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QUEENSLAND AGRICULTURAL JOURNAL.

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXVII. 1 JANUARY, 1927. PART 1.

Event and Comment.

The Economics of the Sugar Industry.

The work of the Bureau of Sugar Experiment Stations for the year just ended is reviewed comprehensively by the Director of the Bureau, Mr. H. T. Easterby, in his very complete and valuable annual report, just published. Remarkable progress has been made by the sugar industry in the course of the last few years, but last year was one of record production, the figures being 485,585 tons of raw sugar of 94 net titre. Seasonal conditions were, on the whole, favourable, but the large increase in the number of growers and consequential extension of cultivated areas and additional crushed tonnages were mainly responsible. The cane yield was 3,668,252 tons, and many of the Northern mills continued operating right through to January and February. The area cropped last year was 269,509 acres, of which cane from 189,466 acres was put through the mills. Thirty-five acres was the average area of each planter. The number of plantations of 5 acres and over totalled 6,730. The acreages of individual planters vary largely according to district and local conditions. From Cairns to Townsville the average is 48; Townsville to Mackay, 43; Bundaberg, the Isis, and Maryborough, 26; Maroochy and Logan, 9. The average yield of cane last year was 19.36 tons per acre, which was the best for some years; the average sugar yield was 2.56 tons, the second best on record. Ayr provided the highest figures for cane and sugar yield with 24.64 and 3.57 tons, respectively. Those who saw the particularly fine crops in the Lower Burdekin in 1925 can understand this. Ingham and Innisfail provided the next best sugar yield per acre with 2.89 tons. The quantity of cane required to make 1 ton of 94 net titre sugar was 7.55 tons, also the second best result to date. The lowest weight of cane required to make a ton of sugar is given as 6.89 in the Ayr, Bundaberg, and Gin Gin districts, the highest being 9.94 in the Isis, Maryborough, and Mount Bauple areas. The sugar yield from cane in New South Wales for the same period was 32,000 tons, and from beet in Victoria 2,315 tons. In Queensland there were 37 raw sugar mills and 2 refineries, employing 6,581 people. In 1925, 18,164,416 gallons of molasses were extracted, and of this total 3,430,303 gallons were sold to distilleries; 3,681,394 burnt as furnace fuel; 2,176,649 sold as stock food; 319,485 sold for other purposes; 1,287,400 used as manure; 1,590,212 remained in storage; while 6,287,973 gallons were allowed to run to waste. (Allowing good raw material to run to waste amounts, so it would seem, almost to an economic crime.) The consumption of sugar within the Commonwealth was, according to last figures available, estimated to average 117 lb. per head of population—probably refined sugar. Southern critics of the industry are as clamant, though much less convincing, as ever, but the comparative cost of living table and other informative data embodied in Mr. Easterby's report supply an effective answer.

The Quality of Queensland Butter.

Referring to a recent publication of choicest butter percentages exported by the respective States in the Commonwealth, in which it was noticeable that Queensland butter manufactured during the last season did not occupy a very high place in the list, the Minister for Agriculture and Stock, Hon. W. Forgan Smith, has informed the Press that there were special reasons for this, and in fairness to those engaged in the industry here he thought the conditions should be made known. In the course of the period under review, the seasonal conditions prevailing in Queensland were most adverse to the manufacture of dairy products of high quality. Practically the whole of the dairying areas of the State were influenced by dry weather. Later the conditions became more and more severe, and caused a very material shrinkage in the volume of cream supplies and ultimately brought about disorganisation in delivery of cream from the farms to the factories. In portions of the State where failure of normal rainfall was most severely felt delivery of cream was reduced to once or twice a week service, and the somewhat reduced quality of the butter was attributable to the abnormally high percentage of aged cream delivered to the factories. It was also noteworthy, said the Minister, that the range of points of first-grade butter was from 90 to 91 points, and butter securing 92 points or higher was accepted as of choicest quality. Frequently, it happened that a large proportion of the butter submitted for export in this State was graded at 91 points, thereby missing the choicest quality classification by the narrow margin of one point. Taking the percentage of choicest and first-grade butter collectively, it will be seen that Queensland contributed a fair percentage of butter of high quality. Co-operative dairying companies engaged in the manufacture of butter in this State have during the last few years expended much money in the improvement of their factories, which are to-day better equipped than ever before, and he was confident that with the return of normal seasonal conditions the quality of dairy products from this State would be of higher quality than formerly. "As Minister for Agriculture," continued Mr. Forgan Smith, "I appreciate the necessity of the primary producers, the manufacturing companies, and the dairy officers of this Department, working together harmoniously with a view to the general improvement of quality. Herd-testing is another matter to which reference was made in the Press. The Department has carried out this work for some years past, and continues to make every endeavour to impress on farmers the importance of improving their herds. Unfortunately, the weather conditions have been against the dairy farmer, and a number of dairy cows have not had access to the usual rich pastures which are conducive to high milk production, and farmers have been unable to submit their herds for testing in numbers equal to that of last season. The recent rains, however, which have been fairly general throughout the dairying areas of this State, have completely changed the outlook for the dairy farmer, and I am hopeful that herd-testing will be taken up with increased interest in the immediate future. The necessary staff arrangements to carry out the testing of the herds are in existence, and the officers concerned are awaiting the call of the dairy farmer."

Faculty of Agriculture.

As announced in the course of the month by the Minister for Agriculture and Stock, Hon. W. Forgan Smith, financial provision has been made by the Cabinet to enable the Senate of the Queensland University to make preliminary arrangements for the establishment of a Faculty of Agriculure and the inauguration of a scheme of studies leading to the Degree of Bachelor of Science in Agriculture. The new Faculty has now been constituted. The course of studies leading on to graduation will extend over a period of four years, and will embrace the following subjects:—(*a*) First year: Biology I., Chemistry I., Physics I., Geology I., Elementary Engineering Drawing and Design. (*b*) Second year: Principles of Agriculture, Economic Entomology, Agricultural Chemistry I., Agricultural Geology, Botany II. (*c*) Third year: Agricultural Chemistry II., Plant Pathology, Botany

III., Agricultural Economics, Genetics of Plant Breeding, Agricultural Botany, Zootechny, Ailments of Live Stock, Dairying, &c. (*d*) Fourth year: Principles of Agriculture II., Agricultural Bacteriology, Farm Bookkeeping, Principles of Fruit Culture, Agricultural Engineering, Principles of Forestry, Veterinary Parasitology, Special Subject for intensive study (e.g., Entomology, Plant Pathology, Agricultural Chemistry, Agricultural Bacteriology, Agriculture, &c.). The students will attend lectures and engage in laboratory practice at the University during the first two years, and for the first and second terms of the third year. The third term of the third year and the first two terms of the fourth year will be spent at the Gatton Agricultural College. The students will return to the University at the end of the second term of their fourth year, and will do their final term's lecture and laboratory work at the University. Students who have qualified for matriculation in Science or Engineering will be eligible for admission to the Faculty of Agriculture. As a temporary measure for 1927 students who have qualified under the present syllabus for the Diploma of Agriculture at Gatton College will be accepted as matriculated students of the Faculty of Agriculture without further examination. Students will be enrolled in 1927 for the first year of the course. Arrangements are also being made to enable the Faculty to enrol any qualified students who may desire to enter upon the second year of the course in 1927. The research work which has been conducted in recent years by the Department of Biology into problems affecting the primary industries will be continued as an activity of the Faculty of Agriculture. As the work of the faculty develops it is hoped that greater facilities will be afforded for the scientific investigation of such problems.

An Agricultural Survey.

The commercial problems of agriculture are evident to all interested in the economic conditions of rural industry, and the announcement by Hon. W. Forgan Smith of the institution of an agricultural survey in Queensland in the course of the month was received cordially by all concerned in the progress of this State. The introduction of some system of general rural surveys is regarded as a necessary service to agriculture and the project is worthy of the support of every farmer. A thorough knowledge of the farm economics of a district, and, in fact, of the whole of the State, is essential to agriculture in the general advance which we hope it is about to make in Queensland. An agricultural survey may be likened to a soil survey. For example, merely by way of analogy, a broad survey may be made of a district, soil samples taken here and there, and a good general idea obtained of types of soil and their composition; or a small area may be investigated in detail, and by analyses a complete story of its soils unfolded, disclosing their origin and their differentiation. Both kinds of survey are necessary, for the former may give us something concrete on which to base advice on general questions of soil treatment, but there may arise problems which cannot be solved without the closer study involved in the latter which may then have to be applied to the whole district. The same thing applies in economics. Detailed investigation of farm costs and other relevant matters will provide the facts on which the farmer may be best advised in regard to his own individual affairs, but in the meantime a need exists for a broader consideration of systems of farming and farm management which will be made possible by making a more extended survey. It is to meet this need that a survey system is about to be introduced, a survey that will cover both particular and broader problems and secure data for the study of the farm economics of the State generally. A complete survey will show what capital is required to start farming in any given district, the system of farming suitable, the class of stock required, the country's carrying capacity, the labour necessary, the outgo and income of the first year, and the probable average income when the property is brought to the full profit stage. If it is a question of a small holding a survey will show the size of holding that can be worked by family labour, the system of farming most suitable, actual outside labour, if any, required, and the casual seasonal labour likely to be normally necessary. Apart from these more practical questions a survey will supply information on many important economic aspects of farming, such as the area necessary for any particular form of husbandry. It will also provide data of great value for educational and advisory purposes. A general agricultural survey will, in addition, bring to light the economic factors which influence farm management and the production and disposal of crops; will give guidence as to the local conditions that make for successful farming—soil treatment, cultivation, and so on; and afford definite reliable data as to markets and methods of marketing. To the individual farmer, it may be argued that all this information will be of little practical benefit, but for farmers as a body, and for agriculture generally, it should form the foundation of a real rural economic policy and help to place the industry on a solid and prosperous basis.

Photo.: H. W. Mobsby.

PLATE 1.—THE DAWN OF THE NEW YEAR.—SUNRISE IN HINCHINBROOK PASSAGE, NORTH QUEENSLAND.

The Minister's New Year Message

To the Farmers of Queensland

DEPARTMENT OF AGRICULTURE,
Brisbane, 31st December, 1926.

The recent bounteous rains may be accepted as a happy augury for the New Year, as the beginning of a cycle of good seasons and an era of good and well-established markets. May the farmers of Queensland enjoy all the success and general prosperity that the relieving rains betoken.

The adverse conditions with which the dying year was marked have aroused one's keenest sympathy for the people of the country in all their anxieties and discouragements. They also helped to strengthen an already strong admiration for their pluck and endurance when the odds, in seasonal setbacks, were almost overwhelming—a courage that is typical of the fine spirit of the Australian people in face of misfortune.

In the course of the year now closing further effect was given to the policy of the Government in relation to the Agricultural Industry, particularly in its economical aspects. The passing of the Primary Producers' Organisation and Marketing Act, which consolidates and improves the agricultural measures of preceding sessions, was a mark of further progress towards establishing agriculture in Queensland as a prosperous industry providing the means for the enjoyment by rural society of the opportunities and amenities of life, which are the moral right of a nation's citizens.

I look to the farmers of this State to study carefully the problems that affect their own interests and to act accordingly. In proportion to the loyalty and enlightened interest they display in their own organisation so will personal benefit accrue and agriculture advance.

I wish the farmers of Queensland good seasons and good markets in the coming year and the years that are to follow; that prosperity will be brought to their homes, and happiness to their families through a long future bright with opportunity and achievement.

W. Forgan Smith

AGRICULTURAL ORGANISATION IN QUEENSLAND.

THE NEW COUNCIL OF AGRICULTURE.

THE QUEENSLAND FARMERS' CHARTER.

MINISTER'S INAUGURAL ADDRESS.

"No organisation has ever achieved anything in the realm of human activity without encountering difficulties, and the higher the objective the greater are the obstacles to be overcome . . . .

"I wish your new organisation every success. You are entirely on a commodity basis, and you have been given far-reaching powers under the Act just passed by Parliament—an Act which, to some extent, may be regarded as the Queensland Farmers' Charter."—*Hon. W. Forgan Smith.*

The first meeting of the newly constituted Council of Agriculture was held at Brisbane on the 15th December, 1926, at which there was a full attendance of the elected representatives of the several commodity boards operating under the Primary Producers' Organisation and Marketing Act and related legislation. The Council is therefore completely representative of the working farmers of the State. The opening address was delivered by the Hon. W. Forgan Smith, Minister for Agriculture and Stock.

THE MINISTER'S ADDRESS.

Gentlemen, as Minister for Agriculture, I wish to welcome the new Council of Agriculture recently formed on the passing of the new Act which was approved by Parliament in the course of the last session. I regard, gentlemen, agricultural organisation of this nature as an evolutionary growth. One must realise that organisations of all kinds must keep developing and growing, and as you increase your sphere of activities it is necessary, on some occasions, to alter the basis of your organisation.

When the Government, first of all, set out with the launching of this scheme, it was necessary to provide the nucleus of an organisation, so that ultimately the objective of the control of agricultural industries being placed in the hands of those directly concerned might be achieved, and as a result of that we are glad at the present day to form a new Council of Agriculture elected on a commodity basis and representative of far the greater portion of agricultural wealth now produced in Queensland.

Something Worth While Achieved.

On the inception of this movement there were a number of people opposed to any form of organisation. There was another section of the community who realised that while organisation itself was good, they feared that the scheme undertaken was too ambitious. With regard to that point of view, I do not think that any reasonable body of men could have too ambitious a project. No organisation has ever achieved anything in the realm of human activity without first encountering difficulties, and the higher the objective the greater are the obstacles to be overcome. I think everyone to-day who takes an impartial view of agricultural organisation in Queensland will realise that something well worth while has been achieved. I believe that this organisation has been of considerable value to the farmers of Queensland, and through them to the State. I believe that the organisation has been justified from every point of view, and I look to a greater sphere of activity and usefulness in the years to come. You have had some difficulties to encounter; but, as I remarked earlier, those difficulties are only there to be overcome, but with intelligence and loyalty to the organisation, you will go on improving your position.

The Problem of Finance.

One of the greatest problems you are faced with in connection with organised marketing is in regard to the financing of your various projects. The pool boards that have been established have been financed by the Government in various ways, chiefly by means of a guarantee. I have always taken the view, as most of you gentlemen know, that the security of the commodity itself which a pool board is in a position to give is sufficient security for any financial institution without the backing of a Government guarantee. It is, in my opinion, a wrong thing for a financial institution to insist on that form of Government guarantee, because it means that any risk involved in the transaction is borne by the Government and any profit is taken by the private financial institution. They are playing, in effect, with a double-headed penny. That is something that we have to consider. We have to apply our mind to improving that position and endeavour to devise a method whereby pool boards and organised marketing bodies will be able to secure their necessary finance as a matter of course, without recourse to artificial aids and Government guarantees. However, it is well for me to make this point, which is indicative of the general success of the work of pool boards, that not one penny of any guarantee has ever been called up. In other words, the pool boards have carried out their affairs in such a way as to meet all their obligations, and the Government has never lost a penny in any respect by means of guaranteeing these pool boards. That indicates a high degree of business acumen on the part of those responsible for the working of these boards, and the security itself should be sufficient for the financial institution without the backing of a guarantee. I mention this phase, not that there is any likelihood of any change in the attitude of the Government I represent in that matter. We are prepared to assist your projects in every way, but I realise, having the best interests of agricultural organisation at heart, that the sooner you are in the position to arrange your own finances with financial institutions, without the backing of any Government, the stronger your position is bound to become.

Suppose you continued working on the basis of a Government guarantee, and any change in any policy took place, say, in the Government refusing to make those guarantees available, then the pool boards would be in a very difficult position, if they were able to carry on at all. I mention that because I believe in the permanency of such organisations, and we must put them on a basis, financial and otherwise, so that their continuance and continued usefulness should not be liable to suffer, due to any change of policy that may eventuate in any future years. In other words, it is a good thing to become an independent organisation acting on your own behalf, without the necessity of seeking assistance from outside bodies in any way.

I have been in touch with the Commonwealth Bank in this matter for some time past. You may remember that at a meeting of interstate Ministers in Brisbane, this matter was fully discussed. The Government of other States—Victoria, South Australia, and to some extent New South Wales—had been confronted with some of the same difficulties, and as a result we have made joint representations to the Commonwealth Government to give effect to the principles contained in the Rural Credits Act. So far as it has gone up to the present time, that Bill has not been given an opportunity to function in the manner it was intended to function by the Parliament which passed it. In other words, asking for a guarantee in the manner I have described is not in accordance with any proper scheme of rural credit as I understand it.

The Wheat Board Guarantee.

The latest point I have got to is in regard to a letter I received, having reference to the Wheat Board's guarantee. The Treasurer has found it necessary this year to again sign a guarantee on behalf of the Wheat Board with the Commonwealth Bank. The bank takes the view that the Wheat Act and the Primary Producers' Organisation and Marketing Act of itself does not give them what they call "legal control" over the commodity, and they have suggested that we amend the Wheat Pool Act, and presumably also the other Act, provided that where a pool board has been formed they be given legal ownership in the commodity by those who have grown it. As you all know, gentlemen, that raises a very controversial subject. It raises a very serious matter also on the part of the farmers themselves. While many farmers may be prepared to vote for the formation of a pool, it requires deeper consideration before handing over complete legal control of the commodity. We contend that the provisions contained in the two Acts I have mentioned are ample to give sufficient security to any financial institution operating in this way. As a matter of fact, one of the private banks other than the Commonwealth has already financed the Atherton Maize Board, and if their security is good enough that should apply to the Commonwealth Bank's Rural Credits Department and any other financial institution. However, I do not propose to let the matter end there, and I look to your new Council to take an active part in studying this question, with a view to arriving at a basis whereby pool boards will be enabled to obtain their necessary finance through the ordinary channels available to any other trading organisation. Agriculturists during the past year have been having a very bad time. There is no doubt that the drought which we are enduring and have endured during the past few months has caused untold suffering to those engaged in primary producing work. It will take a considerable time for the State to recover from the losses sustained. In my position, as Minister for Agriculture, I come in close contact with the people on the land, and can appraise perhaps better than most the losses that have been sustained and the suffering that has been endured. However, I hope, ere long, that the disastrous drought will break and the ensuing year will bring in a return of prosperity and good seasons which are necessary to place everyone on their feet again.* It will be one of your functions to study drought problems, consider whether insurance can be made to provide against drought losses, and what steps should be taken to make the losses from recurrent droughts less disastrous.

