were all used, both with and without a resin and washing soda adhesive, and also in conjunction with paradichlorobenzene, which, however, when melted for incorporation in the poison, evaporated too quickly to be of any value."

The above results substantiate the importance of advice given by us in reports issued from time to time during the last few years with regard to the inadvisability of *dissolving* the crystalline nodules of paradichlorobenzene in other liquid fumigants, thereby destroying its effectiveness and rendering this chemical—as was found also when the nodules were *melted*, as described above, and added to other poisonous solutions—of no practical use for combatting soil-frequenting larvæ, &c.

Experiment Plots against Cane-grubs.

Recent results obtained by the establishment of various experiment plots laid down during January last on volcanic land in the Hambledon Mill area indicate that all the plots treated by us with various mixtures of carbon bisulphide and other liquid fumigants look better than the check areas alongside. Cane treated with naphthalene impregnated with sinapis oil appears likely to yield negative results, but it is a little early to make definite statements one way or the other, as the grubs of *albohirtum* have not yet finished feeding.

Significance of the Present Grub Infestation.

In view of the many cases of grub damage reported from the Cairns, Babinda, and Innisfail districts, the following brief notes may be of interest to canegrowers.

In the year 1917, when this pest appeared in alarming numbers, the rainfall for November and December of 1916, together with that of January to April, 1917, was 69.37 inches; as against 81.51 inches for the same period of last year (1927).

During the period of June to October, immediately preceding the outbreak of 1917, a fall of 6.17 inches was registered here; whereas, for the same period of last year which preceded our present grub-infestation, the precipitation happened to be 8.09 inches. Had it not been for the meteorological check to the numerical increase of this pest experienced during the seasons 1925-1927, the recent rainfalls mentioned above—which exceed those leading up to the 1917 outbreak by 14.06 inches—would have brought about a far more serious grub-infestation than that experienced at present in the Cairns district.

RECORDS OF AUSTRALIAN THYSANOPTERA (THRIPS.)

By A. A. GIRAULT, B.Sc., Entomological Branch.

Part III.

The following records are a continuation of those published in May and October, 1927, in the pages of this Journal. The arrangement is as previously adopted, and unless otherwise stated the collector is myself, and the plants, as usual, have very kindly been identified by Mr. C. T. White, the Government Botanist.

1. *Thrips tabaci* Lindeman.—Taken from the following flowers:—*Marrubium vulgare*, Forest Hill, 2nd October, 1927, A. R. Brimblecombe; *Lepidium ruderale*, Norman Park, 31st October, 1927, and Forest Hill, 2nd October, 1927, Brimblecombe; *Dianella coerulea*, Norman Park, 2nd October, 1927; white clover, same place, 12th September, 1927; cultivated flowers, Mayne Junction, 17th September, 1927, Brimblecombe; on pistil of Arum Lily, Geebung, 15th September, 1927; *Trachymene incisa*, Norman Park, 22nd November, 1927; wild carrot, Mayne Junction, 8th October, 1927, A. R. Brimblecombe: *Apium leptophyllum*, Samsonvale, 18th September, 1927; commonest and most abundant in field peas on a farm, same place and date; Iris Lily, Mayne Junction, 6th October, 1927, Brimblecombe; *Helichrysum diosmifolium*, Norman Park, 13th September, 1927; *Argemone mexicana*, Brisbane City, 14th October, 1927; *Rumex brownii*, same place, 29th October, 1927; *Solanum sodomæum*, Norman Park, 17th September, 1927; Calendula, Nundah, 21st September, 1927, I. W. Helmsing; injurying growing tips of cotton, Biloela, October, 1927, G. A. Currie; *Thevetia neriifolia*, 22nd October, 1927, Norman Park; common on Agapanthus lily flowers, Mayne Junction, 13th November, 1927, Brimblecombe; *Trifolium agrarium*, Norman Park, 19th September, 1927; "Silvering" onions, Toowoomba, September, 1927 (Department of Agriculture and Stock); on bean foliage, Glen Osmond, South Australia, 19th March, 1928 (Geoff. Samuel, Waite Agricultural Research Institute).

2. *Thrips imaginis* Bagnall.—*Thrips* in Gurney, "Agricultural Gazette," New South Wales, 1915, pp. 303-305, pl. (opp. p. 307). Attacking in great numbers blossoms of fruit trees in New South Wales; the species is doubtless this one.

3. *Pseudanaphothrips achætus* Bagnall.—Flowers of *Velleia spathulata*, Samsonvale, 18th September, 1927; white clover again, Norman Park, 12th September, 1927; *Anagallis arvensis*, forest, Samsonvale, 18th September, 1927; next commonest to No. 1 and abundant in field peas on a farm, same time and place; *Pimelea linifolia*, forest, same place and time; *Jussiæa repens* and *Eichornia speciosa*, aquatic plants, Alderley, 29th December, 1927; *Stachys arvensis*, Norman Park, 10th September, 1927; *Lepidium ruderale*, Forest Hill, 2nd October, 1927, Brimblecombe; *Trachymene incisa*, Norman Park, 22nd November, 1927; *Vilia sativa segitalis*, same place, 17th September, 1927; *Marrubium vulgare*, Forest Hill, 2nd October, 1927, Brimblecombe; *Pratia erecta*, Mungar Junction, 8th March, 1928; *Melhania incana*, Gayndah, 5th March, 1928; *Lantana sellowiana* again, Gayndah, 28th February, 1928; *Spermacoce* species, Byrnestown, 7th March, 1928; *Wahlenbergia gracilis* again, Gayndah, 28th February, 1928; *Verbena officinalis*, Byrnestown, 6th March, 1928; watermelon, Gayndah, 1st March, 1928.

4. *Physothrips kellyanus* Bagnall.—*Bryonia lacinosa* in a lemon orchard, Gayndah, 1st March, 1928 (the lemon blossoms were also infested with the species); *Thevetia neriifolia,* Norman Park, 22nd October, 1927; lantana again, Taringa, 11th February, 1928, and at Innisfail, 16th June, 1926 (F. W. Becker); *Musa banksii,* Berner's Creek, Innisfail, 23rd November, 1926, J. L. Froggatt; lemon again, Byrnestown, 6th and 7th March, 1928; loquat, Gayndah, 28th February, 1928; granadilla, Taringa, 11th February, 1928; Arum lily, Mayne Junction, 1st October, 1927, Brimblecombe; pawpaw, Mayne Junction, 10th December, 1927, and 15th January, 1928, Brimblecombe, and at Taringa, 11th February, 1928; Iris lily, Botanic Gardens, Brisbane, E. Filer, 3rd November, 1927; Christmas lily, Mayne Junction, 26th December, 1927, Brimblecombe; *Hymenosporum flavum,* Brisbane, 7th October, 1927; honeysuckle, Mayne Junction, 4th December, 1927, Brimblecombe; dahlia, same place, 15th January, 1928, Brimblecombe; custard apple, same place and collector, 17th September and 4th December, 1927; *Acacia maideni,* Toowong, 29th December, 1927; *Viburnum odorotissimum,* Brisbane, 7th October, 1927.

5. *Physothrips mjöbergi* Karny.—Pawpaw, Mayne Junction, 15th January, 1928, Brimblecombe; granadilla, Taringa, 11th February, 1928; lantana again, Innisfail, 16th July, 1926, F. W. Becker; loquat, Gayndah, 29th February and 2nd March, 1928; *Convolvulus erubescens,* Byrnestown, 7th March, 1928; loquat, Byrnestown, 7th March, 1928.

6. *Physothrips brevicornis* Bagnall.—*Crotolaria sericea,* Alderley, 20th September, 1927; sweeping in forest, Morningside, 9th September, 1927; from composite flowers, Samsonvale, 18th September, 1927.

7. *Thrips lacteicorpus* Girault.—Native to *Eucalyptus* and *Acacia. Acacia maideni,* Toowong, 29th December, 1927; *Apium leptophyllum,* Samsonvale, 18th September, 1927; Iris lily, Mayne Junction, 6th October, 1927, Brimblecombe; *Allium* probably *fragrans,* Norman Park, 30th October, 1927; *Ligustrum sinense,* Mayne Junction, 29th September, 1927, Brimblecombe; pawpaw, Taringa, 11th February, 1928; lantana, Innisfail, 16th June, 1926, F. W. Becker; *Buckinghamia celsissima,* Brisbane, 2nd February, 1927; *Viburnum odorotissimum,* Brisbane, 7th October, 1927; dahlia, Mayne Junction, 15th January, 1928, Brimblecombe; *Flindersia collina,* Forest Hill, 2nd October, 1927, Brimblecombe.

9. *Idolothrips marginatus* Haliday.—A female, forest sweepings, Morningside, 9th September, 1927; in grass tussocks and so forth, Bogong High Plains, Victoria, 5-6,000 feet, January, 1928, F. E. Wilson.

15. *Scirtothrips signipennis* Bagnall.—For distribution and other hosts than banana, also origin, see J. L. Froggatt, this Journal, January, 1928, pp. 16-17.

16. *Cryptothrips dimidiatus* Hood.—Apterous forms common in grass and forest sweepings, Morningside, 9th, 13th September, 1927.

18. *Physothrips cinctipennis* Bagnall.—*Melhania incana,* Gayndah, 5th March, 1928; *Glycine tabacina,* Mitchelton, 27th December, 1927; *Phaseolus semierectus,* Alderley, 29th December, 1927; *Crotolaria linifolia,* Gayndah, 6th March, 1928; *Rhynchosia minima,* Byrnestown, 7th March, 1928; *Crotolaria trifoliastrum,* Gayndah, 1st March, 1928; *Cassia mimosoides,* Gayndah, 6th March, 1928; and at Tiaro, 8th March, 1928; *Glycine tabacina,* Byrnestown, 6th March, 1928; *Œnothera longifolia,* Gayndah, 1st March, 1928; *Medicago sativa,* Gayndah, 2nd

March, 1928; *Tribulus tenestris*, same place, 1st March, 1928; *Crotolaria mitchellii*, same place, 28th February, 1928; peanut again, Byrnestown, 6th March, 1928.

23. *Neophysopus flavicinctus* Karny.—A female, sweeping in forest, Alderley, 29th September, 1927; on grass, Gayndah, March, 1928.

24. *Stylothrips brevipalpus* Karny.—*Poranthera microphylla*, Samsonvale, 18th September, 1927; cultivated flowers, Nundah, 13th January, 1928, I. W. Helmsing; *Ageratum conyzoides*, Taringa, 3rd February, 1928, common with occasional *Thrips tabaci; Callistemon viminalis*, Forest Hill, 2nd October, 1927, Brimblecombe; *Emilia sonchifolia*, Alderley, 20th September, 1927; *Aster subulatus*, Taringa, 30th March, 1928.

32. This is *Australothrips bicolor* Bagnall and this name takes precedence over *Pterothrips quadratus* Hood, which it equals. A pair, sweeping forest and grass, Samsonvale, 18th September, 1927; a rather common species.

35. *Thrips shakespearei* Girault.—Three males, cunjevoy, *Alocasia macrorrhiza*, Innisfail, 4th December, 1925, J. L. Froggatt.

37. *Frankliniella æschyli* Girault.—*Melhania incana*, Gayndah, 5th March, 1928.

38. *Heliothrips bifasciipennis* Girault.—Four females reared from larvæ found by M. E. Temperley on the foliage of *Solanum nigrum* in the Department of Agriculture's grounds, Brisbane, December, 1927. They were denuding the epidermis in spots and also soiling it with excrementitious matter. They were placed over earth and emerged in a week's time.

40. *Odontothrips australis* Bagnall.—*Oxalis corniculata*, Samsonvale, forest, 18th September, 1927; also males with the typical "anal prong" from flowers of *Daviesia squarrosa villifera*, forest, Morningside, 9th September, 1927. This species resembles somewhat *Physothrips seticollis* Bagnall.

41. *Anaphothrips keatsi* Girault.—On bean leaves, Glen Osmond, South Australia, 19th March, 1928 (Geoff. Samuel, Waite Agricultural Research Institute).

44. *Haplothrips partifuscipennis* Girault.—Flowers of *Spermacoce* species, Byrnestown, 7th March, 1928.

47. *Haplothrips froggatti* Hood.—*Dianella coerulea*, Norman Park, 6th October, 1927.