The Queensland Farmers' Charter.

Now I wish your new organisation every success. You are entirely on a commodity basis, and you have been given far-reaching powers under the Act which has just been passed by Parliament, which may be to some extent regarded as the Queensland Farmers' Charter. Under that Act you will be able to accomplish a great deal. I keep in close touch with the various forms of legislation passed throughout the world dealing with agriculture, and I can confidently assert that this Bill gives the farmers of Queensland more power into their own hands than has been given to any other country of the world. Of course, no one can accomplish miracles. There is no Messiah in Queensland in the agricultural industry who can accomplish or perform miracles on your behalf, but you have been given machinery which, if used wisely and intelligently, will do much to improve your position. Careful thought and intelligent consideration to all those problems, complete loyalty to the various organisations that are built up, are the essentials necessary for success.

The Queensland Farmers' Opportunities.

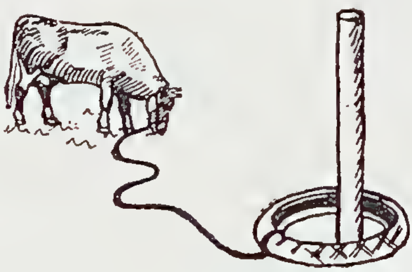
I wish you every prosperity in the new year. I hope that your organisation will continue to develop and prosper, and I believe that, operating as it will through the channels of this new Council and through the various marketing boards that have been established, a new lease of activity will be given to the organisation and much benefit will result therefrom.

As far as I am aware, the relations between the Council of Agriculture and the Department have always been of a most cordial character. I am satisfied that they will continue to be so, and, with the various organisations working in harmony one with the other, Queensland's agriculturists have opportunities unsurpassed in any other State of the Commonwealth.

*[Copious and continued, and in some localities torrential, rains have since fallen over most of the agricultural areas of Queensland.—ED.]

TETHERING COWS.

Tying and untying the tether rope is rather troublesome, and can be eliminated by using the method shown in the illustration. The rope is tied to an old motor-tyre casing which is simply thrown over one of several posts driven into the ground in the



grazing field. Another advantage of using this method is that the casing will roll around the post, preventing the rope from winding around the pole and thus bringing the cow close to it and decreasing her grazing area.—"Popular Mechanics."

THE COUNCIL OF AGRICULTURE.

THE MINISTER ELECTED PRESIDENT.

One of the first matters considered by the newly constituted Council of Agriculture was the appointment of a President of the Queensland Producers' Association, of which the Council is the executive. It was the unanimous desire of the Council, representative of the several Commodity Boards, and therefore of every section of the agricultural industry, that the presidential chair should be occupied by the Minister for Agriculture and Stock, Hon. W. Forgan Smith. Messrs. George Johnson and H. Keefer were deputed to convey that desire to the Minister and request his acceptance of the position. Subjoined is a full report of the deputation.

Subject: The preferring of a request from the Council of Agriculture that the Minister should accept the position of President of the newly constituted Council of Agriculture.

Mr. Johnson: Mr. Keefer and myself have been deputed by the Council of Agriculture to approach you with a view to attaining your consent to your acceptance of the position of President of the Queensland Agricultural Council. I might say that it is a pleasure, both to Mr. Keefer and myself, that we have been asked to come along with this request, and also to think that we have behind us every member of the Council in the matter. We feel sure that you will give it sympathetic consideration. I believe that you will agree with us that it is of mutual advantage that you should hold the position of Chairman of the Council, as I think it will be of benefit to you to get the first-hand views of the representatives of the various industries on the different problems which confront us. It gives us an insight into your problems —which are our problems—and we get a better knowledge of one another. We know that you are sympathetic, and that during the time you have held the office of President it could not have been better filled, either in the manner in which the business was conducted or otherwise. On behalf of the Council I have to ask that you will be so good as to accept the position of President of the Council of Agriculture.

Mr. Keefer: I would like to endorse the remarks of Mr. Johnson. I fully realise that the very sympathetic treatment which the various commodity boards have had in the past has been due, to a considerable extent, to the fact that the Minister for Agriculture for the time being presided at the meetings, which gave him an opportunity which he probably could not have otherwise had of getting into touch with the various problems and difficulties and trials of the man on the land. I recognise that we have had the most sympathetic treatment possible from this Government since the organisation was brought into existence—or since pooling was brought into being. I happened to be in the position of being connected with the two first pools which were brought into existence prior to the Agricultural Council, and I realise that, had it not been for the sympathetic treatment and kindly consideration of the Minister for Agriculture of the Government of that time, we could not have inaugurated those pools and carried them on as we have done. I am sure that it will be to our interests if you accept the position of President of the Council of Agriculture, and preside as often as you possibly can at our meetings, and thus get in touch with all our difficulties. I hope you will see your way to accept the position.

THE MINISTER'S REPLY.

The Minister: I wish to say that I feel honoured at your request. I feel it to be a distinct honour to be requested by a body representative of all the agriculturists of Queensland to be the President of what might be termed their "National Executive." I have followed the work of the Council of Agriculture and the various commodity boards right from the inception of the movement, and I believe that the association of the various organisations with the Government, as was pointed out by the deputation, has been of mutual advantage. By the intelligent co-operation of the Department of Agriculture with the various commodity boards and the Council of Agriculture good results can be achieved, and there is no doubt that the Minister having the opportunity of hearing the discussions on any project and being present at such gatherings enables a better understanding to exist between us, and enables the Government to realise more clearly the problems confronting the farming industry, and to realise also the direction in which the Department could help the agriculturists. I believe that agriculture in Queensland requires all the aid that the Government can give it—that form of national help which is conducive to national well-being. By help from the Government I mean that form of aid which will enable the agriculturists to obtain more advantage through their own efforts and activities, and not that form of assistance which in the last analysis brings about a form of State mendicancy. We have been able during the period to accomplish good work for the agriculturists of Queensland, and the reorganisation will result in greater efforts being made and in greater achievements being accomplished. At the present time the farmers of this State are going through a very trying and difficult period. The seasons are adverse, and considerable losses have resulted throughout the State which will have a far-reaching effect for a long time to come. These conditions will not always remain, and the Council of Agriculture, in conjunction with the Agricultural Department, will have to apply itself with renewed energy to the solution of those problems.

An Agricultural Survey.

I have been engaged during the past few weeks in considering a question which more directly affects agriculture. We can produce in Queensland very many commodities in plenty, but in some cases we are producing for an already overstocked market, and the farmer cannot be expected to produce for a market which will not give him an adequate return for his labour. I have also taken out figures showing those commodities which can be grown successfully in Queensland, and for which there is a greater demand than supply. It is the Government's intention to encourage and develop the production of those commodities which will find a ready market in Queensland and Australia, and with that end in view the Cabinet has approved of a scheme to make a complete agricultural survey of the State. At the present time we know that certain things can be grown, but we want to be in the position to know where those commodities can be grown commercially, and where the best results will be given to those who embark in those industries. Take, for example, the North. There we have the problem of the sugar industry, which cannot be extended to any great extent owing to the over-production already, yet much fertile land exists. We have the land available, and we want to consider the best crops to grow in those areas which cannot be given a permit for the growing of sugar-cane. The same necessity for a survey exists in other portions of the State. A committee will be formed to carry out a complete agricultural survey of Queensland, commencing chiefly in the North. Men capable of carrying out that work will be appointed, and I look to the Council of Agriculture to aid that committee of economists in every possible way. I mention that matter to show where the co-operation between the Council and the Department will be to some considerable advantage.

Provision was made under the new Act for the Council of Agriculture to have the right to elect its own Chairman. I considered that it was not proper for the Government to insist on any of its nominees holding administrative positions, and believed that the time had come to leave the Council untrammelled in its choice as to who should be its President.

Mr. JOHNSON: We have exercised that right.

The MINISTER: While I have quite a lot of other work to do, I think the importance of the matter is so great that I will be pleased to comply with your request, and accept the honour you have conferred upon me.

The deputation thanked the Minister for his favourable consideration of their request, and then withdrew.

Bureau of Sugar Experiment Stations.

FIELD REPORTS.

Mr. A. P. Gibson, the Northern Field Assistant, reports (6th December, 1926):—

Innisfail District.

Weather.—The weather is hot, dry, and dusty. Storms have appeared and disappeared without much relief.

Rainfall.—Monthly rainfall since June:—June, 4.24; July, 2.69; August, 5.38; September, 13.11; October, .9; to 19th November, 1.05; total 26.56; and for the year, 87.27 inches.

The Crop.—The end of the 1926 crop is in sight. Mourilyan Mill has already finished its second greatest crop. The continuous wall of standing cane of a few months ago has almost vanished, and in its stead remain small somewhat-scattered patches. The unusually long spell of dry mid-seasonal weather had a bad effect on the general crop growth, therefore many mill estimates were temporarily reduced, but the fine widespread rains of September brought them up again. This unexpected yet welcome fall caused quite a transformation; it slightly delayed harvesting, but promoted wonderfully the new crop growth, especially that of the very late cut cane. The total tonnage of cane likely to be crushed from the eight most northerly mills should yield slightly over one-half of Australia's present sugar requirements. The local mills, with the exception of the South Johnstone, are treating crops in excess of those expected prior to receiving the September rains. Last year the South Johnstone area yielded about 23 tons per acre; this season it is likely to be about 4 tons less. Work in field, mill, and transport had progressed uninterruptedly. Inadequate shipping space to meet the ever-increasing daily quantity of sugar manufactured has caused an accumulation of some 3,000 tons at Mourilyan. Compulsory stacking entails much unnecessary expense and possible losses, due to depreciation, all of which must be added to the cost of production. The watersiders' overtime strike is having a bad effect on the industry. It has disorganised and considerably reduced the running of big and small coastal freighters, thus slowing down the removal of sugar and other perishable goods. The mill has worked well and smoothly. Mourilyan, especially, had a particularly fine run, perhaps the best since its inception, treating some 135,000 tons in good time. The mill has averaged 5,500 tons a week (working week 44 hours) with a 14.38 sugar percentage. Over 97 per cent. of the crop milled was Badila.

Harvesting.—This had proceeded satisfactorily. Some exceptionally fine crops of Badila had been removed off the richer river-bank deposits. The cane was weighing surprisingly well. Arrowing and top rot had occasioned much stem sprouting, thus making harvesting more difficult and having the tendency of slightly lowering the extraordinarily high prevailing c.c.s. It was pleasing to note the very clean state of cane coming forward for milling at Goondi.

Cultivation.—Growers are taking full advantage of the present dry weather, and field work is being performed under perfect conditions. The economy practised by some growers is impressive, but generally there is much room for improvement. Farmers do not protect their valuable implements to the extent they should. Now is the time to conserve moisture and control the weed growth in field and headlands by the judicious mulching of surface soil, thereby encouraging speedy growth, when the foliage will quickly cover the bare spaces between cane rows, thus reducing the ground exposed to the fierce summer sun and drying winds. The great importance of cleaning up and destroying tops, dead cane, or exhausted stubble cannot be too strongly emphasised.

Ratooning.—This important work is often delayed. It should be performed as soon as practicable. The rotary cultivator is becoming popular, and where used is speeding up this class of work. The depth to which it operates entirely depends on the physical condition of the soil. The continuous September rains, followed by a hot dry month, made some fields most refractory, and, when subsequently tilled, the soil turned up in great lumps.

Cane Trash.—As much of that as possible raised from a soil should be returned to it. It is correct agriculture to plough in crop residues immediately after harvesting, the greener the better, for then will decomposition be speedier, especially in a moist and humid climate. As yet we have no machine that can successfully do this very necessary work and save the high annual plant food losses and free the ground surface of encumbrances, and so the least line of resistance is followed—that is, burning. Agriculturally speaking, that is wrong. However, from a pest and disease point of view it may sometimes be desirable to burn the trash after each cutting.

The following benefits result from the conservation of trash:—

(1) Plant foods, mainly nitrogen, are saved, but when the trash is left on the surface to decompose much of the nitrogen is lost in the atmosphere;
(2) A mulch is formed which assists the conservation of moisture and retards weed growth;
(3) Cultivation is reduced;
(4) The leaching of plant foods and the washing away of fine soil are minimised during periods of excessive wetness.

The benefits of burning trash are—

(1) A vast number of pests and diseases are destroyed;
(2) The risk of fire is less, and the area is freed of rubbish, thus permitting superior cultivation and soil aeration.

Manuring.—The C.S.R. Company adopt the draught-board pattern of manuring on the various types of local soils. This method entails more work, but is satisfactory. Queensland sugar soils generally are most deficient in organic matter, such a condition probably being the result of always burning crop residues. Our farmers are doing little towards restoring this highly important soil constituent. Some growers prefer applying mixed fertilisers to centre of crop interspaces, for it is considered the root system is attracted thereto, thus offering a greater root anchorage and a larger feeding area. It must not be forgotten, however, that subsequent necessary intertillage frequently severs this surface-rooting system. Accumulated experience rather favours depositing such mixture adjacent to both sides of the stool where the roots immediately assimilate it, thus promoting early crop growth.

Molasses.—When we consider that about 80 lb. of potash are lost in every ton of molasses, and that our voolcanic red soils are mostly deficient in this constituent, it is to be wondered why some of our progressive and hardy farmers do not experiment with this waste, a product mainly removed from the ground.

Planting.—A big area, mostly Badila, has been planted. Germination has varied all the way from poor to exceptionally good, with sets just bursting through the soil to well-established stools. The dry condition had permitted improved tilling. Cane planted about September, the wet month, germinated erratically, and the soil appeared refractory.

Pests.—Injuring foliage—Army worms, *Aphis sacchari,* and rats eating portion of midrib of young ratoons in a small way;

Shoot Killers—The larvæ of the tineid, big moth and weevil borer, and *Pentodon Australis* (black beetle);

Stem Destroyers—Rats and weevil borers. Greybacks have been on the wing off and on since the 5th October, but no great flight has yet been noted; possibly they are soil bound. A good fall of rain may permit their emergence. Three tachinid-fly cages have been built in the South Johnstone area; so far they have not been very successful in breeding the fly. *Pentodon Australis* has been located injuring primary shoots of plant cane in the local mill areas, mainly in newly broken-up grass lands planted to cane. Some half-inch holes are made in shoots, thus severing the base of the arrow or heart above the mother plant. Such destruction is generally put down to grub or mechanical injury.

Diseases.—Leaf scald, top rot, and red rot. The two first-mentioned are prevalent, and it is rather difficult to find a farm totally free from these. Where diseased canes have been planted the resulting crop speaks for itself. Innisfail Estate, a fairly level, fine, brown to red fertile area of alluvial land almost surrounded by the North Johnstone River and the united waters of this and the Southern branch of the main Johnstone River, was in the early days the home of a pioneer mill. This fine bit of country is not directly connected to the factory by a railroad; the crop, however, is brought forward on trucks over portable rails, and on a big punt capable of carrying ten trucks of cane every trip over the river to the point of delivery. The 1927 seasonal prospects at present are promising. The September rains had worked wonders with the new crop, and the old crop would be finished in good time, thus permitting a longer growing period. The weather, however, is again dry, and some of the older and early cut ratoons are beginning to show signs of distress.

PURE SEEDS, STOCK FOODS, FERTILISERS, AND PEST DESTROYERS.

By FRED. F. COLEMAN, Officer in Charge, Seeds, Stock Foods, Fertilisers, and Pest Destroyers Investigation Branch.*

Seeds Suitable for Market Gardeners.

The ever-growing demand for such vegetables as cabbage, cauliflower, carrot, beet, onion, turnip, and tomato has directed many growers' attention to the necessity of sowing the varieties most suitable for market requirements. In the past little attention has been given to strains, the usual idea being that identical crops would be produced from any kind of cabbage, cauliflower, &c., and the buyers' principal aim was the price of the seed.

Seedsmen obtain their supplies from many countries. As every exporting country has a number of merchants doing an oversea trade, it follows that because A and B purchase cabbage seed from, say, the United States of America, it is more than probable that their supplies come from different merchants. Assuming both importers purchase cabbage under the same variety name, it is still possible for the seeds to be of different strains of the particular kind of cabbage invoiced.

New seeds of cabbage, beet, cucumber, cauliflower, tomato, turnip, and even carrot will easily retain their germination for a year if kept in a cool dry place. Market growers would, therefore, be well advised to purchase their requirements of cabbage, cucumber, tomato, &c., a year in advance and make a trial of each lot by putting a row alongside the main crop. If the seed proves to be the strain best suited for market requirements they have enough on hand for their next year's main crop. If unsatisfactory their loss is little more than the cost of the seed.

When buying it is well to ascertain the seedsman's stock number, and any other particulars regarding the strain purchased. This will enable the seedsman to supply the buyer's future requirements with seed from the same source. When a good source of supply has been found it is obvious that the buyer should again obtain supplies from the same merchant, as the buying of supplies from casual vendors of seed in most cases leads to monetary loss in the resulting crop.

Vegetable Seeds in Pictorial Packets.

Sixty-three samples of seeds in pictorial packets were examined; the goods in question were offered for sale by shopkeepers who had obtained their supplies from what can best be described as itinerant dealers in seeds.

From the samples examined it appears that the packers had in many instances put prickly spinach into cabbage packets, turnip into packets marked "celery," also turnip into cauliflower packets. Many of the seeds were of poor germination, some as low as 20 per cent., and in a few cases even less. As a result of investigations, several thousand packets were destroyed by various vendors, who it appeared had paid cash for the goods on or before delivery.

Unfortunately the small traders selling these lines are absolutely without knowledge of seeds; further, they neglected the ordinary business precautions when purchasing goods from an unknown source, with the result that they not only lost more money than they could well afford but at the same time raised a considerable number of irate customers. If small shopkeepers must sell seeds, they should at least obtain their supplies from seed merchants of repute; and the general body of amateurs would also be well advised to obtain their supplies from legitimate seedsmen, or as an alternative from those storekeepers who sell pictorial packets bearing the names of merchants of good standing.

Agricultural Seeds.

Although nearly everyone will agree that better seeds means better crops, it must not be overlooked that better cultivation means better seeds. On reference to Table I. it will be noted that, in many cases, samples of canary, prairie grass, *Setaria italica*, Japanese millet, Sudan grass, barley, and lucerne contained seeds of the poisonous thorn apple (*Datura* sp.); several samples of lucerne contained seeds of dodder (*Cuscuta* sp.); about one-third of the cowpea samples were infested with the cowpea weevil (*Bruchus* sp.).

* In the Annual Report, Department of Agriculture and Stock, 1926.

The general body of merchants cannot be held to blame for these occurrences; the producer of the crop must know of the presence of such weeds as thorn apple and dodder, which should be eradicated from all crops, whether intended for seed or for use as feed.

With the cowpea weevil (*Bruchus* sp.), it is possible for it to be kept under control by the fumigation of the seed as soon as possible after threshing, and then storing it in an insect-proof container, such as a tank, otherwise stray insects will lay their eggs on the cowpeas, making a further fumigation necessary. From experiments made with cowpeas during 1925-26 it appears that 4 oz. of bisulphide of carbon is sufficient for 100 cubic feet of chamber space.

The round tanks usually sold as 500-gallon tanks, measuring about 4 feet in diameter with a height of 6 feet, with a capacity of about 75 cubic feet, would require 3 fluid oz. of bisulphide of carbon. To get the best results the tank should be filled with cowpeas, and some cotton waste placed near the opening, the quantity of bisulphide of carbon required being poured on the cotton waste and the tank quickly closed with an air-tight lid. The seed should remain in the tank (which must be airtight) not less than twenty-four hours or longer than thirty hours. The cowpeas should then be taken out of the tank and bagged for immediate despatch to a merchant, or stored in an insect-proof, airtight container, free from bisulphide of carbon.

In our report for 1924 reference was made to the increasing number of lucerne seed samples that had been attacked by the lucerne seed wasp (*Bruchophagus funebris*). At the time it was suggested that farmers would be well advised not to save any seed from infested paddocks, and to cut the crop before the seed had ripened, or utilise it as green feed. During 1925-26 several merchants found it necessary to fumigate their lucerne seed in the manner described for cowpeas, also to heavily machine-clean the bulks, and at our suggestion burn all the cleanings.

Whatever a merchant may do to bring a sample of lucerne seed up to the requirements of the Seeds Acts, it should not be overlooked that effective control of the pest must be on the farm. When lucerne seed is thrashed a quantity of debris is always left. As this material often contains a large number of broken pods containing seeds infested with the hibernating larvæ, it is obvious that such debris should be burnt, and a general clean-up made before the warm weather sets in.

Bisulphide of Carbon.

Users of bisulphide of carbon have been repeatedly warned of the danger of explosion when a naked light is brought near air charged with its fumes. As a precaution against such an occurrence it is advisable to place the fumigation tanks in a position that does not exclude daylight. Further, it must not be overlooked that, when the fumes of bisulphide of carbon are present in the fumigation chamber for a longer period than is suggested, the germination of the seed may be adversely affected. With seed stored for any length of time the loss of germination will be particularly noticeable. This loss will not occur if the fumigant is used in the manner recommended.

Good Seed.

Seed to be good must have a high germinating capacity, be true to variety name, and free from weed seeds, inert matter, and diseased or insect-infested seeds. No matter how careful the grower may be, all crops will contain some plants other than the ones which it is intended to produce. A cleaning machine should therefore be used before the seed is offered for sale. In Queensland, as in every part of the world, the most critical buyers will be found in the merchants with efficient cleaning machinery.

An up-to-date seed-cleaning plant can make good samples of "As grown seeds" better, but it cannot make bad samples good. With a full knowledge of their machinery possibilities, most merchants are willing to buy on a clean seed basis; they are not, however, inclined to purchase poor samples, and the usual market for seeds of indifferent quality is with dealers who have little appreciation of impurities. The actual seed user who insists on buying his supply on a price rather than a quality basis encourages the vendors of goods of inferior quality. Unfortunately, seeds of indifferent quality usually carry a large profit to the seller.

Good seeds cost money to produce and money to clean, and the general improvement of farm seeds rests largely on the farmers themselves. When practically every farmer insists on a high-grade product, the demand for poor-quality seeds will cease, and those unfit for sale as seed for sowing will disappear from the market.

It cannot be too widely known that samples representing seeds purchased by farmers for their own sowing are examined at the Seed Laboratory free of charge. During the year only twenty-seven farmers availed themselves of this opportunity. Although buyers are able to form a good idea as to the market values or prices of produce, experience shows that they are frequently misled as to the purity and germination of seeds. The time to ascertain this is before sowing; samples should be drawn from the goods actually delivered and in the buyer's possession, care being taken to make them truly representative of the bulk. One little matter is most important—the name and address of the sender should be written in ink on every sample.

Stock Foods.

Owing to sub-normal seasonal conditions in the Western areas there has been a greatly increased demand for concentrated stock foods, and many inquiries have been made for a concentrate suitable for feeding to sheep. However good the concentrate suitable for this purpose may be, sheep still require a sufficiency of roughage. It must also be borne in mind that maize is not high in protein. Some samples representing large quantities sent to the Western districts had a crude protein content of less than 9 per cent., and contained a quantity of damaged and mouldy grain.

In the production of stock foods in cube form, manufacturers often use a proportion of molasses in order that the ingredients may adhere and take the desired shape. Owing to long transit from the place of manufacture, in some instances a considerable proportion of this material has arrived in more or less a powder form, therefore not so suitable for feeding to sheep as would be foods arriving in an unbroken condition. Further, it has been noticed that molasses is apt to make the feed mouldy when stored for any length of time. This condition, however, has not been noticed in stock foods obtained fresh from the manufacturer.

Barley meal appears to be coming into favour as a food for pigs. The regulations under the Stock Foods Act define meal as the clean, sound, ground grain or finely crushed product of the entire grain cereal, or seed of which such meal purports to be made. Recently, several samples of barley were submitted for examination; most of them were badly smut-infested, and merchants have been warned that the making of meal from such material would render them liable to proceedings. A linseed oil meal manufactured by the new process is now on the market. As would be expected, the meal in question contains less than 1 per cent. of crude fat and more crude fibre than the ordinary linseed oil meals.

The large quantities of foxtail millet (*Setaria italica*) and Japanese millet seeds held by many produce merchants during the early part of the year induced several of them to make millet seed meals. Samples of the meals in question were analysed by the Agricultural Chemist, and the average results tabulated.

For the information of several large produce merchants, samples of prime lucerne chaff, ordinary lucerne chaff, wheaten hay chaff, also wheat, barley, and oat straw, were analysed, and the figures given will be useful for the future guidance of both buyers and sellers, who often hold quite erroneous opinions as to the feeding value of straw as compared with lucerne hay. The Stock Foods Act defines chaff as being hay or straw cut into short lengths, and hay as any dried or cured cereal, grass, or legumes, 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 an insect or by storm.

Unfortunately, chaffing of lucerne hay makes the selling of inferior lucerne possible, as the buyer has difficulty in the detection of weeds and other foreign material frequently therein.

Last January, several complaints were made by merchants regarding the quality of a lucerne hay received from some of their sending stations. In the first place the battens ranged in weight from just over 3 lb. to just under 9 lb. each, and the material was badly infested with *Xanthium spinosum* (Bathurst burr). Several bales from these consignments were carefully examined. One contained just over 84 per cent. of lucerne hay and grasses, 13.8 per cent. of Buthurst burr, and 1.25 per cent. of other bad weeds. Another bale, representing goods purchased by a large baker in the Paddington district, contained 5.4 per cent. of Bathurst burr, and 8.3

per cent. of other bad weeds, dirt, roots, &c. The total weight of the battens on this bale was just over 60 lb., nearly 9 lb. each. A sample of lucerne chaff submitted for examination by Chief Inspector of Stock contained over 2 per cent. of Datura seeds and capsules. The sample in question represented a line of fifty-three bags delivered by a farmer of the Kingsthorpe district to a Toowoomba merchant. An official sample taken on the merchant's premises was carefully examined, and found to consist of 90.47 per cent. of lucerne and useful plants, just over 2.3 per cent. of Datura seeds and capsules, 4.8 per cent. of weed seeds principally *Tribulus terrestris* (bull's head) and *Hibiscus trionum*; the remainder of the sample consisted of soil.

As a result of these investigations, several lots of so-called lucerne chaff and hay were destroyed by the owners on account of the material being deleterious to the life and health of stock.

In consequence of these findings and at the request of the Brisbane Produce Merchants' Association, a lecture was given early in June on weeds and other substances found in hay and chaff, and known to be deleterious to the life and health of stock. The merchants attending this lecture were each given specimens of Datura seeds and capsules, and similar specimens put up in sealed bottles have since been distributed to the principal merchants in the Toowoomba, Warwick, and Kingaroy districts. For the information of both buyers and sellers, paragraphs have appeared in the papers published in the areas referred to, and specimens of Datura can now be seen at the offices of the respective papers. Further specimens are available for distribution to persons interested in the production or sale of produce likely to contain plants or seeds deleterious to the life and health of stock.

In June, 1924, several large users of maize consulted us regarding the commercial possibilities of maize storage. At the time a satisfactory method of examination had not been worked out, too much reliance being placed on the grains being free from external insects. Several of these buyers who were interested in maize for feeding to horses submitted samples of different lines then offered for sale at Roma street; and, acting under our advice, purchased samples with a heavy volume weight, free from (external) live insects, with a moisture content of less than 14 per cent., samples containing a number of live insects or otherwise of obviously poor quality being rejected. A sample from each of the lots purchased was kept at the Laboratory. As soon as the hot weather set in, the samples in question were found to be badly insect-infested, in spite of the fact that they were free from external insects when put into airtight containers.

The buyers of the maize in question were recommended to fumigate with bisulphide of carbon on delivery and then store in airtight tanks. One large firm of carriers carefully followed our suggestions and did not open the tanks until after fifteen months' storage. The maize came out in excellent condition, and they were able, after retaining a sufficient quantity for their ordinary requirements, to sell the remainder at the highest then ruling prices.

When the tanks were opened the maize was sampled and the grain examined by the methods now adopted. As anticipated, the grain contained traces of insects in developmental stages; these, however, had been killed by the 1924 fumigation.

Fertilisers.

Until quite recently the sale of fertilisers in Queensland appears to have been confined to the canegrowers and to such areas as Nambour, Redland Bay, Stanthorpe, &c. During the year under review no less than ninety-nine persons applied for licenses to sell fertilisers, many in districts from which hitherto there has been no demand. The reason for the great increase in the number of fertiliser dealers is probably due to inquiries made of country storekeepers for fertilisers suitable for the top-dressing of both lucerne and grass land. It is known that the use during the last three years of a few bags of fertiliser has now resulted in the selling of both super. and mixed fertilisers in quantities undreamt of two years ago.

A large lucerne grower who recently consulted us regarding the purchase of seed stated that he was this year buying several tons of fertiliser, as his experience during the last three years had convinced him that the top-dressing of lucerne pays; the increased crops had fully satisfied him that his failures, if any, were in the application of too small quantities. Another grower some five years since applied super. at the rate of 1 cwt. per acre to a lucerne paddock now ten years old. Since the first year of application he has been using 2 cwt. per acre, and is convinced that he has more than doubled his crop.

In favourable years Nature is such an ample provider of grass of sorts—and carries on so unaided in its production—that stock raisers are apt to regard grass with indifference, probably for the reason that it is the only crop that gives something for nothing. The something, however, is often of low feeding value; this is particularly noticeable at the present time, with the result that many landowners are now purchasing considerable quantities of super., finely-ground Nauru phosphate, and bonemeal for the top-dressing of large areas, and present indications point to a large and increasing demand in Queensland for fertilisers suitable for the purpose referred to.

For the information of large buyers a formula table was issued with last year's Annual Report. As inquiries are from time to time received for such a table, reprints were made and are now available for distribution. The raw materials available are as follows:—

Containing nitrogen only—
- Sulphate of ammonia,
- Nitrate of soda,
- Dried blood.

Containing both nitrogen and phosphoric acid—
- Bone meal or dust,
- Bone, flesh, and offal fertilisers.

Containing phosphoric acid only—
- Nauru or Ocean Island phosphate, superphosphate, basic super., basic slag.

Containing potash only—
- Sulphate of potash,
- Muriate of potash.

Pest Destroyers.

It is frequently overlooked that the Pest Destroyers Act applies to such articles as arsenate of lead, arsenic, calcium cyanide, cattle dips, copper soda, copper carbonate, copper sulphate, cyanide of sodium, cyanide of potassium, formalin or formol, iron sulphate, lime sulphur, nicotine, nicotine compounds, phenolic insecticides, germicides and disinfectants, phosphorous pest destroyers, pyrethrum (or insect powder), prickly-pear poisons, arsenical weed destroyers, insecticides, red oil preparations, sheep dips, strychnine, sulphur, tobacco dust, tobacco powder; also, any insecticide, fungicide, vermin destroyer, or weed destroyer not elsewhere included.

For the protection of the user, every dealer is required to label each package of pest destroyer in such a manner as to give the following particulars:—

1. The distinctive name of the pest destroyer.
2. The net weight contained in the package or, in the case of liquids, the true volume content expressed in imperial gallons or fractional parts thereof.
3. The names of the active constituents, and, when so required by the prescribed standards, the percentage of such active constituents and/or the impurities contained therein.
4. All directions for use of the pest destroyer.
5. The name and address of the Queensland wholesale dealer.

On the purchase of any pest destroyer of a greater value than 5s. the buyer should receive from the dealer a signed invoice setting out—

1. The name of the pest destroyer;
2. The net weight or imperial measure;
3. A warranty to the following effect:—

> Notwithstanding any agreement to the contrary, this invoice shall be deemed to be and shall have effect as a warranty by me, the seller, that the constituents of the pest destroyer sold, and the percentage in which each constituent is contained therein and the percentage of each constituent contained in that part thereof which is soluble in cold water, accurately correspond with the constituents and percentages respectively stated in the statutory declaration furnished to the Under Secretary, Department of Agriculture and Stock, Brisbane, as prescribed with respect to the pest destroyer of the same name by "*The Pest Destroyers Act of* 1923."

FRUITGROWING IN QUEENSLAND.

A GENERAL REVIEW.

By ALBERT H. BENSON, Director of Fruit Culture.*

The year ending 30th June has not on the whole been a satisfactory one for Queensland fruitgrowers, as the rainfall in the principal fruitgrowing districts has been deficient at those periods of the year when it was most badly needed, though ample during the latter part of last winter and autumn. Insufficient rain fell during the spring, and although there were fair rains in December, yet the long, dry, hot spell experienced during January and February and March retarded the growth of bananas, citrus, and other fruits, as well as of all kinds of vegetables. Since the recent rains, however, banana plantations have improved somewhat, but have not made up the leeway due to their lack of growth during what should have been their most active growing period. Citrus trees, have, however, made a good recovery, and vegetables of excellent quality are now being marketed in large quantities.

Pineapples have not suffered to any great extent, and, thanks to the improved marketing conditions relating to this fruit, growers have received better returns, and the industry generally is on a more satisfactory basis, both as regards the market for fresh fruit and the canned product.

The Stanthorpe fruitgrowers have had a fairly good year, and there was less loss from fruit fly and other diseases, and satisfactory prices were obtained for for all good quality lines. Grape growers did well, as the hot dry summer was very favourable to this crop, which was of exceptionally good quality, very free from disease, and met with a ready sale, fancy lines realising a record price. I have never seen better grapes grown in this State than those produced during the past season, as, from the earliest coast-grown fruit to the latest ripening varieties of the Stanthorpe district, the crop, taken as a whole, was a very satisfactory one, and growers have done well.

Little damage was caused by hail or late frosts, but one particularly severe frost during last winter damaged bananas in several low-lying areas and checked the growth even where the temperature did not fall as low as freezing point, and heavy winter rains damaged the mandarin crop in some districts.