51. *Haplothrips gowdeyi* Franklin.—*Allium* probably *fragrans*, Norman Park, 20th October, 1927; *Acacia maideni*, Toowong, 29th December, 1927; *Emila sonchifolia*, Alderley, 20th September, 1927; lantana again, Innisfail, 16th June, 1926, F. W. Becker; banana, Palm Island, 27th May, 1926, J. L. Froggatt; in curling leaves, *Musa banksii*, Innisfail, 14th July, 1926, J. L. Froggatt; *Eleusine ægyptiaca*, Gayndah, 1st March, 1928.

52. *Thrips io* Girault.—Loquat, Gayndah, 29th February, 1928.

54. *Haplothrips nigroculex* Girault.—On pistils of Arum lily, Geebung, 15th September, 1927; *Viburnum odorotissimum*, Brisbane, 7th October, 1927; forest, Samsonvale, 18th September, 1927; sweeping grass and low vegetation, Morningside, 9th September, 1927; sweeping *Leptospermum*, Geebung, 15th September, 1927; on burrs of *Xanthium*

strumarium (identified by W. A. T. Summerville), Taringa, 27th March, 1928; Alderley, forest, 20th September, 1927, common.

57. *Hydatothrips argenticinctus* Girault.—On lemon foliage, Mayne Junction, 17th December, 1927, Brimblecombe; in forest sweepings, Morningside, 9th September, 1927.

The forewing is black only at base and at middle and apex widely. The male is like the female but segment 7 of the abdomen and the meson of 2 and 3 are also silvery.

59. *Anaphothrips regalis* Girault.—Common in flowers of *Solanum nigrum,* forest, Murarrie, 27th September, 1927.

60. *Anaphothrips cecili* Girault.—*A. striatus* (Osborn) in W. W. Froggatt, "Agricultural Gazette," New South Wales, 1915, pp. 303-305. Injuring fruit blossoms in great numbers.

61. *Physothrips quadrisetæ* Girault.—Described from the cunjevoy, *Alocasia macrorrhiza;* lantana, Innisfail, 16th June, 1926, F. W. Becker.

62. *Thrips partirufus* Girault.—On bananas, Fiji, 24th November, 1925 (H. W. Simmonds); *Musa banksii,* Innisfail, 15th May, 1926, J. L. Froggatt; also *Alocasia macrorrhiza,* Innisfail, 4th December, 1925, J. L. Froggatt; bananas, Palm Island, 27th May, 1926, J. L. Froggatt; banana flower buds, Innisfail, 15th February, 1926, J. L. Froggatt, and under flower bracts, banana, 18th May, 1926, J. L. Froggatt; lantana, Innisfail, 16th June, 1926, F. W. Becker.

63. *Physothrips bilongilineatus* (Girault).—On banana, Innisfail, 21st September, 1925, J. L. Froggatt.

64. *Frankliniella trybomi* Karny.—*Convolvulus erubescens,* Byrnestown, 7th March, 1928. Wings are practically clear; head, thorax black, former not narrowing behind.

65. *Scolothrips sexmaculatus* Pergande.—A single female amongst material comprising Nos. 1 and 41, bean leaves, Glen Osmond, South Australia, 19th March, 1928 (Geoff. Samuel, Waite Agricultural Research Institute).

This specimen bore upon the first five segments of the abdomen on each side a pair of marginal dots near base, the inner dot of each dorsal.

The species occurs in North America, Hawaii, India, Europe, but this is the first Australian record.

AFTER TREATMENT OF THE WHEAT CROP.

The harrowing of the growing crop when it is about 6 inches high is coming more into favour. Harrows certainly drag a few plants out, but when the stand is not already too thin no damage results, as the increased vigour of the crop and the better stooling induced more than make up for any disadvantage. In years when heavy winter rains have fallen, and on heavy land which is inclined to set hard, harrowing in early spring is very beneficial. Harrowing breaks this surface crust and also destroys many weeds. It is also of great advantage even in normal years on all classes of soil in the drier parts of the State, as it helps to conserve moisture by producing a surface mulch. On heavy land harrowing should be completed early in spring, otherwise the land is inclined to become so hard that the harrows will hardly mark the surface.

Rolling is sometimes practised when the crop is 6 to 8 inches high if it is intended to be cut for hay or silage. This is only done to level the surface. Rolling is beneficial on many of the light open soils, as it assists in consolidating the soil. Farmers on this class of land would improve their yields by rolling the growing crop. On very heavy soils rolling is not so beneficial.

OBITUARY.

MAJOR A. J. BOYD, F.R.G.S.

Many friends and old associates throughout Queensland and in other parts of the Commonwealth will learn with regret of the death of Major A. J. Boyd, F.R.G.S., which occurred in Sydney on 19th May.

The late Major Boyd was editor of the "Queensland Agricultural Journal" from its first issue in July, 1897, until May, 1921, and in the course of that time he became a friend of practically every farmer in the State. By general consensus of opinion in agricultural and literary circles, the "Journal" under his directorship attained a very high standard as an official publication, and was a distinct credit to the Department and the State.

Honesty is a word of many meanings. Major Boyd was honest in the widest sense—honest with himself, setting no standard which he himself would not maintain, seeking no honours but his own self-esteem, his knowledge of work well attempted and well done, and the confidence and affection of his friends. He was one of those in whom the pioneering history of Queensland is rich, one who was content to leave others to reap the harvest of his efforts. In all his enterprises he was a man of well-tested merit who possessed great gifts, and through them gave big and unstinted services to Queensland. He had a strong character as well as great capacity, and in his character was a rare combination of inflexible purpose and genial humanity. As a man, everyone who knew him was the better for knowing him, and those who enjoyed his friendship were very happy in the association.

He was intense in his patriotism, which found practical expression in many fields of effort. Though too old for active service in the great war, he was one

PLATE 96.—THE LATE MAJOR A. J. BOYD, F.R.G.S., FORMERLY EDITOR OF THE "QUEENSLAND AGRICULTURAL JOURNAL."

A man of well-tested merit who possessed great gifts, and through them gave great and unstinted services to Queensland.

of the first to volunteer for the A.I.F. His wide knowledge of languages, however, gave him an opportunity of doing excellent work as an Intelligence Officer; while he used his limited leisure in those days of stress in coaching young volunteers for non-commissioned and commissioned ranks in the newly-formed citizen army that was to win so much honour for Australia on the battlefields of three continents.

On one of those golden mornings which are the charm of Queensland's early winter, Major Boyd was laid to rest at Toowong on the crest of a knoll backed by Mount Coot-tha's wooded splendour. The scene at the graveside was very impressive. The service was beautiful in its simplicity. In sight was his much-loved river down which in his pioneering days he had rafted logs felled by his own hand and on the banks of which he had seen a city grow—a city in the building of which he had taken no small part, both materially and as a guiding influence in the formation of the character of many of its citizens. From the nearby eucalyptus forest came a gentle sap-scented breeze; from high up in the ranges came the staccato tapping of an axe—fitting symbolry in sense and sound. Gathered round were many old friends, old associates and old pupils, while within reach on either hand were many more old friends, fellow pioneers who had gone before but not without leaving their imperishable mark on Queensland history.

Since his retirement from the State Service in 1921, Major Boyd was engaged in literary pursuits, much of his work being published in the metropolitan Press. During the previous 40 years he had been in different branches of the Public Service, and was generally admired for his upright bearing and extensive learning. He was a son of the late Colonel Charles Boyd (of the 95th Regiment), of Kilmarnock, Scotland, and was born in France on 27th November, 1842. His mother was a member of the Vachell family, and Horace Vachell, the author, is his cousin. Educated in France, Switzerland, Germany, and Italy for a commission in the British Army, he, however, was placed in a mercantile house in Manchester. Deciding to go to sea, he went practically all over the world, including Australia. When in England he heard Dr. Lang lecture on cotton-growing in Queensland, and this induced him to come to Brisbane in January, 1860, to purchase land at Oxley Creek (now Corinda), but after a few years he obtained the appointment of head master of the new State school at Oxley. Later on he took up a large area of land at Pimpama, growing sugar, and erected a sugar-mill. Success attended this enterprise until cane d sease, frosts, and pest attack impoverished for a time nearly all the sugar-growers on the Pimpama, Logan, and Albert Rivers. His plantation name, Ormeau, still survives as a railway station. Next he became head master at the Townsville State School and Inspector of Schools in North Queensland. The only means of journeying in those days was by horseback, and the fierceness of native blacks made bush travelling very risky. Journalism next attracted him, and the purchase of the Townsville "Cleveland Bay Express" proved a good investment. Later he sold out and opened a private school at Milton, Brisbane. In 1882 he and his wife went to England. On returning he was appointed head master of the Toowoomba Grammar School. His journalistic engagements have been with the London "Graphic," "Brisbane Courier," and "Queenslander," and in 1897 he was appointed editor of the "Queensland Agricultural Journal," a position he held up to the time of his retirement. The late Major Boyd obtained his rank in the Queensland Garrison Artillery. He was twice married, and the death of the second Mrs. Boyd took place at the close of 1927. An adopted daughter survives, the widow of Lieutenant Ralph Clifton, an officer in the Royal Artillery, killed on the Western Front during the Great War. Major Boyd was a past master of the St. Patrick's Lodge, Irish Constitution, of Brisbane Freemasons.

A striking tribute to the late Major Boyd was accorded at the obsequies, which took place at the Toowong Cemetery on 22nd May, when, in addition to a large number of intimate friends and Public Service associates, there were present many of his old school pupils and members and ex-members of the Queensland Garrison Artillery, and four of the maids of Major and Mrs. Boyd, who were in their service thirty years ago. The casket was draped with the Union Jack, and was surrounded by numerous floral tributes testifying to the sorrow of a wide circle of friends. The service at the graveside was performed by the Rev. F. W. E. Wilkinson, of St. Paul's, Taringa, the chief mourners being Mrs. Ralph Clifton, adopted daughter (wife of the late Lieut. R. B. Clifton), who was accompanied by Mrs. Spencer-Browne, and Mr. S. H. H. White (son-in-law). Among those present at the graveside were Messrs. R. Wilson, S. S. Hooper, A. H. Cory, H. S. Iliff, A. E. Gibson, H. G. Crofts, H. W. Mobsby, A. H. Jones, J. C. Brunnich, H. C. Quodling, R. P. Short, F. F. Coleman, E. G. E. Scriven, H. Tryon, C. McGrath, and J. P. Orr (representing the Department of Agriculture and Stock), Mr. R. Hogan (State Stores), Dr. J. P. Thomson (Royal Geographical Society), Captain W. Campbell Thomson, Captain G. A. H. Curtis, Col. R. A. Stanley, Captain Chester Reynolds (editor, "Queensland Government Mining Journal"), Lieut. J. F. F. Reid (editor, "Queensland Agricultural Journal"), Col. C. H. Drummond and Major H. Maddock (representing the president and committee of the United Service Club), Lieut. R. L. Higgins, O.C. Garrison Artillery, Major-General Spencer Browne (representing literary department, Brisbane Newspaper Company, Ltd.), Mr. H. C. Woodhouse (publisher, Brisbane Newspaper Company, Ltd.), Captain H. S. Bere, Dr. von Schultze, Captain J. E. Hinton, and Messrs. O. Radcliffe, H. S. Macpherson, J. Baxendale, Daniel Jones, J. Walker, T. A. Jones, J. Soutter, S. Sinnamon, J. P. Kennedy, W. K. Berry, W. H. Parker, A. Paterson, and A. Jones. Messrs. Radcliffe, Berry, and Sinnamon were original pupils with Major Boyd at the opening of the Oxley school in 1867.

Included among numerous floral tributes were wreaths from the Minister and officers, Department of Agriculture and Stock, President and members of the United Service Club, Directors of the Brisbane Newspaper Company, and "Old Comrades, 'Courier' and 'Queenslander' literary staffs."

Tributes.

Many were the tributes to the memory of Major Boyd. His work, worth, and public service were the subjects of extended and appreciative Press references, of which the subjoined were expressive of the general feeling of regret for the ending of a long and useful life:—

Vale Major Boyd, wrote Dr. J. P. Thomson, C.B.E. "He sleepeth the sleep —the eternal sleep—we all must sleep. And no one knows whence we come and where we go. The purpose of life is truly a puzzle, the longest span being but short, and the strength of man being disproportionate to his years. Cicero considered that every man has lived long enough who has gone through all the duties of life with unblemished character. This, I think, is a noble sentiment. It is just about forty years ago since the late Major A. J. Boyd associated himself with the activities of the Royal Geographical Society in Queensland, and which continued up to within a couple of years of his death. He filled various positions with zeal and enthusiasm, and for a time acted as secretary during my occupancy of the presidential chair. A most efficient and accomplished officer, he carried out the duties of his post successfully, and was esteemed by his colleagues as a ready worker and staunch supporter. Of a most genial disposition, Boyd was always accessible to the large number of members and their friends who usually filled the society's hall at the monthly meetings, and frequently took a leading part in the discussions following the lectures and addresses given at those gatherings. In recognition of his valuable services to the society, the council awarded him the diploma of fellowship some years ago. At a meeting of the council of the Royal Geographical Society yesterday, his Grace Archbishop Duhig, F.R.G.S., in the chair, allusion was made to the death of Major Boyd, and it was decided to record on the minutes the council's deep regret at the loss sustained thereby, and sympathy with his surviving relatives.

THE LATE A. J. BOYD.

SOLDIER, SAILOR, SCHOOLMASTER, AND JOURNALIST.

By "Nut Quad."*

Fifty-four years ago the present writer first became acquainted with the late Major Boyd. In 1874, Mr. Boyd was, by the late Mr. Gresley Lukin, then managing director of the Brisbane Newspaper Company, appointed to the position of agricultural editor of the "Queenslander," a position previously held by the late Angus Mackay, who was the first editor of the paper. In the year mentioned, the late Hon. Arthur Macalister, who was then Colonial Secretary, wanted to send someone to America to represent the Queensland Government at the great Centennial Exhibition, held in Philadelphia, to celebrate the first century of the great Republic. His choice fell on Mr. Mackay, who, a few years before, had been on the staff of the New York "Tribune" when the eminent Horace Greeley had been editor-in-chief. Mr. Mackay had the Queensland Court at the Exhibition ready for the reception of the public two or three days before the official opening day, and sent by telegram to the "Tribune" a full description of the Queensland exhibits. Queensland was, therefore, the only country in the world to have its exhibits described in the American Press on the opening day.

For some years previous to this, numbers of well-educated young Englishmen from the great public schools in the Homeland had been arriving in Queensland to seek their fortunes in this new and promising land. To the sons of well-to-do English gentlemen, and to the yeoman and peasant stock of England, Ireland, and Scotland, we are indebted for many of our most valuable pioneer families. A typical specimen of this stamp of colonist—versatile, energetic, and undismayed by failure —was Major A. J. Boyd. According to an article which was published in the "Queenslander" in 1897, Major Boyd was a Frenchman born, but a Briton by parentage and heredity. He was born in the historic City of Tours in the year 1842. After passing through a course of primary and secondary education at the

* In "The Brisbane Courier."

Fulham and Brampton Grammar School, he was, for the higher educational honours, sent to Switzerland, France, and Germany, successively, with the intention of entering the British Army; for many generations his male ancestors had worn Her Majesty's uniform. His father (Lieutenant-Colonel Boyd), owing to pecuniary losses, was unable to maintain two sons in the army, and it was decided that the younger son should go to sea. He, therefore, joined the American mercantile marine, but, foreseeing, after a few years in that service, that it offered no very bright future as a sailor, he determined to seek some other career. Being in London when the late Henry Jordan, our first Immigration Agent, was delivering lectures on Queensland as a desirable field for immigration, he decided to come to this State. He arrived in Brisbane in the ship Saldanha, in 1861, and pitched his tent on the then wooded slopes of Wickham terrace, on ground which is now a portion of the Roma Street Railway Reserve. A few days later he purchased land on Oxley Creek, adjoining what was afterwards known as Consort Cliff. There he started farming, and, in spite of floods, with a fair measure of success. Cotton growing was then the pet agricultural industry, and he started the first ginning establishment in the Oxley district. After some time he relinquished cotton growing, and entered the service of the Queensland Board of Education as the first head master of the Oxley State School. This was his first experience as a schoolmaster, to be frequently repeated in after life.

Sugar growing next claimed his attention. He took up a plantation at Ormeau, erected a mill at Pimpama, and took his share in the ruin which frosts and rust in the Bourbon cane brought upon the entire body of Southern planters. Rejoining the Department of Public Instruction, he was appointed head master of the school at Townsville, and was shortly afterwards promoted to an inspectorship. An opportunity of acquiring the Cleveland Bay "Express" was too fascinating to be resisted by a man of Mr. Boyd's literary tastes, and for the sum of £500 he became sole proprietor and editor. The paper, which he developed into a bi-weekly, proved a great success, and realised a handsome figure when disposed of by Mr. Boyd, who, shortly afterwards, left for Brisbane to take up the position of agricultural editor of the "Queenslander," under the late Mr. Gresley Lukin.

But the scholastic life still beckoned to him, and we next find him located at Milton as a private schoolmaster, a step which proved to be the initiative of successful educational records. Mr. Boyd's proved teaching capacity, and his rare faculty for the handling of boys, secured for his school a name throughout Queensland, so that, after seven years, it became necessary to go further afield to secure larger accommodation. This was found at Nundah, where ten acres were purchased, and school buildings erected at a cost of about £3,000. After a brief visit to England, Mr. Boyd opened his new school, where success continued so to smile on him that the dormitories were soon found to be too small for the reception of all the pupils seeking admission. All went well with him for six or seven years, when, under the pressure of bad times, Northern and Western men found it was no longer possible to bear the expense of boarding their sons in the South. This proved temporarily disastrous for the school, which had to be closed in 1889.

Mr. Boyd subsequently accepted the head mastership of the Toowoomba Grammar School, where, during his two years' incumbency a high standard of efficiency was attained, and the roll strength of the school was largely augmented. In 1891, Mr. Boyd decided to reopen his old school at Nundah, and his decision was rewarded with fair prospects, until the disastrous floods of 1893 drowned his hopes, in common with those of many Southern Queenslanders. This blow determined him to give up proprietary schoolkeeping for ever, after devoting twenty-five of his best years to the work.

A large number of men now prominent in the professions, in commerce, and in the Public Service are proud to acknowledge the debt of gratitude they owe to the late Major Boyd for all of value they possess in the way of educational equipment.

In his journalistic days, apart from routine work, he wrote many Christmas stories for the "Queenslander," and was a frequent contributor both to the pictorial and ordinary columns of the London "Graphic. His "Old Colonials," in which he described many old Queenslanders, such as the sawyer, splitter and fencer, the boundary rider, the bullock driver, &c., has passed through several editions. He wrote the book called "Queensland" at the instance of the Government, and on one occasion he wooed the muses with such effect in "Geology in Verse" for boys and girls that the entire colonial Press applauded. He also was for some years editor of the Queensland Government "Agricultural Journal," and indeed drew an honorarium from the department until the time of his death.

That excellent corps, the Darling Downs Mounted Infantry, is largely the fruit of the late Major's recruiting zeal. For twelve years he was in command of the Brisbane Garrison Battery, having creditably qualified for all grades from acting lieutenant to major, which rank he held on the retired list.

PROFESSOR E. M. SHELTON.

The news has been received by cable from America that Professor Shelton, Instructor in Agriculture to the Queensland Government from 1890 to 1897, has died at Seattle, at the ripe age of eighty-one years.

The late Edward Mason Shelton was one of the pioneers of the modern system of agricultural instruction, and typical of a body of men who came into prominence in America, Great Britain, and Australia between forty and fifty years ago. They were men actuated by high ideals, great energy, and a devotion to the cause of improvement in farming methods.

PLATE 97.—THE LATE PROFESSOR E. M. SHELTON.

Born in England, the late Mr. Shelton went to the United States of America at an early age, and on attaining manhood made agricultural education his life's purpose. Among other offices he held was the position of Agricultural Instructor to the Government of Japan. On returning to America he was appointed first Principal of the Kansas Agricultural College at Manhattan. Professor Shelton started this institution with about fifty students, but when he left it in 1889 to come to Queensland, the number had grown to five hundred. He accepted the position of Instructor in Agriculture in the Queensland Government service on the 15th January, 1890, in the then recently formed Department of Agriculture. He, the late Mr. Peter McLean, and Mr. E. G. E. Scriven, formerly Under Secretary, were the three men mainly instrumental in laying the foundations of the Department.

From the time of his arrival he was bent upon the establishment of an Agricultural College, and in 1897 he had the satisfaction of seeing the results of his advocacy realised. The site of the College was selected by him in collaboration with Mr. Peter McLean. He was the first Principal, but resigned in the following year and entered into partnership with Mr. Robert Brown, in the firm of Shelton and Brown, machinery agents. He subsequently returned to the United States, where for years he maintained an orchard which he worked commercially as well as a hobby.

Professor Shelton had a numerous family, and had the satisfaction in his later years of seeing them all honourably placed in life.

While in Queensland he was assisted admirably in his work by Mrs. Shelton, who became well-known as a lecturer in domestic science subjects to rural audiences. She was the first to popularise bottling fruit as a local home industry.

In his work in the Department, Professor Shelton was specially interested in wheat, maize, and pigs, as was natural in one coming direct from the Middle West of the United States. In wheat, he was one of an Australian Committee whose labours were largely responsible for reducing the ill-effects of what was once the great bugbear of the Australian grain grower—namely, "rust." He was particularly active in introducing new varieties of both wheat and maize. He was also instrumental in getting the Department to bring out a regular Bulletin, the forerunner of this Journal, for which much of the matter came from his vigorous pen. He also inaugurated a system of annual agricultural conferences, with a regularly changing venue to the advantage of different parts of the State, and the establishment of Government experiment plots on private farms. He did a great deal of work in reporting generally upon land throughout the State for the Government, and was one of the first to draw attention to the possibilities of the commercial production of fruits, other than bananas, in Queensland, a possibility which for many years was derided. It was he probably more than anyone else who gave the necessary publicity to the, then almost unknown, agricultural wealth of the Blackall Range, one of the most productive and picturesque regions in the whole of the Commonwealth.

Whilst here, there was no more genuinely enthusiastic Australian than Professor Shelton, and he maintained correspondence with the State up to the time of his death. He was in regular receipt of the "Queensland Agricultural Journal" and the "Queenslander," so that he could keep in touch with the events that followed his sojourn here. Moreover, he never forgot those with whom he had been associated in the Department, and in his letters always made reference to one or another. To his old associates, both of the farm and the Department, it seems a striking coincidence that two old colleagues to whom Queensland is indebted for much that has emerged from formula to fact in the long and fruitful years of our agricultural advance—Professor E. M. Shelton and Major A. J. Boyd—should pass hence almost at the same time.