There was a considerable increase in the yield of custard apples, and a quantity of very fine fruit has been marketed; at the same time there has been far too much inferior, undersized, and immature fruit offered for sale at a low rate that has been anything but a credit to the producers. There is an increasing tendency to market immature fruit, both locally and in the Southern markets, pineapple growers being the worst offenders, as on several occasions immature pines totally unfit for human consumption have been offered for sale. The practice is a regrettable one, as nothing tends more to put a buyer off purchasing pineapples than to find that he has paid for an article that is not only inedible but actually dangerous to eat. Orange growers are nearly as bad, as they frequently market fruit containing as much acid as a lemon, and which is only fit for making an acid drink to be sweetened with sugar to taste.

Owing to a great scarcity of lemons in the autumn, and to the prevalence of influenza and dengue fever, there was a great demand for immature oranges for making cooling drinks, and much higher prices were obtained for the immature fruit than it would have realised had it been allowed to mature. This, however, is exceptional and should not be taken as a precedent, especially as the Southern States refuse to permit the sale of immature oranges or mandarins, and our growers have to comply with the maturity standards fixed in these States.

Improvement in Marketing Methods.

As a general rule there is an all-round improvement in the quality, packing, and get-up of the fruit offered for sale, both with respect to that locally grown as well as that imported from the Southern States; but there is still plenty of room for improvement, especially in grading, as there is frequently a great difference in the size of the individual fruits packed in the same case. This applies to both local and Southern grown apples and pears, and is frequently very noticeable in the case of bananas, where unfortunately the grade mark on the case cannot always be relied upon, and as a consequence Southern buyers have lost confidence in our fruit. In order to regain the confidence of our buyers, a minimum size of fruit that can be packed has been fixed in this State; and the States of New South

* In the Report of the Department of Agriculture and Stock, 1926.

Wales, Victoria, and South Australia, who take practically all our fruit that is sent South, have agreed to recognise the grade standard fixed by Queensland and not to permit the sale of any bananas that do not come up to such standard. This will have the effect of making our growers more careful in the class of fruit they pack, as once they find that undersized fruit will not be permitted to be sold, they will not attempt to send it, and the rubbish that now finds its way to the Southern markets and gives our Queensland-grown bananas a bad name will be cut out.

It is gratifying to know that the days of being able to dispose of inferior fruit are very rapidly drawing to an end, as with the very greatly increased production of all kinds of fruit within the Commonwealth there is very little demand for rubbish at any price; and the only chance a grower now has of making a success of fruitgrowing is to produce a high-class article and place it on the market in the best possible condition and in the most attractive form. This will mean the elimination of the careless and ignorant grower, who will not keep abreast of the time, as he will not be able to compete with the man who knows his work thoroughly and manages his business on sound business lines. The elimination of such growers will greatly benefit competent orchardists, as many of their orchards have been planted in unsuitable localities, with inferior varieties, and are so neglected that they are a serious menace to the adjoining properties, as they are simply a nursery for the breeding and dissemination of every kind of pest that fruit or fruit trees are subject to.

Unprofitable Orchards.

Unfortunately, many persons take up fruit-growing who have not the faintest idea of what they are undertaking, and as a result we have thousands of acres of unprofitable orchards, pineapple and banana plantations, many of which have been planted in unsuitable soil or in unsuitable localities or in land improperly prepared and never thoroughly looked after, that are now either abandoned or so neglected as to be valueless; and, as previously stated, nothing more or less than a breeding-ground for all kinds of pests. The cleaning up of these worthless orchards and plantations is a matter that must receive immediate attention if the fruit-growing industry of Queensland is to make any progress. The cleaning up process will be in any case a costly one, and the longer it is delayed the more costly it will be. Growers must do their share of the work, as the Government cannot be expected to bear the whole of the expense. There is unfortunately a strong tendency on the part of many growers to shelve their responsibility, to put off anything that requires any expenditure of time or money, and expect the Government to come to their assistance. The sooner this idea is exploded the better for the fruitgrowing industry, as growers must recognise that it is only right that they should do their share of the work and develop a spirit of self-reliance, instead of trying to pass their responsibilities on, and expect the Government to come to their assistance whenever they ask for it.

Educational Progress.

The educational side of fruit culture has, thanks to the increased staff, made steady progress during the year, and several matters of great importance to citrus, pineapple, banana, and deciduous fruit growers have received attention. There is, however, a very great deal to be accomplished, as any investigation work requires constant and careful supervision, and, if reliable results are to be obtained, the work cannot be hurried. Up to the present the Fruit Branch has been handicapped by not having a sufficient staff of efficient officers capable of carrying out research work, and in order to remedy this defect, three officers have been given special training both in the orchard and at the Queensland University. By this means it is hoped that a capable and highly efficient educational staff, possessing local knowledge and experience, will eventually be secured, and should it be necessary to obtain special information on any particular branch of fruit culture not obtainable in Australia, then one of our own officers should be sent to the country where such information is to be obtained, rather than import an expert from such country who has no knowledge whatever of our climate or local conditions, and is heavily handicapped in consequence. The policy recommended is to train our own experts rather than to depend on obtaining them elsewhere, and although we are somewhat late in making a start, it is a case of better late than never. The Fruit Branch has also been badly handicapped by not having a fruit experiment station within easy access of headquarters, as the lack of such a place has prevented us carrying out many important investigations, which require to be continued over a series of years, as well as many that are of a more temporary nature. Investigation work of any kind necessitates our having an absolute control of every detail, and this is not possible where the work is being attempted on private property.

Twenty-nine years ago the Department leased a suitable area of land at Redland Bay on which to carry out the work of investigating the various problems confronting the growing of fruit and vegetables, and a comprehensive series of practical fruit experiments were initiated. Unfortunately, the Government of the day did not consider the work of sufficient importance to warrant the small expenditure incurred and closed the place down when little more than initiatory work had been completed and before any definite results had been obtained. This action was very unfortunate and undoubtedly retarded the development of the fruit industry of this State, as, had the work then initiated being continued, many of the problems that confront fruitgrowers to-day would have been solved years ago, and the establishment of a fruit experiment station would not be so essential as it is at the present time. The establishment of such a station should be undertaken at once, as it will be of the greatest assistance, not only to the Fruit Branch, but to the Biological Branch as well, as this branch, which is in close touch with the Fruit Branch, is also very badly in want of a convenient place in which to carry out practical investigations in the field on numerous fungus and insect pests—investigations that require to be conducted under conditions which can be absolutely controlled and which will permit of definite and reliable results being obtained. Such a system will also prove a very valuable training ground for the officers of the Fruit Branch, especially if combined with a special University course. The Fruit Branch requires highly efficient officers and, as such are by no means easy to procure, men showing a marked aptitude for the work will have to undergo a special training in order that they may attain that degree of efficiency, the possession of which is so essential to anyone engaged in the work of instruction or investigation.

THE BANANA INDUSTRY.

The banana is by far our most important fruit commercially, as its cultivation not only provides a living for a large number of white growers and their families but the marketing of the fruit gives employment to many transport workers, timber-getters, and sawmillers, and is an important source of revenue to the railways of this and the Southern States. The industry is of national importance, and should be fostered in every possible way, as, should it fail, either as a result of disease or neglect, its loss would be a very serious one to Queensland. In order to prevent the possibility of the industry failing, much more attention will have to be given in future to the selection of the land in which to grow bananas, the cultivation and manuring of the land, the systematic suckering of the stools, and keeping the plantation free from disease. Unfortunately, insufficient attention has frequently been given to these essentials, and many growers have been inclined to look upon banana culture more as a gamble than as a staple industry, and to plant up any available areas, take as much as they can off the plants with the least possible labour, and when the plantation is no longer profitable walk off and abandon it. This has been done in many instances, and very serious results have already followed, as these abandoned and neglected plantations are breeding-grounds for countless numbers of beetle borers, and in districts where bunchy top is present are a fertile source of disseminating this disease. As stated in my opening remarks these worthless, abandoned, diseased, and neglected plantations must be destroyed. As long as they are allowed to remain in their present state, there is no possibility of keeping bunchy top or beetle borers in check, let alone exterminating these very serious pests.

There are some thousands of acres to be dealt with, and unless a determined attempt is made to clean them up the future success of banana culture in many districts in the southern part of the State is seriously menaced. Queensland cannot afford to lose its banana industry, and there is no reason for it to do so, provided we scrap our policy of procrastination and get systematically to work to place it on a sound and satisfactory basis. Far too much inferior fruit has been grown in the past, much of which has been sent to the Southern markets and has seriously injured the reputation of our bananas. Much of this fruit has been the produce of neglected or diseased plantations, or has been grown in land in which bananas should never have been planted, and the destruction of such plantations will materially benefit the growers of good fruit, as good fruit will sell on any market, whereas inferior rubbish is hard to dispose of at any time and is unsaleable on a glutted market.

Diseases and Pests.

The diseases of bananas have occupied a large amount of the time of the Fruit Branch, which has been intimately associated with the work of investigation that is being carried out by the Bunchy Top Investigation Committee, as well as with the investigations of the Biological Branch of the Department.

In the case of bunchy top, squirter, and leaf spot, that are receiving the special attention of this Committee, important headway has been made during the year, as in the case of the former disease it has been definitely proved that it is due to an ultra-microscopic virus which is carried by one species of aphis from a diseased to a healthy plant, and as far as is known cannot be transmitted by any other insect or to any other plant except those belonging to the banana family. This most important and valuable discovery was fortunately made prior to the discovery of the outbreak of bunchy top in the Dayboro' district, on the last day of December, 1925, as it has enabled us to take steps to restrict the transference of the disease; and I am of the opinion that, if the recommendations of the Bunchy Top Investigation Committee are given effect to, and every banana grower makes himself conversant with the symptoms of bunchy top, particularly in its initial stages, and immediately destroys any and every stool in which the disease is seen, that bunchy top can be so controlled as to be no longer a menace to the banana industry. Bunchy top can only be spread by the aphis carrying the virus from a bunchy top infested plant to a healthy plant, and therefore if every infested plant is destroyed as soon as seen, there will be no virus to transmit, and the aphids will do no harm, as they are not the cause of the disease but are simply the carriers of the disease from a diseased to a healthy plant. This is a very important point, and every banana grower is urged to systematically inspect his plantation at regular intervals so that, should disease make its appearance, it will be discovered before it has become fairly established, and can be stamped out. A detailed examination of every banana plantation in the State by Government inspectors is a physical impossibility, as it means an individual inspection of every banana plant in the State and cannot be carried out, but growers can do the work, as in the cutting of the fruit and the chipping of the plantation they see every stool and therefore, if they are thoroughly conversant with the disease, they are undoubtedly the best inspectors and can be of the very greatest assistance to the Department in its attempt to control this very serious pest.

Some growers do not even yet realise the seriousness of bunchy top and think other diseases, such as beetle borer, a greater danger. Let them make no mistake, however, once bunchy top gets the upper hand all other diseases are of a secondary importance, as there is no longer a fruit-yielding plantation but a number of stunted malformed plants that will not die but are a persistent menace to all adjacent plantations and to the State as a whole.

Unfortunately, before it was known that bunchy top was present in the Dayboro' district, large numbers of suckers had been sent from there to the Innisfail district as well as to other parts of the State. This necessitated a careful inspection of every plantation in the Innisfail district and bunchy top was found to be present. Immediate steps were taken to destroy all affected plants, and two extra inspectors—banana growers who had been heavy losers from the disease in the Currumbin district, and were thoroughly acquainted with it—have been appointed temporarily; and are now making a thorough and detailed inspection. So far, the outbreaks have been isolated ones, and only a few plants have shown the disease, so that it is hoped we have it under control, and that there will be no further trouble. It is, however, premature to make any definite statement, and some time must elapse before we are sure that the disease has been stamped out and are able to declare the district free from bunchy top. In any case it is of great importance to keep this district clean, and no banana suckers will be permitted to enter that part of the State that is north of the Herbert River from any other part of Queensland or elsewhere.

At present the transfer of suckers in any part of the State is totally prohibited as, until it has been definitely determined how far the disease has spread and what districts are so far free, it is not advisable to shift any suckers even from plantation to plantation in the same district, as the disease is of such an insidious nature that no risks can be taken. In the meantime a careful inspection of the area lying to the north of the known infested area in Southern Queensland is being carried out, and as soon as it is safe to do so, the prohibition now in force will be relaxed under certain conditions so as to permit the planting of new areas during the coming season.

Beetle borer is a serious menace to banana growers, and is spreading rapidly, thanks mainly to the neglected and abandoned plantations which form an ideal breeding-ground for this pest. Numerous experiments have been carried out in order to determine the possibility of successfully combating it, but so far there is nothing better than trapping systematically with poisoned baits; and I feel certain that there will not be any appreciable diminution of the pest until the large numbers of neglected, abandoned, and badly-diseased plantations are completely destroyed.

Rust has not caused any serious loss in the Southern part of the State, but has done considerable damage in the Innisfail district and parts of Coastal Central Queensland. The entomological staff is dealing with this matter, and as a result of their investigations remedial measures which promise well are being tested. Leaf spot is a disease that must be given more attention by growers, as when it appears in a severe form the crop is destroyed, and even when it is only present to a slight extent it throws the plants back and the fruit does not develop to perfection.

During the year we had a visit from Mr. Campbell, the mycologist of the Fijian Department of Agriculture, who came here to investigate leaf spot, as this disease, or one very similar to it, caused serious loss to Fijian growers. Leaf spot can be controlled by the use of fungicides applied as a dust as can also fruit spot or Anthracnose. A fruit spot caused by the puncture of a sucking bug has also received the attention of the entomological staff, and an effectual remedy has been discovered.

Squirter is being specially investigated by Professor Goddard, who is carrying out a very large number of experiments to determine the cause of and the possibility of controlling this serious trouble, which causes such heavy losses in fruit sent to the Southern States during certain periods of the year. The results of Professor Goddard's investigations are awaited with interest as, until they are known, it is not advisable to definitely decide on any particular pack for the Southern markets.

During the year Mr. Wm. Ellison, junr., was temporarily appointed as banana packing instructor, and his appointment has given general satisfaction. In addition to being an expert packer, he possesses a good practical knowledge of banana culture, and has thereby been able, not only to give instruction in packing the fruit, but to advise on all matters connected with the growing of the fruit and the care of the plantation. He recently packed a quantity of fruit for the Melbourne and Sydney markets which he saw unpacked when it reached its destination. His pack was favourably commented upon, but, as I have already stated, no pack will be definitely decided upon until the results of our squirter investigations are known.

Northern Revival.

In the course of the year there has been a resuscitation of banana growing in Northern Queensland, along the line of the Northern Railway from Cardwell to Cairns, and as the climate of this part of the State is more suitable for the growing of this fruit than that of the more Southern banana-growing districts, there is a probability of a large output of fruit from this district in the near future, which will more than make good any decreased yield that may occur in the South. The present decreased yield in the South is the result of last winter's cold and last summer's drought, but the yield will increase from now. Considerable areas of new land are being prepared for the present season's planting, despite bunchy top, beetle borer, and other pests, as growers have not lost faith in the industry; and if they will only plant in good soil, in suitable localities, take good care of their plantation, grow nothing but good quality fruit, and market it honestly there is no reason why they should not obtain a good return for their labour and outlay provided the seasons are favourable.

PINEAPPLE CULTIVATION.

As already stated, better marketing arrangements have had the effect of stabilising and improving prices, and the industry is in a better position now than it has been previously. Despite the many years that have elapsed since the commercial cultivation of pineapples was started in this State, there are still many growers who fail to realise the importance of thoroughly preparing the land prior to planting, or of carefully selecting the suckers with which to plant the land when prepared. These factors, combined with the selection of unsuitable land on which to grow this fruit, are responsible for the failure of many plantations to produce good crops of first-class fruit or to suffer from the so-called pineapple disease or wilt.

Suckers should only be taken from plants that are free from disease, that produce fruit of good size, shape, and quality, and possess a healthy root system as well as the habit of suckering as close to the soil as possible, instead of taking suckers indiscriminately from any worn-out plantation, as very frequently happens. Careful selection of suckers will undoubtedly improve the yield and quality of the product, and this has been proved in no uncertain manner during the past season at the Bribie Nursery, where a number of suckers specially selected from healthy plants, that had produced high-class fruit, were planted in practically pure sand, and yet every sucker produced a fruit, 75 per cent. of which were the right size and type to fill a 30-oz. can. Results such as this could be obtained generally, provided the same care and attention were given to the selection of the suckers, and if carried out systematically by growers, the result would be that, instead of the summer crop yielding about 10 per cent. of fruit suitable to filling a 30-oz. can, at least 60 per cent. of such fruit would be obtained, and we would then be able to put up a pack that would be a credit to the State and that could hold its own anywhere, as there is no question that our pines cannot be beaten for flavour.

Diseases and Pests.

The work of investigating the various diseases of pineapples has received further attention during the year, but there is little to add to the advice that has been given by the Department for many years—viz., to select suitable land, prepare it properly, plant healthy selected suckers, keep the land in a state of thorough tilth, and maintain its fertility by judicious manuring. Most of the diseases of the pineapple are due to unsuitable soil, and in any soil that has an excess of mineral acidity there is always a likelihood of the root becoming injured and the plant dying of starvation owing to the inability of the root system to secure the plant foods esential to the healthy development of the plant. Any serious injury to the root system of the pineapple plant, whether same be due to insects, unsuitable, badly-drained soil, or mineral acidity, brings about the death of the plant sooner or later, and produces that decolouration of the foliage commonly associated with the so-called pineapple disease. There is no great extension of the industry nor is the same likely, as a number of the plantations in the metropolitan area are far from healthy and, with the exception of the Gympie district, there is little new planting being done. The Gympie district grows excellent fruit, and there are large areas suitable for its culture, so that should the demand arise there will be no difficulty in producing large quantities of fruit suitable for canning. Bowen continues to produce very fine fruit, but its cultivation is not extending to any extent in the Northern part of the State.