Many of the late Professor Shelton's agricultural ambitions in Queensland have been realised. He had one vision, as yet unfulfilled, and that was of a great wheat belt stretching from Hughenden to Roma. In his usual thorough manner he conducted a series of tests with wheat varieties at Hughenden, Barcaldine, and Roma, and the results were sufficiently satisfactory to indicate that time may yet prove that his opinion upon this particular matter was no idle dream.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING APRIL 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1928.	April, 1927.
North Coast.	In.		In.	In.
Atherton	4·31	26	1·26	5·97
Cairns	12·09	45	2·48	12·19
Cardwell	9·49	55	2·31	4·23
Cooktown	9·01	51	1·63	10·50
Herberton	4·14	40	0·63	2·81
Ingham	8·45	35	2·93	5·55
Innisfail	21·22	46	5·90	13·56
Mossman	9·96	14	2·48	7·23
Townsville	3·67	56	0·16	0·43
Central Coast.				
Ayr	2·72	40	0·19	0·10
Bowen	2·83	56	1·19	0·17
Charters Towers ...	1·68	45	0·20	0·62
Mackay	6·56	56	6·83	2·07
Proserpine	6·23	24	5·43	1·11
St. Lawrence ...	2·75	56	11·93	0·68
South Coast.				
Biggenden	1·80	28	5·68	2·90
Bundaberg	2·82	44	13·54	3·33
Brisbane	3·69	77	14·89	2·07
Caboolture	3·91	40	17·61	3·64
Childers	2·51	32	9·76	3·57
Crohamhurst ...	5·78	35	27·04	5·27
Esk	2·58	40	16·69	3·01
Gayndah	1·29	56	2·42	3·32
Gympie	3·12	57	14·17	4·16
Kilkivan	2·00	48	7·13	2·36
Maryborough ...	3·43	55	13·34	4·21

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1928.	April, 1927.
South Coast—continued:	In.		In.	In.
Nambour	5·39	31	21·78	4·43
Nanango	1·76	45	6·24	2·59
Rockhampton ...	2·24	40	21·68	2·03
Woodford ...	4·09	40	19·16	4·63
Darling Downs.				
Dalby	1·20	57	5·02	2·20
Emu Vale ...	1·15	31	4·16	0·79
Jimbour	1·19	39	4·80	1·87
Miles	1·28	42	4·59	1·37
Stanthorpe ...	1·62	54	3·12	1·32
Toowoomba ...	2·36	55	9·58	3·29
Warwick	1·58	62	4·70	1·21
Maranoa.				
Roma	1·21	53	3·93	0·85
State Farms, &c.				
Bungeworgorai ...	0·78	12	3·91	0·51
Gatton College ...	1·53	27	6·94	1·64
Gindie	1·14	27	6·05	0·
Hermitage ...	1·18	20	4·00	1·13
Kairi	4·93	12	1·20	4·01
Sugar Experiment Station, Mackay	5·16	29	5·07	2·11
Warren	1·31	12	...	1·80

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Red Ash (*Alphitonia Petriei*) is a fairly distinctive tree. It has a deeply-fissured bark and the underside of the leaves is white or very pale. The bark of the young branchlets has a peculiar, sarsaparilla-like scent. The leaves and young shoots are eaten by stock and are considered to be good forage. The timber is red in colour, and should be useful for cabinet-making and general indoor fittings. The species is found in Queensland from the Blackall Range in the South to Cairns in the North. It also occurs in Northern Australia from Thursday Island to Port Darwin. The accompanying illustrations show the appearance of the lower part of the stem and of the leaves, flowers, and fruit.

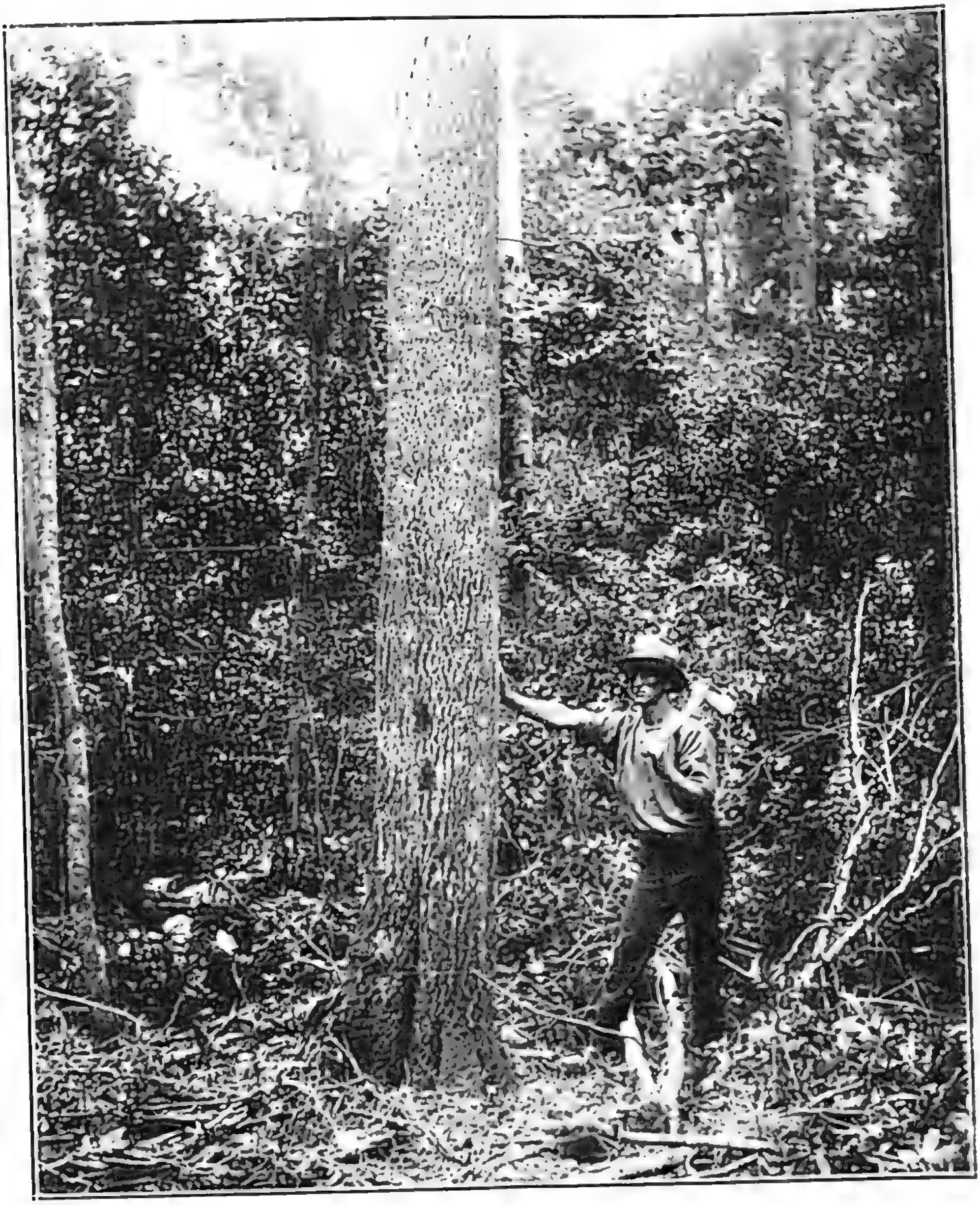


Photo.: W. D. Francis.]

PLATE 98.—THE RED ASH (*Alphitonia Petriei*) IN THE RAIN FOREST AT IMBIL.

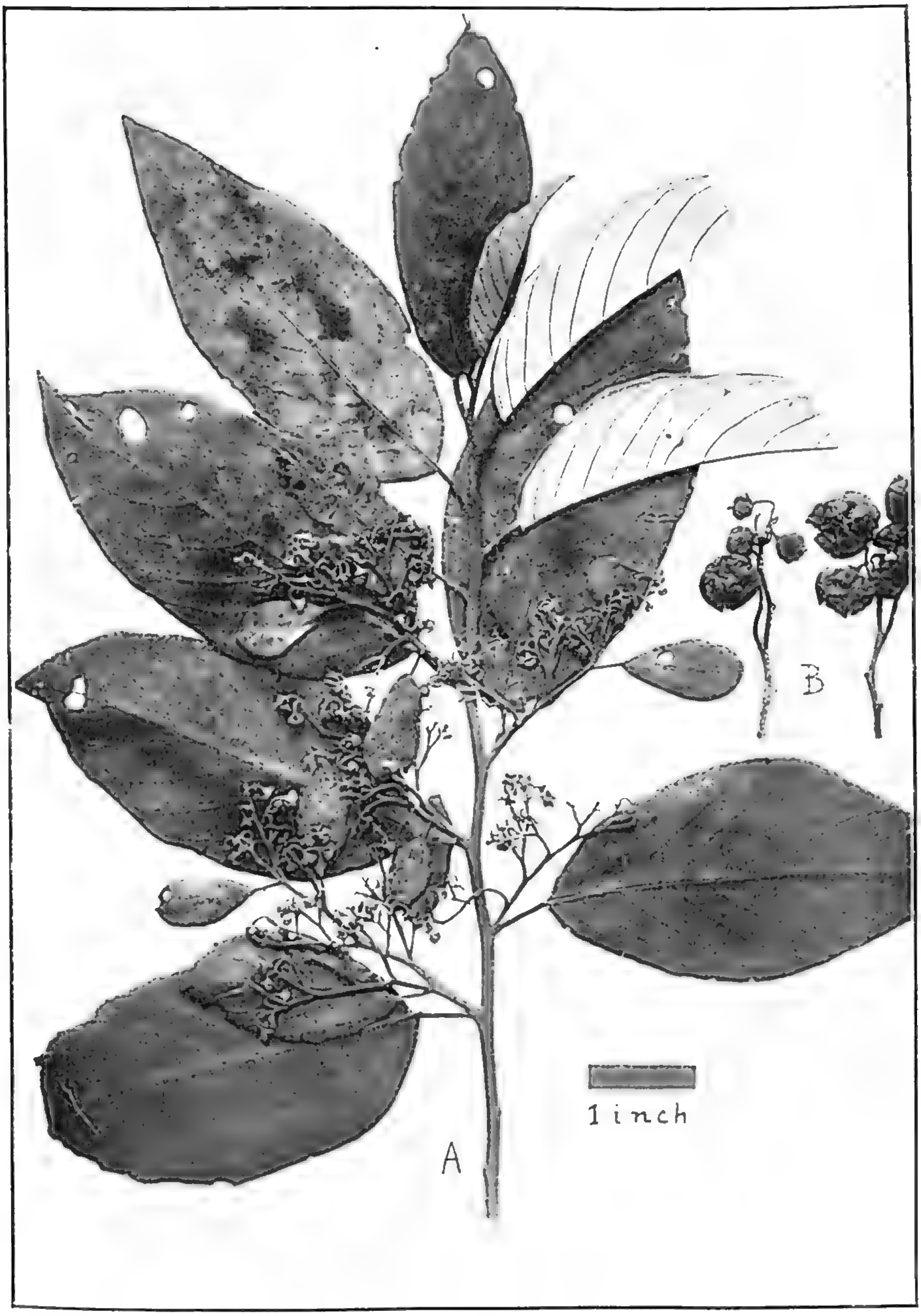


Photo.: Dept. of Agriculture and Stock.]

PLATE 99.—RED ASH (*Alphitonia Petriei*).

A. Flower-bearing Shoot. B. Dry Fruit.

DAIRYING IN QUEENSLAND

The Minister for Agriculture and Stock (the Hon. W. Forgan Smith) announced last year the appointment of a Departmental Committee to make a survey of economic facts relating to some important phases of agriculture in Queensland.

The Committee has met from time to time and has collected and collated much useful data. It is the intention of the Minister to convey some conclusions based upon this data to producers through a series of Bulletins. Mr. Forgan Smith has chosen as the subject-matter for the first bulletin, "Dairying in Queensland," from which the subjoined notes are taken.—ED.

Introduction.

The dairying industry is one of the most important of the primary enterprises of the State, and the position of dairying in Queensland has been considered from every angle. The producing, manufacturing, and marketing interests have assisted in this review of the industry. Investigations have also been made under actual field conditions on holdings regarded as typical Queensland dairy farms. The ultra-practical as well as the technical and theoretical aspect of affairs has been taken fully into account.

Dairying Industry in Perspective.

The following facts serve to indicate the position of the dairying industry in Queensland:—

(*a*) Production of milk in Queensland for all purposes, ranges, according to the season, from 100,000,000 to 150,000,000 gallons per annum.

(*b*) In a reasonably good season, butter production reaches more than 60,000,000 lb. and cheese production reaches 13,000,000 lb.; the gross annual value of this production is approximately £6,000,000.

The quantity of milk produced in 1926 and how it was utilised was—

	Gallons.
Total milk production	132,144,165
How distributed—	
(1) Butter factories	103,314,026
(2) Cheese factories	9,244,373
(3) Condensed milk factories	1,662,755
(4) Butter made on farms	5,726,647
(5) Cheese made on farms	17,763

(*c*) Queensland produces approximately one-fourth of the total Commonwealth output of butter and almost one-half of its cheese production.

(*d*) In Queensland there are 52 butter factories and 73 cheese factories and 22,500 dairying establishments. It is estimated that 21,172 males and 14,849 females, or a total of 36,021 persons, are engaged in the dairying industry. It is further estimated that there are about 90,000 persons, or more than 10 per cent. of the population of the State, largely dependent upon the industry.

(*e*) The number of dairy cattle in Queensland is estimated at 500,000, and the amount of capital invested in the dairying industry is approximately £35,000,000.

These figures illustrate very forcibly the importance of dairying to Queensland, the extent to which our people are influenced for good or for ill by the prosperity or the adversity of the dairying industry, and the necessity of developing it along sound lines.