Should the further tests that are being made to determine the possibility of pineapples being placed on the European markets in perfect condition prove successful, this will give growers a new outlet for their fruit, as once the difficulty in transport is overcome, there is no reason why large quantities of pineapples should not be exported and sold at a price that will tend to enormously increase their present consumption.

CITRICULTURE.

Queensland has gained a reputation for the high quality of its citrus fruit, which is fully borne out by the excellent exhibits that are seen at many country shows and at the annual exhibitions of the Royal National Association in Brisbane, and it is of vital importance to the citrus industry that the high reputation be maintained. This can only be done by keeping our orchards in a healthy and vigorous condition, by growing nothing but suitable varieties producing the best quality fruit, by eliminating all unprofitable and inferior specimens, destroying those that are useless and heading back and re-working with more suitable varieties all trees that are only producing thick-skinned, inferior quality fruit that is hard to dispose of. During recent years there has been a heavy planting of citrus trees in the Southern States, so that our only chance of maintaining or extending our markets in these States is to produce fruit of such superior quality that it will find a ready sale even on a congested market, as there is always a good demand for a first-class article.

Many growers have unfortunately planted many trees that will never yield profitable returns, as they will never yield a high-class product, and the sooner such trees are re-worked with first-class varieties, or, if diseased as well, taken out and burnt, the better for the industry. These remarks apply particularly to the growing of lemons in Coastal Queensland, where thousands of trees have been planted that are practically useless, as the fruit is very inferior and often quite unusable, as it has little or no juice and the flesh is a mass of gum. Such trees are usually smothered with scale insects, fungus pests, and other insects, and are nothing more than a breeding ground for all pests and a source of danger to all citrus trees growing in their vicinity. The lemon, on the other hand, when grown under suitable climatic conditions, which seldom exist in coastal districts, does well in Queensland, and there is a good market for such fruit, as, if cut at the right period, carefully handled, and properly cured, it can be kept in perfect condition for months and will supply the demand during our summer season when we are more or less dependent on imported fruit.

During the year the Department has conducted a number of orchard experiments in order to determine the best way of dealing with neglected trees, by manuring or otherwise, as well as the best means of treating such pests as the bronzy and spiny orange bugs, scale insects, root borers, and other diseases. New methods of destruction have been tried, amongst others the use of calcium cyanide as a dust in place of generating hydrocyanic acid gas for fumigation purposes by using sodium or potassium cyanide with sulphuric acid. It is too soon to make a definite statement, but from the experience gained already, it appears that the use of calcium cyanide in the dust form will be likely to prove of value to our citrus growers.

An old enemy, the Queensland fruit fly, still takes a heavy toll from citrus growers, many of whom do not yet realise the importance of destroying all useless, fruit-bearing plants that harbour this pest and of systematically trapping every mature fly early in the season as well as gathering and destroying every fly-infested fruit.

There is an improvement in the packing and grading of citrus fruit, and many of the exhibits of packing seen at the various shows are a credit to the exhibitors

So far the vexed question of a standard case for citrus fruit has not been settled, and until growers can come to a definite agreement on this matter it is impossible to fix grade standards for citrus fruits in this State, although it would be to the benefit of our growers if they would fall into line with the standards adopted in the Southern States. The question of obtaining a reliable supply of trees for planting out should also be settled, as many of the orchards planted during recent years contain a number of useless, unprofitable, or unproductive trees, that have been propagated on unsuitable or diseased stocks, from scions taken from diseased, constitutionally unhealthy, or unproductive trees of inferior varieties, that cannot be expected under any conditions to produce a satisfactory tree that will yield regular and good crops of first-class fruit.

This is a matter I have dealt with many times, as I am confident that many of the most troublesome diseases of citrus fruits are capable of being transmitted both by the stock and scion, and nursery stock so affected is doomed to failure from the start. The only way to get over the difficulty is for co-operative bodies of citrus growers to establish their own nurseries and propagate nothing except on absolutely healthy stocks, worked with scions taken from healthy productive trees yielding fruit of the highest possible quality. If this is done, I am certain that the high reputations that our really good citrus fruits have attained will be maintained in the future, and that a ready market at a remunerative rate will be obtained for a first-class article.

DECIDUOUS FRUITS.

The granite belt is our main source of supply of deciduous fruits, though selected varieties of early-maturing peaches as well as Chickasaw and hybrid Chickasaw plums have been a profitable line on the coast, where the fruit fly has been kept in check by systematically trapping. In the Stanthorpe fruit district good crops of excellent peaches, nectarines, plums, apples, pears, and grapes were grown, and the prices realised for quality lines were very satisfactory, though inferior lines were hard to dispose of.

A record of the examination of the different fruits sent to the Brisbane market showed a great improvement over previous years, in that the number of cases of fruit of all kinds ordered to be picked over for diseases of all kinds, decay, &c., only amounted to 5,091, of which only 355 were destroyed and 902 lost in repacking, as a result of overripe, rotten, and diseased fruit. This is very satisfactory as the loss was very much less than that experienced in any recent year. A dry season, greater care in handling and packing, and the destruction of fruit pests are responsible for the improvement.

The grape crop, both on the coast and inland, was of very good quality, and I do not remember having seen finer samples of several varieties of grapes than those grown in the Stanthorpe district. The officer in charge of the field inspection staff, Mr. T. W. Lowry, whose headquarters are in Stanthorpe, reports that, although the district as a whole escaped serious damage from hail or heavy storms, yet a portion of the district lying to the south and east of Stanthorpe suffered somewhat severely from hail. Unfortunately, there is always a danger of hailstorms causing serious loss, and an attempt should be made to test the possibility of breaking up the clouds in which hail is formed, before the actual formation of the ice particles takes place, by means of explosives or otherwise, as the experience of hailstorms in the Stanthorpe district is that they follow certain lines or belts of country, and it should therefore be possible to arrange means for breaking them up before they cause serious damage. Mr. Lowry states that two growers in the Glen Aplin district used fine wire-netting to protect their vines against hail and found that it paid them to do so, as the netting not only prevented the hail from damaging the vines and fruit but also protected the fruit from the attack of birds; which, especially in a dry season, when their usual supply of food is scarce, do a lot of damage to all kinds of fruit. He also reports that, probably as a result of the hot and dry season, fruit fly did comparatively little damage, and it was not until the latter end of January, when an influx of flies from outside the district took place in a number of orchards, that the fly did any damage to speak of, and even then some parts of the district were practically free from this pest.

A special officer was appointed temporarily to give instruction in fruit packing during the season, thus following up the work of the late Mr. Rowlands, and as a result of the instruction growers have received there is a very marked improvement in the manner in which the fruit is placed on the market for sale. Seven temporary inspectors were also employed during the fruit season in order to see that the regulations governing the gathering of fallen fruit and the destruction of diseased fruit were carried out. Action has also been taken to clean up a number of abandoned and neglected orchards, and this work will be continued, as such places are only a breeding ground for pests of all kinds and a source of danger to all neighbouring growers.

The marketing of the crop has been carried out mainly under the auspices of the Committee of Direction of Fruit Marketing, with satisfactory results.

Other Fruits.

There has been a good crop of custard apples, and this excellent fruit is steadily gaining favour in the Southern States, to which large quantities are now being sent. Papaws have also done well, and there is a fairly good demand for the fresh fruit trade as well as for the manufacture of chutneys and sauces. Passion fruit is becoming more and more difficult to grow, and many of our best producing areas are now so badly affected with leaf spot that its cultivation is no longer profitable. The cause of the trouble is being investigated, and it is hoped that an effectual remedy will be discovered, as where the plants are free from disease they yield a good return to the grower and there is a steady demand for the fruit both for consumption in the fresh state and also for preserving.

Strawberries were a profitable crop and where they are irrigated the returns are fairly constant. Many growers have installed irrigation plants, and have proved the investment a profitable one, as the strawberry soon suffers from a dry spell. The quality of the fruit was excellent, both for table use and jam making.

The cultivation of tomatoes is now an important industry, as will be noted by the volume of the exports, as no less than 321,851 packages of fruit were forwarded to the Southern States during the year, in addition to which the local consumption is very heavy, as tomatoes are in daily demand as a staple food throughout the State. Potatoes, on the other hand, are not grown to anything like the extent they should be, and during the year this State has imported about 30,000 tons. This is largely due to the unfavourable season, but there is no reason if more attention were given to this crop and better cultural methods adopted, that Queensland should not be able to produce the bulk of its requirements, instead of having to go outside the State for our supply.

Bribie State Nursery.

A sudden drop in the temperature during the last winter injured a number of the trees and plants growing at the nursery, and this cold spell was followed by months of the driest weather ever known on the island. Fortunately, our water supply held out, but, with the extension of the bushhouses and other work, an increased supply is required, and arrangements are being made to secure it. There is practically an unlimited supply of very pure water within a few feet of the surface, so that all that is required is to increase the pumping capacity of the present plant. Experience has shown that bush-house propagation is essential, as the young plants require protection from the direct rays of the sun.

Very good results have been obtained from the experiment that is being conducted to determine the possibility of improving smooth leaf pineapples by careful selection, as the fruit produced last summer was of very even type, especially adapted for the canning trade, a very important consideration when we have to dispose of our surplus fruit to canners. This experiment will be continued and results carefully watched.

The young thin-shelled Queensland nuts, pecan nuts, and avocadoes have done well, and where they have been planted out in their permanent positions, the majority have made a satisfactory growth. The worked trees imported from the United States of America have not yet fruited, but it is probable that several of the varieties will fruit during the year. Large numbers of banana plants have been propagated from the single eye, and, prior to the proclamation prohibiting the transfer of banana plants, a number were distributed to several parts of the State. Neither bunchy top nor beetle borer have been seen in the plants, and every possible care is taken to prevent the introduction of these diseases.

In order to produce a new strawberry that will take the place of the varieties now commonly grown, and which are showing signs of deterioration, a quantity of seed was obtained from Queensland grown fruit and was specially selected from plants that were of a vigorous habit, and heavy producers of high-class fruit. A number of seedlings were raised from the selected seed and some of them give promise of being heavy producers of good fruit, but no definite results can be expected until they have produced their second crop, which is now showing. A quantity of named varieties were also imported from England, but unfortunately the bulk of the consignment died in transit; one or two varieties that survived, however, promise to do well. A quantity of seed was also obtained from the United

States of America, from which a large number of seedlings of many types have been raised and planted out in the bushhouse. Although the seed was only planted last spring, several plants have already borne fruit and many now show blossoms. Many of the plants are very vigorous growers, and amongst the large number we are testing, I am in hopes that we will get one or more plants that will show special merit and from which the future strawberry crops will eventually be produced, as once it is certain that a particular plant is just what is required, we will propagate from it as quickly as possible, in order to get enough plants to set out an area from which runners can be distributed to growers.

Tests are also being made with little-known varieties of passion fruit in order to see whether it is possible to obtain plants that will produce a marketable fruit of high quality that is free from leaf spot.

A number of seedling apple trees are also being grown from seed obtained from England, and when big enough to be worked they will be budded or grafted with varieties suitable to the Stanthorpe district, to be planted there permanently in order to see whether they will be resistant to crown gall or hairy root. Many experiments have been carried out at the nursery during the year, and the work has been carried out in an efficient manner under the direction of the manager, Mr. T. Mitchell.

Fruit Diseases Act.

As stated, it is proposed to amend the present Act in order to give the necessary power to enable it to be administered in a more efficient manner, as it is imperative that the many abandoned, neglected, and diseased orchards and banana plantations be efficiently dealt with, as if this is not done the fruit-growing industry of Queensland is not likely to make any progress. A number of temporary inspectors were appointed for the fruit season in the Stanthorpe district, and, as already mentioned in this report, there was much less loss there from fruit fly and other diseases than during previous years, and this decrease can be accounted for by the dry season and the care being taken to gather and destroy all infested fruit. On the last day of December, bunchy top was discovered at Rush Creek, in the Dayboro' District, and as a result it was necessary to make an inspection of all the surrounding banana plantations. This necessitated every available officer of the Fruit Branch who had any field experience being employed on this work, even at the risk of neglecting other branches of the fruit industry, as it was of vital importance to determine as quickly as possible how far the disease had spread and to which part of the State suckers had been sent from the infected area. This necessitated a large amount of extra work and expense, which has, however, been justified, as it has enabled the Department to follow up the plants sent to other districts, and in cases where bunchy top has broken out in the plants so sent to take steps for its immediate suppression.

The inspection work is still being carried out, and it is not possible to say when it will be completed. So far as is known at present the disease, which was transferred to the Innisfail district by means of infected suckers, is now well under control, and it is hoped that the slight infestation that has taken place there will be stamped out. In order to bring this about, two practical banana growers, who were thoroughly acquainted with bunchy top, were appointed as temporary inspectors and sent to Innisfail, where they are still engaged in inspecting plantations, and should no further outbreaks occur, it would probably be possible to declare the district north of the Herbert River clean by about the end of the year.

SUPPOSED POISONOUS WEEDS.

The Government Botanist, Mr. C. T. White, F.L.S., has supplied the following information in answer to a correspondent:—

> The specimen forwarded by Inspector O'Bryen is the "Narrow-leaved Sage" (*Salvia lanceifolia*), a native of the United States and Mexico, naturalised in Queensland for some years. It first made its appearance in the Pittsworth district, where it is now very common, and has spread to other parts of the Downs. The plant has the reputation in Queensland of being harmful to stock, but no feeding tests or experimental work of any kind, so far as known, has been carried out with it. In America it is recorded as a troublesome weed in the Western United States, but we can find no record of its being regarded as harmful there. Some of the same family cause "staggers" or "shivers" in stock.

DAIRYING IN QUEENSLAND.

By CHAS. McGRATH, Supervisor of Dairying.*

Seasonal conditions in the early part of the year proved favourable, and resulted in the production of increased quantities of dairy products. Dry weather was experienced during the latter half of the year, and as a consequence a falling-off in production occurred during that period.

The following are the particulars of dairy produce manufactured during the season:—

	Lb.
Butter	60,496,753
Cheese	12,515,895
Condensed Milk	9,771,763

BUTTER PRODUCTION.

The average quality of the first-grade butter was higher and the grade generally more uniform than previously.

The world's butter test held in New Zealand claimed attention, and brought into competition the finest products from centres of dairying throughout the world. The general high quality of Queensland butters was commented on by the experts to whom the duty of awarding the honours was entrusted.

The Oakey District Co-operative Dairy Company gained second place, being one-half point below the award allotted to Rangiwahia-Ruahine Dairy Factory, New Zealand. The result of the test has had the effect of drawing the attention of oversea traders to the excellent quality of our butters.

There was an increase in the quantity of second-grade butters, attributable to unfavourable climatic conditions during the period of high production.

Heavy falls of rain occurred in December and January, accompanied by abnormally high temperatures. Such conditions favoured the development of undesirable bacteria and produced rank growth of pasturage, especially on low-lying areas. Milk and cream produced from such pastures at that time were wanting in full natural flavour and aroma.

Interruption of operations occurred in several of our butter factories in consequence of the installation and additions to manufacturing plants. Such disorganisation was also a factor that tended to increase the output of second-grade butter during the season.

Want of care and attention in the production and handling of the cream was in evidence in many cases, especially during the period of the heat wave. Frequent and regular deliveries of cream will assist to improve the grade of buter generally, with benefit to the producer.

Modernisation of dairy factory buildings and equipment, rebuilding and remodelling of dairy factory premises have received a deal of attention in our chief dairying centres, and we have factories of the most modern type, the erection and equipment of which cost from £30,000 to £60,000 each.

The new factory of the Wide Bay Co-operative Dairy Association, Limited, at Gympie, constructed of brick, concrete, and iron, was completed and equipped with modern machinery. This factory is claimed to be the largest butter factory in Australia.

The erection of a new factory building for the Maryborough Co-operative Dairy Association at Kingaroy is nearing completion, which, when finished, will rival the Wide Bay Co-operative Dairy Association's factory in size and equipment. The superstructure is of wood and iron. The building of the Maryborough Co-operative Dairy Association's new factory at Mundubbera, which is being constructed of similar materials to the factory at Kingaroy, is also nearing completion.

The Port Curtis Co-operative Dairy Association, Limited, at Gladstone, erected cold stores with a storage capacity of 4,000 boxes of butter, and is now extending the stores to accommodate over 10,000 boxes. Further improvements to this factory are in hand.

The Queensland Farmers' Co-operative Association has erected a modern factory of brick and concrete at Grantham, fitted with the latest improved butter factory equipment. This factory compares favourably with the most modern of butter factories.

* In the Annual Report, Department of Agriculture and Stock, 1926.

Power Plants.

Suction gas and crude oil units are taking the place of steam and are giving economical and satisfactory service.

The use of electric units to operate the various sections of the dairy factory has been found to increase economy in many instances.

Increasing operating costs render necessary the attainment of industrial efficiency by the installation and use of modern industrial units in all our dairy factories.

Glass-lined batch pasteurisers, cream forewarmers, and cream-holding vats have been installed in butter factories recently built or reconstructed.

Manufacture.

Pasteurisation of cream for butter-making is carried out in all butter factories in this State, and the butter produced is now more uniform in character with increased durability.

It has, however, been noticeable that since the process of pasteurisation of cream at factories has been adopted that no general improvement has taken place in the quality of the cream supplied, and that in some districts the quality has tended to depreciate rather than improve. This is apparently caused by dairymen having the erroneous opinion that it is unnecessary to take particular care that pasteurisation will eliminate all defects in cream.