Factors in Successful Production.

An analysis of returns furnished by dairymen shows that there are marked variations in milk production in relation to size of holding, number of cows milked, number of hours worked, and amount of capital invested. The conclusion which may be drawn from a review of individual returns is that satisfactory production in dairying depends on—

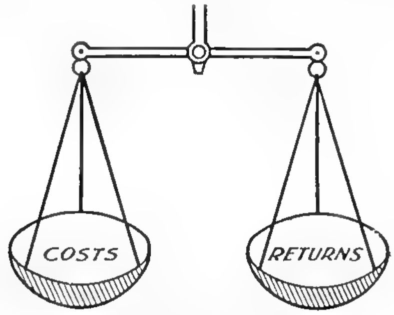
(i.) Suitable land of adequate acreage;
(ii.) Suitable cattle in sufficient number;
(iii.) Feeding and care of milch cows conducive to high milk yield.

If any one of these factors is unsatisfactory production is likely to suffer.

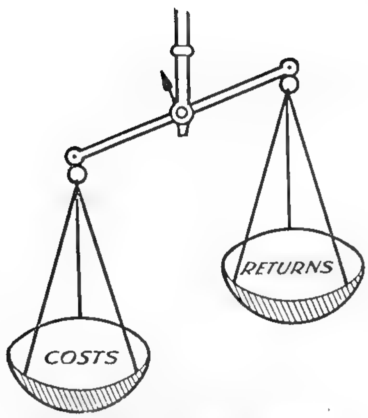
If, for example, the milch cows are not of good producing strain, much labour expended in milking and attending to them, and much of the feed which they consume, will, to a great extent, be wasted; on the other hand, if even good cattle are not suitably fed and cared for production will be unsatisfactory, the capital represented by their value will not be used to advantage, and the dairying business will not be progressive.

It is illogical to suppose that the average person without experience or capital can take up land and run a dairying business successfully in competition with more experienced and practical men. One might just as reasonably expect an unskilled workman to turn out as much as a skilled operator using a modern machine.

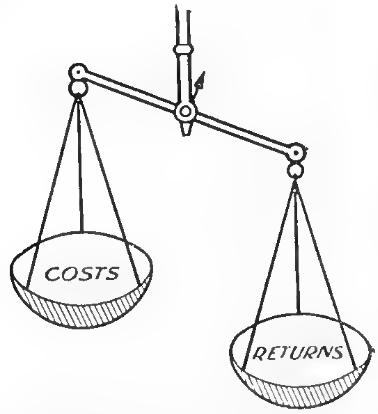
Review your position and find out where you stand!



Business
Stagnation.



Unprofitable Business leading to
Financial Disaster.



Profitable Business leading to
Financial Prosperity.

In many districts in Queensland dairying may be carried on in congenial circumstances; conditions generally are conducive to the production of a product of superfine flavour and of high food value.

In view of these facts it might naturally be expected that the average yield of milk per cow in Queensland should be higher than the average yield in any of the other States; but what do we find? Let the following figures supply the answer:—

——	1921. Butter.		1922. Butter.		1923. Butter.		1924. Butter.	
	Gall.	Fat.	Gall.	Fat.	Gall.	Fat.	Gall.	Fat.
Victoria	366	146·4	329	131·6	340	136	393	157·2
New South Wales	363	145·2	281	112·4	285	114	391	156·4
South Australia ..	333	133·2	316	126·4	350	140	336	134·4
Queensland ..	301	120·4	240	96	194	77·6	310	124
Western Australia	223	89·2	213	85·2	217	86·8	218	87·2

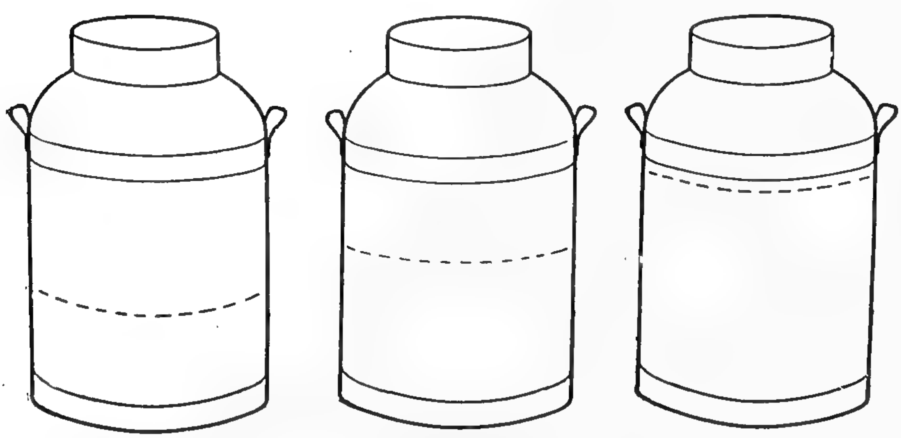
Is it in the interests of the dairy farmers of Queensland that this State should have the second lowest average? Should not the objective be to secure for Queensland—the Queen Dairying State—pride of place? Would not the realisation of this objective result in substantial gain to the dairy farmers?

It is realised that our average production of butter fat per cow is based upon the production of all herds, that some herds are milked only during periods when natural pastures are plentiful, and that by reason of these facts the average production may be somewhat lower than in the case of full-time dairy herds. The herd-testing records of the Department, however, indicate a very wide variation in the production of butter fat per cow in the herds tested, and it may be assumed that these herds are not below average in production.

Official figures prove indisputably that a very large number of Queensland dairy farmers are carrying on their operations with cows that are definitely unprofitable.

The figures for the year 1925-26 show that the cow with the lowest yield of butter fat for a full milking period (290 days) gave 133 lb. of butter fat (equivalent to 156 lb. of commercial butter), while the cow with the highest yield of butter fat gave 366 lb. (431 lb. of commercial butter) over the same period. Assuming 1s. 2d. per lb. to be the average price received for commercial butter, we find the lowest-yielding cow returning its owner £9 2s. per annum and the highest £25 2s. 10d., a difference of £16 0s. 10d. in favour of the better animal.

A graphic representation of returns per cow is shown hereunder; the effect of keeping high-producing cows upon the individual dairyman's finances and upon the industry generally should be obvious.



Lowest Cow in Tested Herds 156 lb. C.B. — Average of Tested Herds 239 lb. C.B. — Herd Book Standard 400 lb. C.B.

The particulars which have been given in the foregoing paragraphs are very suggestive. A few of the deductions which may be drawn are:—

(*a*) The capacity of each cow to produce is the fundamental and dominant factor in making dairying profitable.

(*b*) Production per cow is the deciding factor in assessing the number of cows which a dairyman must keep in order to earn sufficient income to maintain himself and his family in reasonable comfort.

(*c*) The price received for butter will not pay for the labour in milking unprofitable cows.

(*d*) The price of dairy products has an important influence upon the cost of living in the community, and the community should not be expected to pay a price which will permit of inefficiency.

POINTERS TO PROSPERITY.

1. Improvement in the breeding of dairy stock.

2. Herd improvement by testing and culling.

3. Systematic and adequate conservation of fodder.

(*e*) A large number of Queensland dairy farmers are carrying on their operations with cows that are unprofitable.

(*f*) The use of approved dairy sires is essential to successful dairy farming. A dairy herd should be built up by the use of sires from proved producing strains. A sire will either increase or decrease the milk production of his progeny.

(*g*) The number of good dairy cows should be increased; the number of unprofitable cows should be reduced. It would be idle to expect dairy farmers to replace immediately all the unprofitable cows in their herds; but they could introduce a gradual elimination process by breeding from selected dams mated with approved sires.

(*h*) To breed from unprofitable cows increases the number of inferior milch cows; the dairy farmer who persists in milking unprofitable cows and breeding from them will not secure a return commensurate with his labour and with the capital which he has invested.

(*i*) Every breed of improved live stock has been developed by well-defined laws of selection and breeding. Under the influence of skilful selection, breeding, and feeding, the dairy cow has developed remarkably, both in type and functions, and differs greatly in general characteristics from the foundation stock from which the modern type has been evolved.

It cannot be emphasised too strongly that the farmer who retains cows yielding a low average production of butter fat per annum, is engaged in farming on a basis which must be unpayable, and which, from the individual as well as from the wide national standpoint, is economically unsound. Of such a farmer, one or more of the following things might be said:—

(*a*) He is not sufficiently interested in the business to keep accurate records and ascertain his real financial position;

(*b*) He is not making effectual efforts to increase the production of his herd and to make the best use of his time and money;

(*c*) He is utilising under-paid family labour which sooner or later will result in discontent;

(*d*) He and his family are not experiencing the standard of comfort and living which would be afforded by keeping a herd of good cows.

> **Production per cow is the fundamental factor in making dairying profitable. It is also the deciding factor in assessing the number and productivity of cows which a dairyman in Queensland must keep in order to earn sufficient income to maintain himself and family in reasonable comfort. The many problems of dairying in Queensland surround the basic factor of production per cow.**

Based upon the foregoing data and deductions, the urgent attention of the industry is directed to the imperative necessity for taking the following definite steps:—

(i.) By better breeding and testing to raise the producing capacity of the average herd to such a point that the herds will pay for labour and feeding involved and return a reasonable margin on capital invested;

(ii.) By pasture improvement, rotation of crops, and fodder conservation, to provide food rations for milch cows such as have been proved by experiment to be conducive to high production;

(iii.) By sanitary and hygienic methods and due attention to transport to ensure high quality products in order to command top prices.

Queensland's Variety of Climate and Soil.

Generally, dairying is carried on throughout the whole of the coastal districts of Queensland, from Atherton Tableland in the North to Goondiwindi in the South, a stretch of territory of 1,000 miles between extremes. In some districts farmers concentrate on dairying either for butter or for cheese production. In others this activity is combined with the several forms of diversified farming. In other parts of the country dairying is also combined with fruitgrowing and sugar-cane growing. Probably two out of every three of the farmers of

Queensland are interested in the dairying industry. Owing to the variation in the fertility of the soil and of the rainfall throughout the State, the carrying capacity of the land used for dairying purposes differs very greatly, ranging from $1\frac{1}{2}$ acres to 8 acres to the cow. The exact area required is dependent upon the suitability of soil and rainfall for natural pastures and fodder crops. Such factors must be taken into account when determining the living area in any particular district, and no hard and fast rule can be set down that would apply to all the varying conditions under which dairying is conducted.

Fodder Conservation Essential.

In Queensland dairy stock need not be housed at any period of the year. On the other hand this State has its problems connected with recurring dry spells, necessitating provision being made for the storage of fodder in good seasons when production is abundant. Many farmers commence operations with the handicap of shortage of capital, besides having to face, very often, the difficulties of pioneering. Many farmers often find it impracticable to make adequate provision for fodder conservation. Those who condemn the improvidence of Australian dairy farmers, fail to fully recognise or appreciate these circumstances. It is, however, considered to be imperative in profitable dairy farming practice in Queensland that adequate provision should be made for fodder conservation. In some countries the conditions of land tenure provide, as an essential, for conservation of stock feed on the holding. Notwithstanding the wealth of crops and pastures in Queensland in good years, provision for the lean periods is, we have learned by experience, of the highest importance. After making due allowance for the early difficulties mentioned, the practice of fodder conservation is not yet so general as it ought to be, and it demands the serious attention of every dairyman who aims to control a prosperous enterprise.

Cultural methods, fodder conservation, herd improvement, the meeting of the world competition, the influence of the price of dairy products upon the cost of living in the community, and the importance of the prosperity of the dairy farmer himself, are definitely bound up with the productive capacity of the individual unit in the dairy herd.

A series of Bulletins will follow dealing with:—

- Dairying—
  - Herd improvement.
  - Animal husbandry, pastures and fodder crops.
  - Dairy hygiene, transport, manufacturing, and marketing of dairy products.
- Pig raising.
- Poultry keeping.
- General agriculture.

AUSTRALIAN PIG INDUSTRY COUNCIL.

At the first meeting of the newly-formed Australian Pig Industry Council held at the Commonwealth Bank Offices, Sydney, recently, delegates representing both co-operative and proprietary bacon factories, producers, and State and Commonwealth Departments were in attendance. The delegates present were:—

Commonwealth.—The Hon. T. Paterson, Minister for Markets; E. J. Mulvany, Secretary, Department of Markets; J. M. Davidson, Veterinary Officer, New South Wales; P. J. Carroll, Supervisor of Dairy Exports; G. A. Bedwell, representing the Federal Council of the Australian Stud Pig Breeders' Society.