Mr. Dairy Instructor Watson states that a good deal of progress was made in manufacturing methods in his district, and that factory operatives were generally found to be eager to obtain information regarding both theory and practice of butter-making.

There is evidence that, in a few instances, the quality of the butter deteriorated owing to want of care in the neutralisation of the cream, prompted by a desire to economise in time.

Careful estimation of the quantities of cream to be treated, accurate determination of the acid content, and the addition of the correct quantity of neutraliser to the cream are essential in obtaining the benefit of the process. Sufficient time must be allowed for the neutraliser to do its work.

The use of cream forewarmers would impart efficiency to the process of neutralisation.

Transportation from Farm to Factory.

The gap between the producer and his factory requires to be bridged with modern means of transport, ensuring rapid and economical delivery of the products of our dairy farms at manufacturing centres.

Motor road and motor rail service has proved efficient and satisfactory where utilised, and an extension of the system is urged. Two rail motors to be used for the conveyance of cream from the farm to the factory are under construction at the Railway Workshops.

Organisation of the systematic transport of dairy produce from the farm to the factory by the co-operative governing bodies is essential in producing a satisfactory delivery service. Uncontrolled competition in the cartage of cream has in several districts proved wasteful and unsatisfactory.

The Dairy Farm.

Improvements to dairy farm premises are being gradually carried out in all districts. Milking machines are being introduced on many dairy farms throughout the State.

The modern milking plant is efficient and sanitary when controlled by a capable dairy hand, who will give attention in detail to the working, cleansing, and care of the plant. Installation of plant should provide efficiency in operating and facilities for cleansing and sterilising.

Instructional Work.

With a view of increasing the efficiency of the work of dairy inspectors, it is proposed to offer improved facilities for travel throughout their districts.

By co-ordinating the work of the dairy inspectors and dairy instructors it is hoped that the services of such officers will tend to be more instructional, and we look for the co-operation of all dairy farmers in an effort to raise the standard of our dairy products.

CHEESE MANUFACTURE.

Climatic conditions ruling in January, February, and March (heat wave) had a detrimental effect on the quality of the cheese produced at that period.

Pasteurisation has been adopted by factories and has resulted in the production of a more uniform and improved article generally.

Cheese from pasteurised milk cures slowly and has a more open body than the product of raw milk, but the clean flavour, improved storing qualities, and uniformity of the cheese warrant the application of the process in all cheese factories.

The process tends to lessen or eliminate food flavours, and destroys or checks the action of undesirable bacteria. Pasteurisation does not provide the means of renovating poor or low-grade milk and all milk should be carefully graded. Pasteurisation of milk will become general in the cheese industry in the near future.

The quality of cheese has not been all that could be desired, low quality being particularly noticeable during the summer.

Mr. Cheese Instructor Snell advises that acid-cut has been a very prevalent fault in his district.

Immediate improvement was apparent on cheesemakers acting on his advice to lower the wheying off acidity by two or three points.

Weed taints are always with us and have been very prevalent during the past season. Factory managements experienced great trouble in making a first-class cheese from the milk so tainted. Even with the aid of the pasteuriser, the cheese was far below that of normal times.

This state of affairs could be greatly minimised if the farmers went in for some system of fodder conservation. The factories generally are in good order, and the managers and staffs are well acquainted with their work. If the milk is delivered in good order they are quite capable of turning out a first-class article.

Last year a good deal of trouble was experienced with uneven colour in cheese, but during the season under review there were very few complaints on this score, the colouring generally being very even.

The general finish of our cheese has much improved, and the crates and packing are quite attractive.

The cheese industry is now firmly established, and with favourable seasons its future is bright.

The despatch of cheese from factories to exporting agents uncrated resulted in a deal of damage to the product. Uncrated cheese arrived at the port of shipment marked with dust, while green cheese was found out of shape and in some cases broken open.

A regulation (Regulation No. 98A) dealing with the crating of cheese intended for export was brought into force in order to overcome the loss occasioned thereby.

Cold Storage of Cheese.

The cold storage of cheese is a matter which is receiving the attention of the Department. It is evident that unsuitable temperatures and conditions under which cheese is stored at factories and stores awaiting shipment and sale is responsible for a deal of deterioration in quality and financial loss.

THE MARKETING OF DAIRY PRODUCTS.

The activities of the various bodies operating under legislative provisions have been of much benefit to the dairying industry.

Interstate conferences of representatives of the producing interests have co-ordinated the work of marketing throughout the State, and a more orderly system has been evolved.

Paterson (Delroy) Price Stabilising Scheme.

Owing to serious fluctuations and decline in the butter market the Paterson scheme was brought into force as from the 1st January, 1926.

Although voluntary, this scheme has the support of practically all butter and condensed and milk powder manufacturing managements throughout the States. The scheme has given stability to the prices ruling in interstate markets.

The Kangaroo Brand.

The adoption of an all-Australian brand for all high-grade butter exported overseas has had a beneficial effect on the price ruling for Australian butter on the London market.

The Hamilton Cold Stores.

The Hamilton Cold Stores were utilised during the present season, and during the period of high production the support accorded was satisfactory. They are the most modern and spacious cold stores in the Southern Hemisphere. Special facilities for loading from cold stores to ship's hold, so as to avoid fluctuations of temperatures, are also important factors in maintaining the storing properties in butter intended for export and storage.

Ministerial Conference.

A conference of Ministers of Agriculture, all the States being represented, was held in Brisbane on 7th June last, when the following matters, amongst others, pertaining to the dairy industry, were dealt with:—

(*a*) Standardisation of the grading and examination of dairy products placed on the interstate and intrastate markets.

(*b*) Co-ordination in experimental and research work relating to the dairy industry.

(*c*) Question of the compulsory installation in dairy produce factories of thoroughly tried-out and approved machinery.

(*d*) Commonwealth financial assistance to the States in regard to the dairying industry.

(*e*) That the Commonwealth Government defray shipping, rail, and quarantine charges on approved pure-bred farm or dairy stock imported from overseas.

(*f*) Legislative control of the use of sires for the improvement in breeding of grade dairy cattle.

IMPROVEMENT OF DAIRY HERDS.

The health of the dairy stock has been good, no outbreak of disease having occurred during the period. The veterinary officers examine and deal with any animal reported as showing signs of ill-health. A number of animals suffering from minor ailments received veterinary attention.

The desire of the Department to assist in the all-important matter of herd improvement is evidenced by the inauguration by the Minister for Agriculture, the Hon. W. Forgan Smith, of the better bull scheme, which makes provision for the payment of a subsidy of £1 for £1 to the purchasers of approved dairy sires. A number of applications have already been dealt with.

Herd Testing.

The manufacturing and marketing departments of the industry are in advance of the producing section. The matter of herd testing, culling, and feeding on production lines has not received the attention necessary to secure to the primary producer the full benefits of the modernisation of the secondary branch of the industry.

The following is the report of Mr. L. Andersen, Senior Herd Tester:—

"Generally speaking, the season under review has been very hard for the man on the land.

"The spring commenced very dry and hot with spasmodic thunder showers giving slight relief here and there.

"During the months of November and December good storms fell in most of our dairying districts and gave promise of a fair season, but unfortunately this was followed by a long spell of extremely hot and dry weather, which practically burned up the pastures in many places.

"With the exception of the coastal areas, the seasonal rain, which we look for in January, February, and March, did not occur, with the result that most of the dairymen were unable to plant any winter feeds. However, some relief was afforded by autumn rains.

"A slight alteration in the system under which herd testing has been carried out by this department for some years was made at the beginning of this year.

Each farmer applying for the services of a herd testing officer, was asked to sign an agreement to the effect that he would submit his herd at least four times during the lactation period in order that proper records of production of butter could be furnished at the end of the season.

"I think this is a step in the right direction and, judging by the applications received from all parts of the State, it appears that farmers generally realise the advantage of this system.

"Unfortunately, the drought compelled a number of dairy farmers to dry off their cows prematurely, thus losing the full benefit of the testing. However, a number of groups of farmers have again signified their intention of carrying out a further test during the coming season, and I anticipate an extension of the work in this department.

"Eighty-two Local Producers' Associations made applications for the services of herd testers and submitted 524 herds, comprising 15,701 cows.

"In districts, West Moreton submitted 98 herds, Darling Downs 130, Gympie 67, South Burnett 109, Central 73, Gayndah 20, Gin Gin 9, and Atherton 20 herds.

"The general average production of milk and butter-fat is slightly below that of last year, while the average per cent. fat recorded was practically the same.

"The actual number of tests carried out during the year was 27,932, while in addition 150 samples of skim milk were also treated.

"This is approximately 6,000 more than last year, and had the season been even moderately good it is estimated that the number of tests would have reached 35,000.

"The compiling of records, which entails a great deal of work, is now in progress, and at the time of writing 300 dairymen have been supplied with records of cows submitted during the season. These should supply the owners with very important information, and it is hoped that dairymen will make full use of this in the culling of their herds.

"Cases can be pointed out in almost any herd where cows, equal in production of milk, show a difference of 50 to 60 lb. of butter when submitted to the herd tester for a lactation period, while in some instances a difference of 100 lb. is noted in the records of cows from the same herd and grazed in the same field.

"The highest production of butter-fat for a cow tested during the season for a period of 290 days was 366 lb., while the poorest cow in the same period produced 133 lb., a difference of 233 lb., which, taken at 1s. 6d. per lb., equals £17 9s. 6d. in favour of the better cow."

GRADING.

The following is the report of Mr. R. W. Winks, Senior Grading Inspector:—

"Compared with the previous season, that under review was at a great disadvantage owing to unfavourable weather conditions, particularly during the later months. This fact not alone accounts for a serious diminution in the quantity of the output, but also adversely affects its average quality. Owing to the shrinkage in supplies, cream is held too long at the farms, and thus, even in winter, though the temperatures are more favourable, over-acidity, faulty mixing, &c., are responsible for a far larger percentage of second and third class butter than otherwise would be the case. It may seem strange, but is nevertheless true, that better butter is often produced during summer than in winter, a fact due to the more frequent deliveries of cream when the supply is plentiful. During my experience I cannot remember when this was more exemplified than it has been by the season just closed.

"Out of the grand total of 655,512 boxes graded, 8.39 per cent. was choice, 54.46 per cent. first class, 22.56 per cent. second, and 9.02 per cent. third class. Pats and tinned butter were about .55 per cent., and as the bulk of these was first class the percentage of first-class butter, irrespective of that classified choice, would be about 60 per cent. of the grand total. But for the fact that under the Commonwealth regulations the minimum number of points for choice butter was 92, while that of the State was 93 points, a greater percentage of choice would have appeared under that heading. This anomaly, however, has been removed and 92 points is now the minimum standard for 'Choice' or 'Kangaroo' quality.

"The general standard of manufacture is good. Faults such as greasiness, sponginess, &c., often have been due to insufficient room and power to handle the cream at the factories during the busy part of the season. There is a general tendency to overcome this difficulty, and several up-to-date factories quite recently have been established in districts where the production is heavy, and with additions and improved equipments in others the outlook for the ensuing season, so far as manufacturing conditions are concerned, is very favourable.

"Weed taints, with the exception of mustard cress in some localities, were not particularly noticeable.

"Fishiness, too, except in the case of a few factories, where it was very pronounced, was almost entirely absent. Streakiness and mottle, owing probably to the improved texture, the results of pasteurisation, have been considerably reduced, though some factories still require attention in that respect.

"In conclusion, but for the sub-normal conditions, which, as already pointed out, so seriously interfered with both the production and the transport of cream, dairying generally is on the upward grade, and with the advent of favourable weather dairying will again take its place amongst the foremost of our primary industries."

SUMMARY.

The period under review has been characterised by activities in all branches that have proved of benefit to the dairying industry.

The dairy inspector's efforts are directed to improving the conditions, production, and handling of dairy products on the farm. The work of the dairy instructors has been helpful in the manufacturing centres. The modernisation of dairy factories is an indication of the progressive ideas of the management of dairy companies, the most modern ideas of dairy factory buildings and equipment being featured in factories completed during the period reviewed.

The benefits of the Legislative Acts recently given effect to were in evidence during the period, and assisted in the stabilising of the markets for dairy products.

The elective boards functioning under the provisions of the Primary Products Pools Act have rendered a distinct and valuable service to primary producers, and their efforts are now more fully appreciated by all whose interests they serve and whose confidence and support are essential in securing for primary producers a fair return for their labour.

It is pleasing to note that the testing of dairy herds is receiving a greater measure of support, and I appreciate the assistance rendered by the Local Producers' Associations throughout the State for the interest taken and support accorded the Department's Herd Testing Scheme.

With the co-operation of all interests associated with the industry its progress is assured.

PROTECTING WATER-TROUGHS.

An inquiry has been made for a sketch of a device which appeared in "The Australasian" some time ago, for preventing injury to stock and to the water-trough itself. The illustrations and descriptions were supplied us from Western Australia. AA (Fig. 1) are supports of hardwood or saplings let into the ground, bolted together at the top, and placed at intervals along the trough to carry the side-poles, BB and

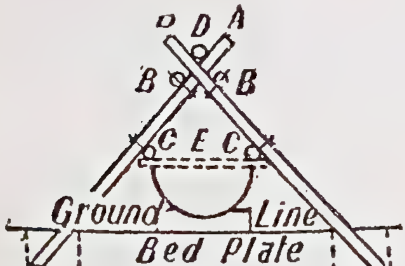


Fig. 1.

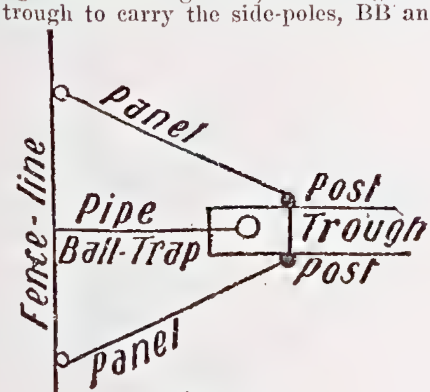


Fig. 2.

CC. These side-poles run the full length of the trough, and are bolted to the supports. If the troughs are for watering stock the horizontal pole, D, is used instead of the side-poles BB. A temporary board is placed across the trough at E to carry the side-poles, CC, but is withdrawn when these poles are bolted to the supports, AA. Fig. 2 shows an arrangement for protecting the ballcock.—"Australasian."

COTTON GROWING IN QUEENSLAND.

By W. G. WELLS, Cotton Specialist.*

The climatic conditions during the cotton season under review have been in many ways the worst experienced during the last five seasons. At the beginning of the planting season conditions were extremely unfavourable to securing a stand either on account of the very low soil temperatures or the heavy falls of rain which occurred after the planting operations were completed. By the time the soils had warmed up sufficiently to give a good strike over most of the cotton belt, the severe winds had caused such a loss of soil moisture as to preclude the possibility of obtaining a good germination. This condition of affairs continued until the first week of November, when general storms were experience in nearly every cotton area. Planting took place immediately after this with the securing of a good strike in nearly all districts.

The season from then on until the middle of January developed as if we were to have the best growing conditions that had been experienced in the above-mentioned five years. Rains of the proper intensity and of not too frequent occurrence fell in nearly all of the main areas, with the exception of the Lockyer, resulting in a very fine development of the fruiting system of all properly grown crops. This was especially noticeable in the early-planted fields, the lower parts of the plants being heavily laden with bolls by the middle of January and the upper parts covered with a fine crop of squares and flowers.

A period of severe drought, accompanied by high temperatures, set in at this time, and continued with little interruption well into March. The results from such weather conditions occurring right at the critical stage in the development of the fruiting system were extremely unfortunate, as not only was the complete top crop of squares lost, but the middle and even the lower crop of bolls, in some coses, were severely reduced in size.

The total yield for the whole of the State has naturally been greatly reduced from that which was anticipated earlier in the season, and is considerably lower than the 12,000-bale crop of last season, as on 5th June a total of 5,147 bales, averaging 481 lb. each, had been ginned, with a possibility of a few hundred bales more from the later receivals. This total does not represent a lower yield per acre, however, as of the 40,000 acres of seed which were applied for, it is doubtful if more than 25,000 acres came through to maturity owing to the inability to obtain a strike, late-planted crops failing under the droughty conditions, &c.

In the area which received the best rains early in January the yields have been excellent, considering the abnormally dry conditions which existed after that during the critical stage of the development of the fruiting system. In several districts many cases are on record where the yield per acre has averaged anywhere from 800 lb. to 1,200 lb. of good-bodied, full 1⅛-inch cotton, and in a few cases as much as 1,500 lb. Such returns received under extremely adverse conditions demonstrate the wonderful drought-resistant properties of the Upland type of cotton plant, and indicate that the farmers in the Southern and Central areas, where cotton can be grown profitably, should include the growing of this crop in their system of farming.

The general standard of the preparation of the seed bed and the cultivation of the cotton crop has shown a decided advance during this past season. The remarkable results obtained last season by the growers who paid careful attention to these points afforded an excellent illustration of the advantages to be obtained by early and thorough preparation of the seed bed, careful planting so as to obtain the correct depth of covering of the seed, early thinning to the proper distance between the plants, and frequent cultivation during the early stages of the plants' development. The result was a decided effort on the part of nearly every district this season to improve the standard of every operation—especially the preparation of the seed bed—and it is extremely unfortunate that the climatic conditions have been so severe, as the total yield for the whole of the cotton belt probably would have been the highest and of the best quality so far recorded for the State.

Callide Cotton Research Station.

The development of this station, which is of the utmost importance to the cotton industry in Queensland, has continued this season with very gratifying results. Another portion of the farm has been cleared, and proved to be of

* In the Annual Report of the Department of Agriculture and Stock, 1926.

exceptional uniform and fertile quality. The crop of cotton grown on this tract, while planted late owing to unfavourable planting conditions, has yielded between 1,000 to 1,200 lb. of seed cotton per acre of very excellent quality. The securing of such a fine plot of some 15 acres is extremely fortunate, as it affords the opportunity of conducting experiments of various natures without encountering the difficulties attending non-uniform soils.

The pure seed propagation work has continued along the approved lines, with satisfactory results. A plot of 6½ acres was sown of bulk selected seed of the Durango variety, grown last season on the Demonstration Farm at Monal Creek, and averaged around 1,200 lb. of good seed cotton to the acre. This plot was carefully inspected plant by plant by Messrs. Henderson, Nagle, and myself, and some 220 lb. of seed cotton selected from 670 plants. This cotton will be ginned and the seed obtained will be used to plant the same plot next season. In addition to this lot of material, special plants were selected for further progeny investigation. The remaining plants of the plot were picked in bulk, and will be ginned separately from the rest of the crop from the farm. The seed obtained from this lot of cotton will be sufficient to plant all of the cotton acreage of the Research Farm next season, and any of the surrounding farmers' crops, so that the purity of the farm's crop may be maintained. At the end of the next season there should be ample seed from these crops to plant the whole of the pure seed areas of the Callide and Upper Burnett Valleys, which in turn would yield sufficient seed to meet the requirements of the entire State in the season 1928-29.

Satisfactory progress has been made in the progeny breeding operations, and one strain has appeared sufficiently uniform and of desirable characteristics to warrant increasing. This strain will be planted on an isolated plot during the coming season, and if further tests demonstrate the superiority of this cotton over the bulk selected lots, the seed supply of it will be increased as rapidly as possible.

Investigations in the various cultural and thinning and spacing problems connected with the growing of cotton were continued along similar lines to those of last season. These investigations will be continued in the coming season as it will require several years' work before we may hope to reach any definite conclusions.

It is particularly gratifying to observe that the growers in the Callide Valley, who have been the most interested in the various phases of the farm's activities, and who have endeavoured to put into operation the practices which have been found to be beneficial, are securing, as a whole, exceptionally good cotton crops. It is anticipated that the experience of these farmers, in conjunction with the results being obtained at the farm, will be of material assistance in raising the yield per acre for the whole of this valley.

Pure Seed Propagation.

In addition to the progeny and bulk selection investigations in the Durango variety which were conducted at the Research Farm this season, similar operations were carried out in the other varieties which are being studied by the Department. Much of this work has been performed by Mr. R. W. Peters, especially in the Burnett and Kingaroy areas, where, with the assistance of Messrs. James Carew and N. E. Goodchild, bulk selected lots of the Durango and Acala varieties were obtained. This material will be grown by selected farmers in the same areas from which the seed was selected, for propagation for further investigations.

The selecting of bulk lots of the Durango variety in the Boyne Valley was continued this season by Mr. Nagle and myself. The material was collected from crops which had been planted with seed grown from selected seed of previous seasons, and the increased uniformity of length of staple and plant types was remarkable. Such excellent results from the method of selecting bulk lots of seed are exceedingly gratifying, and indicate that the continuation of our system of improving the stock of seed will have a marked beneficial effect on the supplies which will be available for general distribution in the future.

The investigations in the Acala variety at the Gatton Agricultural College and High School were continued again this season. Unfortunately, the extremely droughty conditions which have existed for most of the season have seriously affected the results of some of the experiments. The selection work was continued satisfactorily, however, several promising plants being obtained, from which a drought-resisting staple type of cotton may be developed, which will be suitable to the whole of the Southern areas. The opportunity is taken to express my appreciation of the hearty co-operation which Mr. J. K. Murray, the Principal, and his officers have given us in connection with this work.

Experimental Plots.

The investigations of the various problems of cotton culture have not been confined to the Callide Research Farm. Several sets of experiments have been formulated, which the officers of the field staff of the Cotton Section have arranged to be conducted by various growers throughout the cotton areas. These experiments touched on such subjects as the spacing of the rows and the plants in the row, the proper height at which to thin the plants, the effects of fertilisers on the growth of the plant, and the testing of different varieties as to their suitability for the various districts.

Unfortunately, the climatic conditions in some of the districts have been so irregular and unfavourable to the proper conducting of such experiments that inconclusive results have been obtained in many cases. Sufficient results have been obtained, however, to warrant the continuation of these experiments, and the interest shown by many of the growers in the areas in which the experiments have been located indicate that this is an important phase of the activities of the section.

Grading.

The grading staff, under the able direction of Mr. L. Gudge, has had a very successful season in handling the Durango variety of cotton in the first year that it has been available for general distribution. Prior to this crop, this variety has been grown in segregated areas and all seed cotton produced has been forwarded to the Gladstone ginnery, where the graders received periods of training in the handling of this type of cotton. The efficiency of the manner in which Mr. Gudge has trained the members of the staff in the intricacies of determining the length of the fibres of the cottons received at the various ginneries is amply demonstrated by the relatively small number of complaints received from the growers.

Investigations of the complaints received have shown, for the most part, that the growers have not realised the tremendous effect on the length of the fibres or "staple" exerted by such factors as poorly-prepared seed beds, soil types, irregular rainfall conditions, &c. When a better understanding of these points is reached, it is anticipated that a far greater degree of satisfaction on the part of the growers as to the efficiency of the grading will be obtained.

The unusually dry season since the middle of January over nearly all of the cotton belt, while greatly reducing the yields in several areas, has been of great benefit in producing a very bright, white cotton, remarkably free from stains or tinges of colour. Not only may this be attributed to lack of rain, thereby eliminating the possibility of moisture staining, but also to the absence of certain insect pests and the accompanying fungoid diseases. The result has been that a remarkably high percentage of the crop received at the ginneries was of the top grades. This will be of decided value in assisting in the marketing of the crop, as the bulk of it should arrive in Liverpool before the new American crop is received, and when there is generally a scarcity of white cottons.

Unfortunately, the drought has been so severe in some areas as to affect the length of staple, and consequently there has been some criticism of the Durango variety not producing the length of staple that it generally averages. The consignments of seed cotton of the ordinary variety from these same areas have generally shown a corresponding reduction in length of staple with a consequent lowering in the value of the cotton, so that it appears that while the Durango fibre may have been somewhat shorter than is usually the case, the grower has received more money for it than if he had been growing the ordinary cotton, which in many consignments received the lowest staple class.

Insect Pests and Diseases.

This past season has been characterised by a remarkable freedom from the pests which attack the cotton crop, with the exception of the maize grub (*Heliothis obsoleta*), which in some areas did a considerable amount of damage. This freedom from insect pests has been of enormous value to the crop in that, not only was there no loss of squares and bolls, but the bolls which developed opened well and produced cotton of good quality and free of stains from internal boll rots.

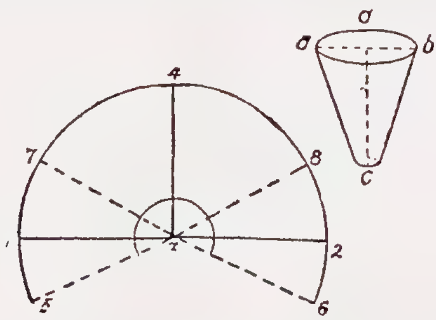
Inspections in the field and at the ginneries have shown that the seed of the crop just harvested has escaped from the attacks of any of the sucking insects to a marked degree as compared to other seasons. This, in conjunction with the consequent freedom of internal boll rot attacks, should make the planting seed for next season's crop some of the best that has been issued.

Mr. Ballard, the Commonwealth Cotton Entomologist, who is engaged in the investigations of the various insects affecting the cotton crop, has obtained some very interesting and valuable information during the past season on several of these insects, particularly the maize grub and the "stainers." In conjunction with these investigations, valuable data have been obtained which show the advantages which accrue from early as compared to late planting of cotton. Not only does the early planting of cotton assist in escaping the effects of the attacks of the maize grub, but the effects of the peach grub (*Conogethes punctiferalis*) are nullified to a great extent. In nearly every case of an attack from the peach grub which has been investigated, it has been found that the crop has been planted late in the season, and this also applies to the maize grub. This was shown this season at the Callide Research Farm, when an early-planted crop yielded around 1,000 lb. of seed cotton to the acre, while a late-planted crop was so badly affected as to not warrant picking.

In view of these results, it is to be hoped that the growers will pay more attention to the early preparation of the seed bed in order that the planting operations can be effected at the earliest moment in the spring after the danger of frosts is past.

SETTING OUT A CONE.

It is often required to set out a cone of a given diameter and depth to be used for such purposes as making a funnel, a cap for a flue pipe, &c. The illustration shows how the sheet metal is to be cut. First of all set out a base line, 1-2, and erect a perpendicular, 3-4. The point 3 is the centre from which the arc required is set out. In the smaller sketch, ab = diameter of the cone, dc = perpendicular height, and cb = slant-height. Suppose it is desired to make a cone 8 inches high and 5 inches in diameter, it will be necessary first to find the slant-height of the cone. Reference to the small figure will show that the slant-height is the hypotenuse of a right-angled triangle, of which the height of the cone is the perpendicular and the radius or half the diameter of the cone is the base. In the cone required 8 inches is the perpendicular, $2\frac{1}{2}$ inches the base, and the slant-height will be found by taking the square root of the sum of the squares on the base and the perpendicular; thus the square root of $2\frac{1}{2}$ x $2\frac{1}{2}$ + 8 x 8 = 8.3, or approximately $8\frac{1}{3}$ inches. Now with the point 3 as centre and $8\frac{1}{3}$ inches as radius, describe the arc 1, 4, 2. It is next necessary



to calculate the perimeter of the cone. Since the diameter is 5 inches and the circumference of a circle is diameter x $3\frac{1}{7}$, the perimeter will be 5 x $3\frac{1}{7}$, = approximately $15\frac{5}{7}$ inches. Now from the point 4 measure along the arc half this distance, $7\frac{6}{7}$ inches, to the points 7 and 8. Cut out the sector 3, 7, 8, which when bent round will give the required cone 8 inches high and 5 inches in diameter. The sector 5, 4, 6 would give a cone 10 inches in diameter and approximately $6\frac{3}{4}$ inches high, the slant-height, of course, being the same as in the previous case, $8\frac{1}{3}$ inches. In making a funnel the frustrum of a cone is required. In the sketch the smaller arc indicates how the metal would need to be cut. According to this figure the bottom diameter would be approximately $2\frac{1}{2}$ inches, and, of course, the slant-height of the frustrum would be reduced by this amount. If required to provide an opening of definite diameter, say 1 inch, this arc would be described with a radius of 1 inch, and if it is still desired to have the slant-height of the cone $8\frac{1}{3}$ inches, the radius of the larger arc should be $9\frac{1}{3}$ inches, while the perimeter must remain the same as in the previous cases, so that the top diameter will be unchanged.—"Australasian."

POWER ON THE FARM.*

The provisions of adequate supplies of fodder is a question that is increasing in importance every year, but the selection of suitable crops and cultivation methods represents only one side of the question, the other being the efficient, economical production of those crops. At the Producers and Consumers' Conference held at Bathurst recently the question of marketing seemed to be the central thought in the minds of the various delegates. It was a marketing conference, and did not endeavour to cure all the ills of the farmer by discussing improved methods of marketing. Marketing is vitally important, I will admit, but there is too great a tendency to-day among men on the land to attribute all their troubles to a defective marketing system. This, I suppose, is only human nature, as it enables us to put the blame on to somebody else's shoulders when rightly perhaps we should be bearing it ourselves. The point I am driving at is that even with the most efficient marketing system possible we cannot expect our agricultural industries to prosper if our prices be too high, or, in other words, if the cost of production be too high. Our constant aim, therefore, should be to reduce the cost of production by efficient business-like methods and by utilising to the utmost the discoveries and inventions of the scientific and engineering world. Given a good article, produced at a low cost, many marketing problems will solve themselves, but with inefficient and costly production all the marketing schemes conceived by man will never bring prosperity.

Let us consider butter as a case in point. The butter committee at the Bathurst conference came to the conclusion that under basic wage conditions the cost of production of butter is 1s. 11d. per lb. The present system of marketing is efficient and economical, but if the price of butter were increased to return 1s. 11d. per lb. to the farmer it would cost the housewife 2s. 6d. per lb., which we cannot expect to receive.

The one thing to do is to endeavour by various ways to reduce the cost of production, and I wish to say a few words to you on one way which I believe holds big possibilities in this direction, and that is what is known as power farming. There is nothing revolutionary about this; rather, considering the world as we find it to-day, it seems to me but a natural development and one, moreover, that is somewhat overdue unless we are prepared to witness the decline of farming to mere unskilled labour.

When one of our remote ancestors put the idea of tilling the soil into practice it is very difficult to say how he set about it. I think, however, that we can safely say that he either did all the work by hand himself or made somebody else do it for him. The man who first thought of making some long suffering and stupid animal do the heavy work for him made a discovery the importance of which he could not possibly have imagined. He introduced the idea of power to the world. It is tolerably certain that this discovery of power first came about in the agricultural world, and yet we find to-day that all the world over the agricultural industries are the most backward in its utilisation.

For centuries while cloth was all being entirely manufactured by hand, farmers were using power to cultivate their fields. To-day the position is to a certain extent reversed. Cloth is manufactured entirely by mechanical means with mechanical power, while agriculture is still being largely carried on either by hand or by mechanical means with animal power. This wonderful change in secondary industries did not take place in a day. It passed through various stages, but necessity forced manufacturers to adopt mechanical power in preference to animal power. That same necessity is going to force farmers to do precisely the same thing, as animal power is costly and inefficient.

I can see many old and experienced farmers questioning this statement and pointing to this one and that who believed as I do and who were a dismal failure on the land. I will probably be told how motor transport is slipping back and how large numbers of city firms are scrapping their motor lorries and going back to horses. Maybe they are, but I venture to assert that for every motor lorry that is being discarded in favour of horses ten new ones are making their appearance on the road. Every time one goes to the city there seem to be more motor lorries and less horses on the streets than ever.

Farm labour is difficult to obtain and often most unsatisfactory when we get it, and under ordinary conditions we cannot carry on without it. If the farmer is placed in control of a machine that is capable of multiplying his outfit many times he should be practically independent of the labour market.

In considering the possibilities of power farming it has to be remembered that the idea is practically a post-war development and therefore still in its infancy, while men have been tilling the land with horses for centuries. It must also be

* From a paper read by Mr. Lindsay Evans, Dapto (N.S.W.), at the Annual Conference, Hunter and North Coast Branches, N.S.W. Agricultural Bureau.—*Bureau Record* (N.S.W.), 18th November, 1926.

remembered that the efficiency of the farm tractor is capable of being increased to a much greater extent than that of the horse, which has a definite limit beyond which it cannot go, whereas there seems to be a boundless field for research in the improvement of mechanical power. I say a boundless field advisedly, because there are so many distinct fields of research being explored and capable of being explored that affect mechanical power in its application to agriculture. The steel industry, for instance, has made wonderful strides during even the past decade, and there is absolutely no reason to believe that it will not continue to do so. The matter of the provision of fuel is still in the melting pot and the manufacture of power alcohol and benzol as by-products of already established industries in Australia seems to me to be full of wonderful possibilities in the direction of obtaining adequate supplies of very cheap fuel. In the field of engineering inventions, too, there are what can be regarded as more than possibilities for increasing the efficiency of mehanical power. To get right down to bedrock the position is simply a comparison between two machines—a horse and a mechanical invention.

We provide a horse with fuel in the form of feed and in addition to doing our work for us he has to provide for the functions of his body while at work or otherwise and also to roam all over the place with an occasional mad gallop in response to his animal spirits. Consider the wasted energy, all of which we have to pay for, indirectly, by the fuel we supply the machine. Mechanical power on the other hand merely needs fuel while at work and does not or should not carry on any mad capers. The only reason why animal power can compare with mechanical power are: (1) Inexperienced operators; (2) imperfect machines; and (3) more expensive fuels. These obstacles can and will be overcome. Men have been working horses for centuries, whereas farmers, generally speaking, are unused to mechanical power. Machinery is being continually improved, and the improvement will go on while the world lasts. Supplies of fuel will be provided by the development of our resources and the utilisation of waste products; so that the logical outcome is that fuel will be much cheaper than horse feed and the tractor will be able to get the last ounce of efficiency out of that fuel, which an animal can never do out of his feed. Then with all the fuel provided going into work the farmer will simply be compelled to adopt mechanical power for the bulk of his work.

Don't run away with the impression that I am an agent for tractors or oil engines trying to do business or that I am merely a theorist who does not know anything of the practical side of farming. I am just a plain "cocky" and never want to be anything else. I have used horses and still use them and also have been using a tractor for the past two years, and while I recognise that there is still a place for both I have not the slightest hesitation in saying that the power of the future, and the near future at that, for the farmer as for the manufacturer is mechanical power. I know that there are many difficulties and limitations with regard to power on the farm. These can and will be overcome. For the past ten years we have used an oil engine for separating, for the past five years we have used one for chaff-cutting, and for the past two years we have done all our ploughing and many other jobs with a tractor. Our separator engine has cost us about £2 for repairs in ten years, our chaff-cutting engine £1 in five years, while the tractor has not cost us one penny as yet. All of these machines are in tip-top condition, so that you can scarcely blame me for being rather enthusiastic over the possibilities of mechanical power.