New South Wales.—Producers' Representative: G. W. Gordon, Raleigh, New South Wales; Co-operative Bacon Factories: J. J. Hayter, Byron Bay, New South Wales; Proprietary Bacon Factories: W. J. Gale, Barnes Bacon Company, Homebush, New South Wales; Representing Department of Agriculture: A. F. Gray, Senior Pig Instructor, Department of Agriculture, Sydney.

Victoria.—Producers' Representative: F. E. Kurrle, Korumburra; Co-operative Bacon Factories: T. J. McGalliard, Gippsland, Co-operative Bacon Curing Company, Limited; Proprietary Bacon Factories: F. A. White, J. C. Hutton Proprietary Limited.

Queensland.—Producers' Representative: R. G. Watson, Australian Stud Pig Breeders' Society; Co-operative Bacon Factories: J. A. Heading, Chairman of Directors of the Queensland Co-operative Bacon Association, Limited; Proprietary Bacon Factories: A. B. Anderson of J. C. Hutton Proprietary Limited; Department of Agriculture: E. J. Shelton, Instructor in Pig Raising.

South Australia.—Producers' Representatives: F. G. Ayres, President, South Australia Dairymen's Protection Association.

Tasmania.—Producers' Representative: L. Williams, Tasmanian Branch, Australian Stud Pig Breeders' Society.

Resolutions.

After considerable discussion and after carefully weighing up the pros and cons of the numerous items included on the agenda, the following resolutions were agreed to:—

1. That the constitution of the Council for the Australian Pig Industry and the State Pig Industry Committees drawn up at the Conference held in Sydney on 7th and 8th June, 1927, be accepted, subject to the inclusion in each of the State Committees of one representative of the State Agricultural Colleges in their respective States.

2. This Council approves of the organisation of the pig industry to bring about a stable price, and recommends that the pig-producing States be urged to enact legislation to enable this to be done. (Note.—Legislation is already in existence in Queensland and New South Wales.)

3. Pending the introduction of such legislation the proprietary and co-operative factories in each State be urged to form committees for the regulation of prices, having regard to the interests of the producer and the consumer.

4. That the State Departments of Agriculture be asked to conduct experiments in the breeding and feeding of pigs at the Agricultural Colleges and/or selected farms, and to co-operate with the Royal Agricultural Societies in the different States in the exhibition of the best types of pigs.

5. That it be a recommendation to the pig breeders in the undermentioned States that the most suitable factory weights for best quality bacon pigs be as follow:—

Victoria	110 lb. to 135 lb. dressed weight
New South Wales	105 lb. to 130 lb. dressed weight
Queensland	95 lb. to 120 lb. dressed weight

6. That it be a recommendation to bacon factories that they pay a bonus for pigs of a desired quality within specified weights.

7. That each of the State Committees be requested to consider the question of conducting propaganda to increase the home consumption of pork products.

8. That each of the State Committees be asked to make a recommendation to their respective Departments of Agriculture that all pigs sent to slaughter be fire-branded.

9. That in connection with investigations now being conducted into the question of diseases in pigs by the Council for Scientific and Industrial Research, that body be requested to give particular attention to tuberculosis and to mortality in young pigs.

10. That the question of the interstate carriage of pork and bacon by refrigerated steamers be referred for consideration to the State Committees.

11. That the question of rail transport conditions generally, including bruising of pigs and cleanliness of trucks be referred for consideration to the State Committees.

12. That the question of securing uniformity of control throughout the States and the interchangeability of inspection certificates be referred for consideration to the State Committees.

13. That the Tariff Board be requested to inquire into the question of imposing an increased duty upon imported pig products.

14. That the question of establishing pig clubs in States other than Queensland, where they are at present in operation, be referred to the State Committees for consideration, and that Mr. Shelton forward to those Committees details of the scheme in operation in Queensland.

15. That Mr. Gale's scheme for the stabilisation of the industry be referred to the State Committees for consideration and for report to the next meeting of the Council.

16. That the Council approves of the appointment of proxies in the State Committees in the same way as in the Federal Council.

17. That with regard to the publication of the proceedings of meetings, the secretary prepare a report for the Press after each meeting.

18. That it be a recommendation to the State Committees that members of State Committees and of the Federal Council should hold office for two years, and that the State Committees be authorised to elect a new member to any vacancy in the Committee in their respective States from whatever cause arising.

19. That the next meeting of the Council be held in Melbourne on the Tuesday prior to the opening of the Royal Agricultural Society's Show (September, 1928).

20. That representatives of the various Governments on the State Committees and the Federal Council should act in an advisory capacity only.

21. That the question of the appointment of a Commission to inquire into the pig industry throughout Australia be referred to the State Committees for consideration, and in the event of a recommendation in favour of the appointment of such a Commission, the lines upon which the investigation should be made.

State Committees.

State Committees have already been formed in Queensland, New South Wales, Victoria, and South Australia. Up to the present no Committees have been formed in Western Australia or Tasmania, but it is possible as a result of the above meeting a Committee may be formed in Tasmania. It is hoped later on Western Australia will also join up, for the Director of Agriculture, the Superintendent of Dairying, and other officers and farmers are greatly interested in the development of the industry in that State, while manufacturers have already established modern factories at convenient centres for the treatment of all available stock, and are equally as interested there as elsewhere throughout Australia.

The Queensland Pig Industry Committee is composed of the following representatives:—

Producers: Mr. R. G. Watson representing the Queensland Branch of the Australian Stud Pig Breeders' Society; Mr. John Hardcastle, Director of the Queensland Co-operative Bacon Association, Limited.

Co-operative Factories: Mr. J. A. Heading, Chairman of Directors, Queensland Co-operative Bacon Association, Limited, Murarrie; Mr. H. M. Hart, Chairman of Directors of the Darling Downs Co-operative Bacon Company, Limited.

Proprietary Bacon Factories: Mr. E. E. Forth, General Manager, J. C. Huttons Proprietary, Limited, Brisbane; Mr. T. L. Jones, General Manager, Foggitt, Jones, Limited, Brisbane.

Commonwealth Departments: Mr. O'Boyle, Government Veterinary Officer.

State Departments: Mr. E. J. Shelton, H.D.A., Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane.

SIMPLE SHEEP FENCE.

At the present prices of wire, anything that will economise in material is acceptable to landowners. The fence illustrated, which was noticed by a frequent contributor in Western Australia, will be found an effective fence for merinoes and easily repaired. Only one wire is used, the posts being 100 feet apart, and the secret of success is to keep this wire tightly strained, with wire droppers from it to the netting selvedge. The netting is let into the ground, but is not fastened in any way to the posts. Fig. 1 shows the general arrangement of the fence. Fig. 2 shows the device for making

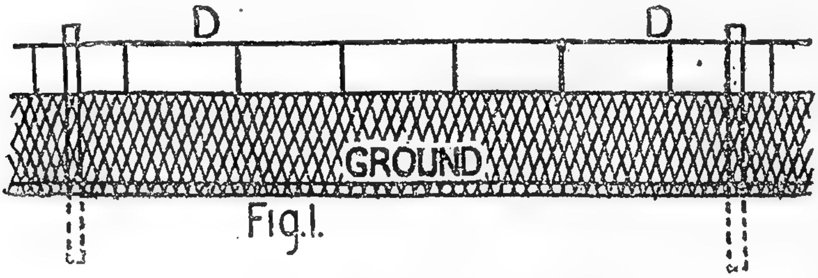


Fig.1.

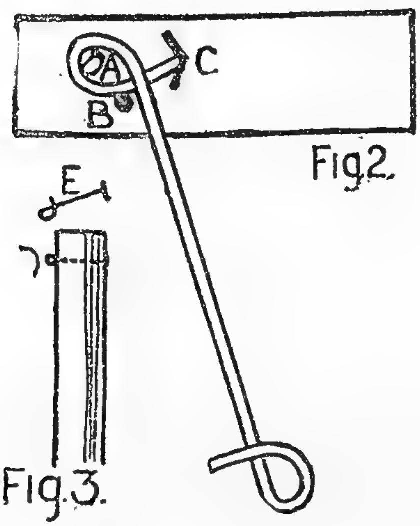


Fig.2.

Fig.3.

the wire droppers, consisting of a piece of batten with a screw, A, a spike, B, and a stop, C, all projecting about half an inch out of the batten. The ends of the droppers must be turned in opposite directions, and on opposite sides. Fig. 3 shows how the top wire of the fence is fastened to the posts by a piece of wire, E, running through the post at right angles, with a twist about the size of a halfpenny at the back to hold it, and an ordinary hitch round the top fence wire to hold that wire in position at D.—"Australasian."

CLASSING SMALL CLIPS.

The following notes are taken from a radio address by Mr. J. Carew, Acting Instructor in Sheep and Wool:—

Having established a flock of sheep, the next thing to consider is the best and most profitable method of preparing the wool for market.

The standard which has been attained in Queensland has caused a feeling of security and confidence to prevail amongst our wool-buying representatives, and this standard should be safeguarded amongst the small holders as well as it is with the large holders. The large stations usually have flocks sufficienty large to justify the employment of a qualified wool-classer. It is really the get-up of these clips that has secured for us the high standard which the trade now enjoys. It is where the flocks are too small to justify the employment of a qualified wool-classer that I wish to direct my remarks. Every sheep farmer knows that from a sheep there will be shorn a low grade of wool as well as the good, clean fleece wool. To keep these grades separate is very important, but first consideration should be given to the matter of general cleanliness. Have a good, clean shearing board, the size suitable to the requirements, and keep it clean. When the sheep is shorn the fleece should be picked up and thrown out, cut side down, on a wool roller's table for skirting.

The reason for skirting the fleece is that the edges represent the lower types. having a greater amount of yolk and run out to short fibres. When this skirting is removed the fleece is composed of wool practically the same length all over, thus allowing the buyers to secure what they require without having these inferior wools included.

If the fleeces are lightly affected with seed or burr, a deep skirting is most suitable, as the fleece wool will then be seed-free.

If seed or burr extend over most of the fleece it is better to give a light skirting, removing the heavy seed-matted edges, as to make the fleece seed-free would mean removing too much wool in the skirtings.

All skirtings should be picked over carefully, removing all stained portions and fatty trimmings, which should be packed separately and called "stained pieces."

The amount of pieces secured from the clip should decide whether they be sorted into two classes or left to go into one bulk line.

If two sorts are made, the bulky, bright, light-conditioned pieces would be called "brokens," and the small, duller, and heavier-conditioned sort would be called "pieces."

Bellies.—As this portion is shorn separately, it is best to keep them separate from fleece wool or pieces. All stained wool should be removed and the bellies packed by themselves. As they are not used for the same purpose they are likely to prejudice a buyer against either lines of fleece or piece wool. No matter how small the flock this precaution should be taken.

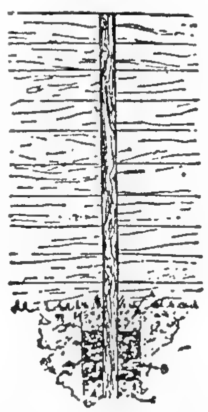
Locks will consist of all second cuts and small locky bits that fall through between the lathes of the wool tables. Where a small flock is being treated the floor sweepings can be mixed with them, thus making one line of locks. When the fleece is skirted it should be rolled. If this is done properly the wool is likely to open up better and be more attractive to the buyer. To do this properly, first throw in one side, about one-third the fleece width, then turn in the same side again, tuck in the edges of the fleece, throw in the neck, and roll from britch to shoulder. The fleece can be secured by drawing out from the shoulder enough wool to turn and tuck into the fleece. This is not necessary if fleeces are properly handled. Fleece wool should not be secured with twine when preparing it for market.

[TO BE CONTINUED.]

SAVING CONCRETE IN POST HOLES.

The ordinary method of setting a post in concrete is to set it into the hole and fill in around with concrete. This is wasteful, and does not reach the highest efficiency.

A square hole should be dug so that the concrete will have square corners. After placing the post in position the concrete should be poured in until the hole



is about one-fifth filled. The concrete is marked A in the drawing. The hole is partially filled with wet earth, here marked B, leaving room for more concrete. The upper concrete block should be about 50 per cent. larger than the lower block to offset any difference in the hardness of the ground. There is practically no strain exerted against the ground between the two concrete blocks.

THE STORAGE OF EGGS.

Compiled by P. RUMBALL, Poultry Instructor.

On the commercial scale eggs are preserved almost universally by means of cold air storage. For the small producer or consumer such a procedure is generally impracticable, and resort has been made to simpler methods, such as packing the eggs in sand, bran, ashes, salt, lime, &c. These methods have, however, now been abandoned in favour of storage in solutions in which the eggs are immersed and held until consumed or sold, states the Department of Scientific and Industrial Research, London, in a report on the ''Storage of Eggs,'' a copy of which has been received by the Department of Markets and Migration. This report, which deals most exhaustively with all phases of the subject, may be obtained directly from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, or from Messrs. Gordon and Gotch, Limited, Little Collins street, Melbourne. The price is 1s. 3d.

Continuing, the report states that the choice of a suitable solution is determined by certain considerations. The shell of the egg and its adjoining membranes are permeable to water and certain dissolved substances, and care must be taken that the preserving solution does not contain any ingredient likely to pass into the egg, thereby affecting its flavour or contaminating it in some way. Various substances have been tried and discarded for different reasons, so that at the present the two solutions most commonly used are a solution of sodium silicate, better known as water glass, and lime water, to which salt is usually added.

Fundamentally the preservation is still one requiring a certain degree of cold, and although for satisfactory results constancy of temperature is not required, it is essential that the eggs should be stored in a cool place where, if possible, the temperature should always lie in the range of 33 deg. to 45 deg. Fahr.

From their investigations the Board of Agriculture and Fisheries recommend the following specific solutions:—

(*a*) Water Glass.—A strong solution containing approximately equal parts by weight of sodium silicate and water is sold commercially. It is very viscous and has a specific gravity of 1.7. A 5 per cent. solution of this is a convenient concentration to use.

(*b*) Lime Water.—Four parts of finely slaked lime are mixed with twenty parts of cold water, and the whole well stirred for several days to ensure saturation. One part of salt is then added and the clear solution decanted and poured over the eggs which should be placed in suitable wooden, cement, or galvanised iron containers.

If the containers are open to the atmosphere the carbon dioxide in the air reacts with the solutions, giving a white precipitate. In the case of lime water it is simply a precipitate of calcium carbonate, whereas with the water glass silica itself is precipitated, due to the neutralisation of the alkali. It is therefore advisable, in order to maintain the solutions at the required strength, to cover the containers and so limit the ingress of carbon dioxide. An alternative method is to cover the liquid surface with a layer of oil, such as liquid paraffin or olive oil.

In both cases the eggs to be preserved should be clean and new-laid, and should not at any time have been subjected to a temperature much higher than 60 deg. It is therefore advisable to candle the eggs and discard cracked ones or any departing from this standard of freshness. Most investigators claim that water glass is the more satisfactory solution. Using the solutions described above, and, in addition, storing the eggs at a temperature of 32 deg. to 35 deg. Fahr., eggs have been preserved in the course of experiments by the Department for twelve months in both solutions with good results. The taste of the eggs stored in water glass was excellent, the air chamber was the same size as before storage, and the white had all the consistency of a new-laid egg. The eggs fried and poached, but nearly always cracked on boiling unless the shell was first pierced at the broad end. The only other point was that the shells had a slight crusty deposit which was not removed on washing with water.

The eggs stored in lime water were not so good, although the flavour was excellent. In all cases the air chamber had completely disappeared and the white was more fluid and tended to spread when the contents of the egg were emptied into a dish. The shell in every case was markedly thinner and appeared rough and amorphous. In general, the shell cracked on boiling, even though it was first pierced. Presumably, the action of the lime water was to make it very brittle.

The role played by the water glass in preserving the eggs is very simple. Being a colloid it does not pass through the egg membrane, and, indeed, Hendrick has shown that the silica content of eggs is not increased after two years' immersion in water glass. Further, Berger has shown that within three to seven days the water glass is deposited in the pores of the shell, completely sealing it. This, of course, is the reason why the shell has to be pierced prior to boiling. Once the egg is sealed it suffers no change resulting from external causes such as mould or bacterial invasion.

Commercial water glass is very alkaline, and some controversy has taken place as to whether a neutral sodium silicate would give better results. A certain amount of alkali is necessary to dissolve the silica, but it is claimed that the excess alkali affects the flavour of the egg. This fear, however, appears to be groundless in view of the fact that with water glass the egg is so quickly sealed. It is possible, however, that the alkali concentration influences the extent of the action of the water glass on the shell surface.

With lime water it would appear that the egg is never completely sealed, and therefore permits the passage of water through the shell, which fills the air chamber. This is rather striking, in that the solution in the present experiments (containing 5 per cent. sodium chloride) had a much lower freezing point, and, therefore, greater osmotic pressure than the white of the egg. The solubility of lime in water is small (approximately 1 in 700), and the freezing point of the lime solution will, therefore, be very approximately that of a 5 per cent. salt solution, i.e., 3 deg. C. One would therefore have expected water to pass from the egg to the lime solution, thereby giving rise to an increased air chamber. That it does not can only be explained by supposing that the lime attacks the egg membranes, destroying their permeability, just as it attacks and wears away the shell.

The efficiency of water glass and lime water as a means of preserving eggs is without question. Used in connection with a rough system of cold storage (i.e., paying no particular regard to constancy of temperature, but merely temperature limits) either method gives excellent results, with the preference, so far as the present experiments show, in favour of water glass. The cost of the water glass is small, and apart from the extra labour involved—e.g., the washing of the eggs on removal from the solution—the only disadvantages are that the surface of the shell is marred, and there is every possibility of the shell cracking on boiling. It would seem, however, that further research might remove these objections. Moreover, there appears to be no reason why, if clean eggs alone are used, the same preserving liquid should not be employed for several storage seasons. Lime water possibly has the advantage in this respect, as it is definitely antiseptic and is less likely to suffer from mould and bacterial contamination than water glass under the same conditions.

QUEENSLAND SHOW DATES.

The following show dates have been listed by the Queensland Chamber of Agricultural Societies for the present year:—

JUNE.

Lowood	8-9
Bundaberg	14-16
Miriam Vale	13-14
Hughenden	12-13
Wellington Point	16
Gladstone	20-21
Mount Larcom	22-23
Gatton	27-28
Woombye	27-28
Rockhampton	27-30

JULY.

Mackay	3-5
Kilcoy	5-6
Proserpine	7
Esk	13-14
Townsville	10-12
Woodford	12-13
Nundah	14
Home Hill	14
Caboolture	19-20
Rosewood	20-21
Charters Towers	18-19
Ingham	20-21
Ithaca	21
Ayr	27-28
Wowan	26

JULY—*continued.*

Laidley	25-26
Nambour	25-26
Mount Gravatt	28
Pine Rivers	27-28

AUGUST.

Bowen	1-2
Redcliffe	3-4
Royal National	6-11
Crow's Nest	22-23
Maroochydore	25
Coorparoo	25

SEPTEMBER.

Imbil	5-6
Zillmere	8
Gympie	12-13
Stephens	15
Pomona	19-20
Rocklea	22
Malanda	26-27
Beenleigh	28-29
Melbourne Royal	20-29

OCTOBER.

Kenilworth	4
Enoggera	6

Answers to Correspondents.

FRUITGROWING.

The following replies have been selected from the outward correspondence of the Director of Fruit Culture, Mr. Geo. Williams:

Monstera Deliciosa.

INQUIRER (N.Q.)—

The *Monstera deliciosa*—a native of Mexico—is an epiphytic climber and of slow growth, with large scolloped and perforated leaves carried on stems 1 ft. to 2 ft. in length, which are very ornamental. Propagated by seeds or short cuttings—the latter coming into bearing in two or three years; seedlings occupy much longer.

Fruit are produced in the axis of the uppermost leaves and occupy upwards of twelve months from the first appearance of the flower sheath (the plant belongs to the Arum family) to ripening. It attains about 10 inches in length by 2½ inches in diameter, and will ripen after being cut from the plant. The flavour is variously described from agreeable to exquisite. When perfectly ripe, the scales, as the outer covering is usually referred to, loosen, and commence to fall, and the edible portion becomes partially detached from the core. The lower half of the fruit is the first to mature, the upper half should be left to the following day. If eaten prematurely an irritation is caused in the throat by the small hairs which are present beneath the scales. Where treated as a climber, the plant may be grown against an old stump or slab wall. It may also be allowed to grow along the ground.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

"Periwinkle" (*Vinca rosea*).

T.M.K. (Beecher)—

The plant sent is *Vinca rosea*—the Periwinkle—commonly found as a stray from garden culture in Queensland, particularly on the coast in North Queensland, where it has become very abundant. It has attracted much attention in recent years as a cure for diabetes. Hundreds of people are now using it and, on the whole, reporting very good results. The plant is not known to be poisonous though it belongs to a dangerous family—the *Apocynoceæ*. Eaten by stock in very large quantities it may have a deleterious effect, but the plant has a rather nauseous taste and on the whole is more or less left untouched by animals.

TICK-FEVER INOCULATION.

PRECAUTIONS TO BE OBSERVED.

1. Animals should be placed in a tick-free stall or shady yard and allowed to remain there until they have recovered from the inoculation fever (approximately four weeks).

2. Animals undergoing inoculation should be given easy access to water and green feed, and should be disturbed as little as possible.

3. The protection afforded by inoculation *is not absolute*, and a second and even fatal attack of the disease may be brought about in any of the following ways:—

Driving too fast and too long distances;
Exposure to extreme temperature;
Unfavourable conditions of environment;
Undue excitement;
Starvation;
Gross tick infestation;
Lowered vitality by an attack of some other disease;
Over service (in a bull).

4. Animals should not be travelled for at least six weeks after inoculation.

5. Any blood remaining in the bottle after inoculation should be destroyed.

Note.—Animals reared in tick-infested country rarely respond to inoculation.

General Notes.

Staff Changes and Appointments.

The resignation of Mr. A. H. T. Bedford as Agricultural Bank Inspector has been accepted as from 12th April, 1928, as tendered.

The following have been appointed Inspectors of Slaughter-houses:—Mr. L. P. Doyle, Inspector of Stock and Brands, Cloncurry; Constable T. J. Brennan, Adavale, and Mr. B. Dunbavand whose appointment will be on probation for a period of six months as from the date of his entry upon duty.

Mr. D. J. Callaghan, Inspector of Dairies, Mundubbera, has, in addition to his present position, been appointed Officer under and for the purposes of the Animals and Birds Acts.

Mr. G. B. Gallway, Senior Clerk, Queensland Agricultural High School and College, Gatton, has been appointed Inspector of Accounts under the Dairy Produce Act.

Messrs. H. Lambert and R. J. Rollston have been appointed Assistant Inspecting Cane Testers for the 1928 sugar season. They will be stationed at Cairns and Mackay, respectively, and will commence duty as from 1st June and 14th June, 1928, respectively. The following have been appointed Cane Testers and Assistant Cane Testers, as the case may be, at the mills and as from the dates set opposite each:—

Cane Testers: Miss S. Riley, Invicta (1st June, 1928); Mr. F. C. J. Jorss, Inkerman (1st June, 1928); Mr. W. J. Richardson, Mulgrave (23rd May, 1928); Miss J. O'Flynn, Mourilyan (1st June, 1928); Mr. L. Chadwick, North Eton (8th June, 1928); Miss F. Parkinson, Proserpine (1st June, 1928); Mr. W. J. Mason, Kalamia (6th June, 1928).

Assistant Cane Testers: Miss D. Bowder, Inkerman (1st June, 1928); Miss J. Orr, Proserpine (1st June, 1928).

Cane Levy.

Additional Regulations have been approved under the Primary Producers' Organisation and Marketing Act, empowering, subject to the following proviso, the Innisfail District Cane Growers' Executive to make a particular levy on growers of sugar-cane on the lands supplying cane to the Goondi, Mourilyan, Tully River, Central, and South Johnstone Central Mills at the rate of 1¼d. per ton on all cane delivered during the period commencing 1st May, 1927, and ending on the 28th February, 1928, provided that, if at least 100 growers in the localities abovementioned, on or before the 11th June, 1928, make a request for a poll on the question of the proposed levy, such poll shall be held, and if the majority of votes is against the making of the levy, the levy will not be made. The amount of the levy, if made, will be deducted by the managers of the respective mills from the final cane payments due by such mills to growers in the said localities, and shall be paid by the managers to the secretary of the Innisfail District Cane Growers' Executive, which shall expend same in the interests of the district comprised within the jurisdiction of that Executive. The secretary of the Executive shall furnish the Minister, not later than the 1st May, 1929, an audited statement setting out in detail the receipts from the levy, if made, and the disbursements therefrom. A penalty not exceeding £5 is provided for any breach of the Regulations.

A Cream Cooler—Its Value.

If properly used under clean conditions, nothing will give better results than a milk or cream cooler. Several very efficient types with a water bag attachment are on the market at comparatively low prices. Besides lowering the temperature of the milk or cream, and thus checking bacterial development, coolers aerate the milk or cream, release gases, food flavours, &c., and in the case of cream, improve its body and consistency. If coolers were generally used, there is no doubt that a marked improvement in quality of milk and cream delivered to both cheese and butter factories would take place.

Care should be taken to thoroughly *wash and boil* a cooler after use, or otherwise it will become a source of infection. It is advisable always to mix creams already held in the dairy immediately the fresh cream is cool, and not to keep the lots separate until delivery to the factory. The mixed creams should be stirred with a metal stirrer several times a day to keep the mass uniform.

Citrus Levy Regulations

On the 10th February, 1928, the Citrus Levy Regulations were extended to deal with citrus fruit marketed during the period from 29th February, 1928, to 28th February, 1929. These Regulations have now been amended to the following effect:—The levy will be at the rate of 2d. per bushel case and 1d. per half-bushel case instead of 1d. and ½d., respectively, as previously. Of the sums raised by the levy, an amount equal to 1d. per half-bushel case and ½d. per half-bushel case shall be expended only in the interests of the Citrus Fruit Section of the Fruit-growing Industry in Queensland, and the balance only upon advertising in the interests of the growers concerned.

Valedictory.

The officers of the Division of Entomology and Plant Pathology of the Department of Agriculture and Stock met recently to bid farewell to Mr. J. Harold Smith, who has been transferred to Cairns, where he is to take charge of the general entomological work of the Northern portion of the State. Mr. R. Veitch, Chief Entomologist, on behalf of the staff of the Division, wished Mr. Smith future prosperity, and presented him with a leather suitcase as an outward expression of regard. Mr. Smith, in responding, thanked those present for the gift, and while expressing pleasure in the thoughts of the possibilities that now lay open to him because of his new appointment, he regretted severing personal contact with the officers of the Division.

Poddies or Pigs.

There are doubtless many dairy farmers who might with advantage put to themselves the question raised by Mr. E. T. Boller in an address before a recent gathering of farmers on the South Coast of New South Wales. Said the speaker:—

"In exploring possible avenues along which the bacon industry might be profitably developed, one cannot help noticing the enormous quantity of skim milk that is somewhat aimlessly fed to calves each year. If we were to follow these calves to their ultimate exit from the district, we would probably find that they were bought for stocking districts where the farmers consider it more profitable to raise pigs and to buy their calves from the districts where the farmers have never taken the trouble to sit down and think things out a little more thoroughly.

"No sound reason exists for our district farmers to raise more than 15 per cent. of the herd in female calves each year in order to replace ordinary depreciation of dairy herds. It cannot be shown that it pays to raise male animals of any description except a small percentage of purebreds. Butchers' meat consists largely of cows. Even though bullocks were required for beef, if the food that is used to fatten them can be turned into either milk or pork, their fattening must be regarded as relatively unprofitable. If all male calves and all female calves not required for replenishing herds were destroyed and the skim milk fed to pigs, South Coast farmers could afford to buy the best Sydney meat all the year round."

Cleaning Tomato Seed.

The best method of separating tomato seed from the surrounding pulp, writes an officer of the New South Wales Department of Agriculture, is as follows:—

Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

A few points in the selection of the fruit are worth noting. Select only from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit. Cut several fruit open to be sure of the quality. Choose a plant that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Be sure the plant is free from disease, as several tomato diseases are transmitted by the seeds. As a further precaution, the seeds, before planting, should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water. The seed should then be rinsed in clean water and dried.

Points in Poddy Rearing.

The essential features of calf rearing may be summarised as follows:—

1. Always handle calves quietly and patiently, and so develop in the animal a sense of confidence in the human foster parent, which will remain till the calf reaches maturity.

2. Feed at regular times each day.

3. Always give the calf a regular quantity of milk.

4. Feed only perfectly clean sweet milk.

5. Feed the milk at body temperature (about 100 deg. Fahr.).

6. Always cleanse feeding buckets as rigidly as you would all other dairy utensils. All the above points have a big bearing on the calf's digestive system, and will eliminate the common causes of calf scours.

7. Provide shade in summer and shelter from winter wind and rain, because it is cheaper to conserve animal heat and energy by these means than by the use of larger amounts of food.

8. Always make a point of picking up pieces of rag, paper, twine, &c., if found about the calf paddock. Young calves exhibit a mischievous delight in picking up foreign substances of this description and ultimately swallowing them. Indigestible material of this nature, when eaten by young calves, is almost certain to set up a serious form of gastro-enteritis.

Points in Working Concrete.

The utility of concrete is appealing increasingly to farmers, but certain precautions are necessary if work constructed of this material is to be as durable as it should. The setting and hardening of concrete depends on several factors. Warm weather, rich mixtures, and dry consistency all make concrete set rapidly. Concrete subject to its own weight and where there is no tendency to bend will be sufficiently hard for the removal of the forms when it cannot be indented by the pressure of the thumb. In reinforced concrete, such as beams, &c., the concrete should remain in the forms from three to four weeks. In cool weather they should be allowed to remain just twice as long as in warm weather.

All concrete should be put into place before it begins to stiffen, any further handling resulting in weak concrete, and retempering is bad practice. If a dry mixture is being used it should be placed in layers not more than 6 in. deep and rammed to compact the mass and to exclude all air. Continue till a little water rises to the surface. With wet mixtures light ramming will do, using a spade to force the stone away from the face of the mould, otherwise a rough surface will be left when the moulds are removed.

In hot dry weather the concrete should be shaded from the sun and wind, as concrete which dries quickly cannot be strong. It should be covered with bagging, canvas, or sand for the first seven to ten days, and if these coverings are kept wet the conditions will be ideal for curing the concrete. It is important that dry mixtures should be kept sprinkled. Light weights may be placed on concrete when it is a few days old, providing the load is a comprehensive one. Much longer is required for bending stresses.

Fresh concrete will not bond well with concrete that has set. To avoid this trouble the work should be left rough where it is stopped. Even one hour's delay will leave a poor bond. On resuming work half an inch should be removed off the place to be joined. The old surface should be well wetted and a rich mixture of one part cement and one part sand made to join the bond. The bond should always be made in a gradual slope off.

Freezing of concrete before it is set is very detrimental to a strong concrete.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

Orchard Notes for July.

THE COASTAL DISTRICTS.

The marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated, but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description or the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit. This commanded the highest price realised for mandarins last season.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing, well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

July is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before spring growth starts.

In pruning, follow the advice given in the June number; and if you are not thoroughly conversant with the work, get the advice of one or other of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left, there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is undersized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two-years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime-sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early flowering period—*i.e.*, when about one-third of the plants in the crop are in flower.

The Home and the Garden.

KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot, where they will start gently and be ready for planting out in August and September.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June, 1928.		July, 1928.		MOONRISE. June, 1928.	MOONRISE. July, 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6.38	6.38	6.46	5.6	3.36	3 29
2	6.38	5.1	6 46	5.6	4.13	4.15
3	6.39	5.1	6 46	5.6	4.47	5.6
4	6 39	5.1	6.46	5 6	5.30	6 1
5	6.39	5 1	6.46	5.7	6.20	6.56
6	6.49	5.1	6.46	5.7	7.10	8.0
7	6.40	5 1	6.46	5.8	8.6	9.1
8	6 41	5.1	6.45	5.8	9.4	10.1
9	6.41	5.1	6.45	5.9	10.4	11.1
10	6.41	5.1	6 45	5.10	11.5	...
11	6.42	5.1	6.44	5.11	...	a.m. 12 3
12	6.42	5.1	6 44	5.12	a.m. 12.5	1.4
13	6.43	5.1	6.44	5.12	1.7	2 19
14	6.43	5.1	6 44	5.12	2.11	3.23
15	6.43	5.1	6 43	5.12	3.16	4.36
16	6.44	5.1	6.43	5.13	4.24	5.33
17	6.44	5.2	6 43	5.13	5.35	6.34
18	6.44	5.2	6 43	5.13	6.43	7.32
19	6.44	5.2	6 43	5.13	7 51	8.31
20	6.44	5.2	6.42	5 14	8.52	9.0
21	6.44	5.3	6.42	5.14	9.46	9.37
22	6.44	5.3	6.42	5.15	10.28	10.9
23	6 45	5.3	6.41	5.15	11.5	10.37
24	6.45	5.3	6.41	5.16	11.39	11.17
25	6.45	5.4	6.40	5.17	12.6	11.37
26	5.45	5.4	6.40	5.17	12.37	p.m. 12.5
27	6.45	5.4	6.39	5.18	1.11	12.44
28	6.45	5.5	6.38	5.18	1.39	1.23
29	6.45	5.5	6.37	5.19	2.14	2.8
30	6.46	5.6	6.37	5.20	2 47	2.59
31	...	...	6.36	5.20	...	3.53

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

7 June	○	Full Moon	10 13 p.m.
11 ,,	☽	Last Quarter	3 51 p.m.
18 ,,	●	New Moon	6 42 a.m.
25 ,,	☾	First Quarter	8 47 a.m.

Apogee, 1st June, at 6.6 p.m.
Perigee, 16th June, at 11.54 p.m.
Apogee, 29th June, at 9.42 a.m.

The conjunction of Saturn with the Moon at 6 a.m. on the 4th will form an interesting sight, Saturn being only 2 degrees north of the full Moon and both being situated more than 20 degrees south of west but well above the horizon in the early dawn. On the 6th Saturn will be in direct opposition to the Sun, as the Moon was at the time of its eclipse on the 3rd.

Phi Capricorni (magnitude 5·8) will be occulted soon after the Moon rises at Warwick on the 8th.

On the 14th a favourable opportunity will occur to see Jupiter about midday and near 2 o'clock, as it will then be 2 degrees north of the waning Moon in the western sky.

On the 19th the conjunction of Mercury with the new Moon will take place, so nearly in a line from the Earth to the Sun that both will be entirely lost in its rays.

The winter solstice will occur on the 22nd, when the Sun, having reached its greatest northern latitude, will be at an angle of about 51 degrees from the zenith of Brisbane, Toowoomba, and Warwick, or 42 degrees at Townsville, affording quite welcome warmth.

Kappa Virginis (magnitude 4·4) will be occulted on the 27th about 9 p.m.

On the 29th Mercury will be passing between the Earth and the Sun from east to west, but will avoid a transit being apparently 3 degrees above it.

Omega Orphincl (magnitude 4·5) will be occulted by the Moon on the 30th soon after 8 o'clock p.m.

3 July	○	Full Moon	Midnight.
10 ,,	☽	Last Quarter	10 0 p.m.
17 ,,	●	New Moon	2 0 p.m.
25 ,,	☾	First Quarter	12 38 a.m.

Perigee, 15th July at 1 6 a.m.
Apogee, 26th July at 10 6 p.m.

Venus will be in superior conjunction with the Sun on the 1st when it will be passing the Sun from the east to the west of it, apparently very closely on the northern side, escaping an occultation by the Sun by about half the Moon's diameter.

An occultation of a small star in Orphiucus will take place a little before half-past 6 p.m. on the 1st at Rockhampton. At places south of Bundaberg and Carnarvon the star will skirt the southern edge of the Moon. Three hours later the occultation of another star in Orphiucus will be visible from any part of Queensland. Another star in the same constellation will be occulted near midnight.

About a quarter past one in the morning of the 3rd Lambda Sagitarii will be occulted at Rockhampton, but somewhat later at other places in Queensland.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.