GARDEN MARKER.

An easily constructed device that is suitable for marking out rows for the planting of seed or seedlings is shown in the accompanying illustration. With its aid the rows in large vegetable gardens can be marked accurately and quickly. It consists of

a long board with pointed wooden pegs extending from the underside, and a handle by which the device can be pulled. Weights are tied on the marker to keep it down so that the pegs will make a deeper impression. As eight rows can be marked at once, the task of marking a large garden is considerably shortened.—"Australasian."

ANNUAL FIELD DAY AT THE SOUTH JOHNSTONE EXPERIMENT STATION.

At the last annual field day of the South Johnstone Sugar Experiment Station the weather and everything else was most favourable. District canegrowers commenced to assemble about 10 a.m. at the station, which is situated picturesquely on the bank of the South Johnstone River, on the opposite side to the mill. Most of the visitors arrived by motor-car.

After being welcomed by the Director of Sugar Experiment Stations, Mr. H. T. Easterby, an explanation was given of the various experiments that were being conducted on the station, together with the yields of cane and sugar per acre from the different treatment of plots, embracing liming, fertilising, and different methods of planting, subsoiling, and green manuring.

PLATE 2.—FARMERS ARRIVING AT THE STATION.

The raising and cultivation of seedling cane varieties were also dealt with. The visitors next proceeded to the field, where detailed information was given by the Director and Mr. P. H. McWalters, the Chemist in Charge, in connection with the experiments and seedlings.

After luncheon, addresses were given by Mr. Edmund Jarvis, Entomologist, on "Insect Pests and their Control," and by the Director on the "Fertilisation of Sugar-cane, and its importance in increasing yields on well cultivated areas."

The afternoon was given to the demonstration of tractors and field implements, and this aroused considerable attention and interest.

The comfort of the visitors was well cared for by Mrs. and Miss McWalters and the staff of the Experiment Station, and at the conclusion of the day a hearty vote of thanks was accorded, on behalf of those attending, by the President of the South Johnstone Shire Council, Councillor Bliss.

PLATE 3.—MR. EASTERBY WELCOMES DISTRICT GROWERS TO THE SOUTH JOHNSTONE STATION.

PLATE 4.—ALONG THE ROWS—INSPECTING SUGAR-CANE EXPERIMENTS, SOUTH JOHNSTONE FIELD DAY.

PLATE 5.—FARMERS AT SOUTH JOHNSTONE FIELD DAY INTERESTED IN TRACTORS.

PLATE 6.—THE DIRECTOR OF SUGAR EXPERIMENT STATIONS (MR. EASTERBY) ADDRESSING FARMERS ON THE WORK OF THE BUREAU.

PLATE 7.—GROUP OF SUGAR-GROWERS AND THEIR FAMILIES AT THE FIELD DAY, SOUTH JOHNSTONE SUGAR EXPERIMENT STATION.

PLATE 8.—AN INTERESTED AUDIENCE OF CANEGROWERS LISTENING TO ADDRESSES ON THE WORK OF THE BUREAU.

PLATE 9.—AROUND THE HEADLANDS—FARMERS LED BY MR. EASTERBY INSPECTING VARIETIES OF SUGAR-CANE, SOUTH JOHNSTONE FIELD DAY.

PLATE 10.—WATCHING THE PLOUGHING DONE BY TRACTORS.
"A 'Busman's Holiday"—Farmers of the South Johnstone casting an expert eye over upturned furrows. Power ploughing at the South Johnstone Station.

PLATE 11.—THE DISTRICT'S NERVE-CENTRE—SOUTH JOHNSTONE SUGAR MILL ACROSS THE RIVER FROM THE EXPERIMENT STATION.

PLATE 12.—CANE FARMERS INTERESTED IN THE TRACTOR AND ITS WORK, SOUTH JOHNSTONE FIELD DAY.

PLATE 13.—THE JOHNSTONE RIVER AT INNISFAIL.
This stream with its two branches waters one of the richest regions in Australia.

Photo.: H. W. Mobsby.]
PLATE 14.—THE END OF A PERFECT DAY—LAST HOURS OF 1926—SUNSET, MORETON BAY, QUEENSLAND.

FACULTY OF AGRICULTURE.

GOVERNMENT ENDOWMENT.

Discussing with representatives of the Press the general question of Agricultural Organisation and Education, Mr. W. Forgan Smith stated recently that, as Minister for Agriculture, he had always recognised that the establishment of a Faculty of Agriculture at the University was highly desirable, not only on the teaching and research side but as a general aid to the agricultural industry. He was therefore anxious to assist the University Senate to have the Faculty of Agriculture established and teaching work begun as early as possible. With that end in view he had submitted a proposal to the Cabinet that the sum of £5,000 be allocated to the Senate for purposes in connection with the Faculty of Agriculture. The Cabinet had approved of his proposal, and he was therefore very hopeful that the Senate would be able to establish the Faculty without further delay and have teaching work begun as from the commencement of the 1927 University academic year. Mr. Smith further explained that the fruition of the Government's scheme for the reorganisation of Gatton Agricultural College also made the establishment of a Faculty of Agriculture now possible. In 1923, he said, the Government began its scheme for the reorganisation of the College. Since that date a gradual building-up of staff and equipment had been in progress in order that at a fitting time the College might, amongst other things, be ready to affiliate with the University as a University College of Agriculture, take a definite part in the system of University agricultural education, and, on the practical side, make possible the establishment of a Faculty of Agriculture in the University. That time, explained the Minister, had now arrived, and he felt sure that not only agriculturists but the community generally would be glad if the Faculty could be definitely established in March of 1927.

THE PRODUCTION OF LUCERNE.*

Lucerne has been well named the "King of Fodders"—I think I may say without fear of contradiction that there is nothing that will produce the amount of fodder per acre per annum and of anything like the same quality as lucerne. Either as a milk producer or for fattening quality lucerne stands on its own, due consideration having been given to the manner in which it is fed, and when one considers that when once a crop has been established you can take from six to eight cuts a year off it and it will stand for several years without replanting, I think it justifies its name.

The first consideration for successful lucerne growing is the suitability of the soil, because while it has been said that lucerne will grow in any soil, it cannot be denied that it favours rich alluvial land, and the deeper the better. On a farm which I worked on the Paterson River, where we had an alluvial flat of about 25 acres, the bank had fallen into the river at one place and there the lucerne roots could be seen penetrating the subsoil to a depth of up to 15 feet—in fact, right down to water level—and in other places the same thing applied. A clay subsoil is not desirable for lucerne; it seems loath to penetrate clay and prefers a light, well-drained subsoil. If a heavy subsoil and one which retains too much water in a wet season is used the crop invariably becomes sickly and yellow and will thin out considerably. This is remarkable, in view of the fact that this crop needs a good rainfall and will sink its roots down to the water level in every case where such a thing is possible.

The importance of using good seed cannot be over-estimated. Fortunately the Government has taken steps to prevent imposition in regard to foreign seed. Good local seed free from seeds of noxious weeds is always desirable, and seed that is not too old, as although lucerne seed will keep for a number of years, new seed will always give stronger and more satisfactory results. New seed can always be recognised by its bright appearance and its plumpness.

The preparation of the soil is a very important matter. Personally I do not favour too deep cultivation for lucerne, as the seed, being very small, is inclined to get too deep if the soil has been cultivated deeply; moreover, the plant seems to thrive best in a solid bed. I have proved this on a plot part of which was ploughed to a depth of, say, 5 inches and the rest only cultivated, after a crop of maize for green feed had been taken off, and for quite two seasons the part that had been cultivated at, say, a depth of 2½ inches showed a better yield. After a flood has covered the soil and left a deposit of several inches of mud it is found that if simply cultivated with a cultivator or skim the results are better than if the land is ploughed.

* From a paper read by Mr. S. T. Parish, Bolwarra (N.S.W.), at the Annual Conference, Hunter and Lower North Coast Branches, Agricultural Bureau, N.S.W.—*Agricultural Bureau Record*, 18th November, 1926.

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The best time to sow varies with the seasons and weather conditions, but autumn planting is largely favoured in our district. March and the end of February seems about the best time, as the plant will establish itself before the severe winter weather sets in and will be well ahead of any weeds that may come up in spring, although good results are often obtained from planting in early spring—say, the end of July to the end of August.

Considerable difference of opinion exists in regard to the quantity of seed per acre to sow; it varies from 10 to 20 lb. Of course one must always be guided by the condition of the soil and the quality of the seed, but I think about 12 to 15 lb. per acre is ample. The soil having been worked to a smooth surface the seed should be distributed evenly and then lightly harrowed and rolled down. In sandy loam it is desirable to sow more seed per acre, as there is always a tendency for a certain amount to remain on the surface and thus be wasted, and as a thin plant is never satisfactory it is wise to err on the side of having too much seed than not enough.

The use of fertilisers in lucerne growing has not been demonstrated to any extent in our district. The Hunter River flats are renowned for lucerne growing, and most farmers laugh at the idea of manuring. Still I am not sure that the plant will not respond to the application of fertilisers, especially in the poorer soils. However, I have had had little experience in this matter.

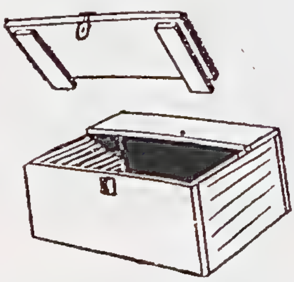
It is a mistake to cut lucerne too young. In summer time, if the weather is favourable, the crop will mature in about five weeks, and this is quite often enough to cut it. It is false economy to cut lucerne when too young, as thereby the plant is "bled," with the result that the next cut will be lighter, and if this practice be persisted in it will have the effect of weakening the plant. Some people turn stock in on the crop and feed it off, but this also has a tendency to thin it out as it will often be eaten down when too young. The correct time to cut it is just when the young shoots are making their appearance at the bottom and before they are sufficiently advanced for harvesting operations to interfere with them to any extent.

The question of drying is one that depends almost entirely on the weather conditions. In extremely hot and dry weather lucerne can be cut and carted to be stacked in the same day, but generally speaking the best method of drying is to rake into rows before it gets too dry and turn it again with the rake and allow it to dry in this way. It may take a little longer, but it is easier and better to handle and load, and also there is less likelihood of loosing the leaf.

During the cooler months and in early spring when the time taken to dry is necessarily longer and when there is more likelihood of showery weather, the question as to whether it pays to stack before too dry and allow the hay to "heat" or to "sweat" may be considered. As far as my experience goes, I do not think that "heating" reduces the feeding value of lucerne hay in any way; in fact, I have known men to prefer brown or sweated hay to dry hay. As regards its keeping, if properly stacked and sweated it will keep for years, but, of course, for market purposes generally hay that has been dried just sufficiently, so that while it retains its green colour it will not sweat, is the most sought after and commands a ready market.

HINGELESS TOOL-BOX.

Although no hinges are used to attach the lid of the tool-box illustrated, it can be locked as securely as if these fittings were employed. The lid is made in two sections, one of which is attached permanently to the box with nails or screws. Two cleats are fastened on the other section, with their ends projecting over one edge,



as shown. When the box is to be closed, the ends are thrust under the fixed section, and the removable section is dropped into position. Almost any type of lock can be used on the box, but a padlock, with hasp and staple, probably is the most suitable. —"Popular Mechanics."

THE PAPAW.

By G. WILLIAMS, Instructor in Fruit Culture.

The Papaw or Papaya (*Carica papaya*), originally reported as being indigenous to Central America and West Indies, is freely distributed throughout coastal Queensland. The small herbaceous tree is practically branchless and surmounted by a crown of large palmate leaves, at the base of which the fruit is produced, this usually maturing after the fall of the foliage from that part of the stem where it is situated. The branchless habit of the tree can be varied by the removal in the early stages of terminal buds, whereby branching is induced and several fruiting heads developed.

The Plant and its Properties.

The succulent flesh is very agreeable to the taste, though preferred by many with the addition of sugar, lemon, or orange juice, the fruit being cut transversely, the seeds removed, and such additions as preferred applied in its capacious cavity. The fruit is credited with containing properties which materially aid digestion, as also are the seeds, which resemble watercress in flavour. The foliage applied as a wrapper is said to have the effect of rendering meat tender—a feature that exists mainly in imagination. From incisions made with a bone or ivory knife in the unripe fruit, the milky juice exudes freely and is collected, dried, and exported from the West Indies and Ceylon to other countries where it is sometimes used as a substitute for pepsin. The demand is said to be limited and irregular.

Under favourable conditions, the first fruit are matured within twelve months from planting, location and rainfall are responsible for variations. The term of productiveness is short, seldom exceeding four years, but this to some extent is compensated by its unbroken continuity.

Cultivation.

Fertile and well-drained soils are essential to successful cultivation. The most vigorous growth is evidenced and the finest fruit produced on volcanic scrub soils. The quality of the fruit varies under different conditions of soil, location, and humidity. Essentially a purely tropical product, the finest fruit are those matured without an excessive moisture. In some of the Northern scrubs Papaws are widely distributed, but under the influences of shade the trees are spindly and the fruit undersized and lacking in flavour. Fruit produced under semi-tropical conditions is admittedly inferior to the purely tropical product.

Varieties.

Various types or varieties have from time to time been introduced into Queensland, but the typical features have by cross-fertilisation been almost eliminated. Two types introduced to the North worthy of mention are the New Guinea or "Long Tom" and the Cowleyii or "New Era" (said to have originated in the Philippines), both being bisexual. The elongated fruit of the former is not quite equal to the latter, but a heavier weight per tree is returned. Earlier introductions were confined to the original unisexual variety, which from a batch of seedlings frequently developed an excess of male and consequently practically unproductive plants, though occasionally the panicles of male flowers are interspersed with those capable of fruit production; the fruit of such are invariably small and inferior. Various suggestions, more or less absurd, have from time to time been published as infallible tests for determining the sex of the young plant, but experience does not favour the acceptance of any of them. Among a batch of seedling plants a wide variation in vigour will be noted, and a reversion of the usual practice of selecting the strongest plants should be applied, for it is found that the most vigorous plants almost invariably turn out to be males.

Planting.

Seeds are planted in boxes or seed-beds under partial shade in early spring, and the young plants are put out when from 8 to 12 inches high, the foliage, except the young undeveloped crowns, being removed, allowing part of the petiole or leaf stalk to remain. Where plants are grown subject to the influences of shade, this should be removed several days prior to transplanting, also water should be withheld, but applied liberally just prior to removing, so that the roots may be mutilated as little as possible. In addition to fertility and good drainage, a soil containing a liberal proportion of humus favours development. No applications of fertilisers to light soils can maintain equal results. Liability or otherwise to frost should be considered in respect to location, for there are few cultivated plants more susceptible to frost injury than the Papaw. In planting the possibility of numerous male plants is present. The effect to a great extent may be minimised by including in place of one plant two in close proximity, and subsequently removing one when the sex is determinable. If both are males they should be discarded, male trees being entirely superfluous. Six feet part has been given as a reasonable distance for planting, but to this at least 2 feet can be added, with 9 or 10 feet between rows to allow for reasonable development and room for the necessary cultural operations.

Fertility being absolutely necessary, applications of fertilisers should be made in accordance with directions contained in the pamphlet "Complete Fertilisers for Farm and Orchard," issued by the Department of Agriculture and Stock, and obtainable on application to the Under Secretary, Brisbane.

Marketing.

For marketing, sufficient care must be exercised so that the fruit is not bruised when handling, and packing is preferable in shallow trays or cases, so that there will not be undue pressure of fruit. Just at what stage of development the fruit should be gathered will vary according to distance from market and transport facilities, but the nearer the fruit approaches maturity at the time of taking from the tree the more pronounced will be its flavour, and when the market is readily accessible colouring should be evidenced at its apex.

In addition to its place as a dessert and entering into the composition of various condiments, the flesh of moderately mature fruit may by cutting into strips be satisfactorily dried by exposure. It is unlikely that the dried fruit will find a market where fresh supplies are available. The green fruit is utilised as a vegetable, treated and served in the same manner as a vegetable marrow.

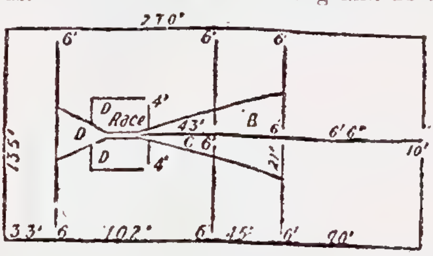
Diseases and Pests Affecting the Plant.

Under fair conditions the Papaw is reasonably free from disease; fungus in Southern districts is sometimes evident on the fruit by discoloured areas of varying extent, causing decay in their vicinity and occasionally affecting the whole fruit. This is preventable by the application of Bordeaux mixture or Bordeaux powder. In some seasons the larva of a moth is persistent in its attacks upon the stem, which it usually enters close to the leaf bases, and may completely destroy the tree; against this it is questionable whether treatment is warranted. Red Spider amongst the young foliage and nematodes on roots are to a great extent attributable to placing plants in unsuitable soils, particularly those of a light sandy nature, though weather conditions adverse to growth are congenial to both pests. Dusting with fine sulphur will have some influence against the former, but remedial measures cannot be profitably applied against the latter.

Being a comparatively shallow rooter, weed growth should be eliminated from plantations and cultivation confined to a shallow depth, varying slightly according to the constituency of the soil, 3 to 4 inches being quite sufficient in that of a close nature.

DRAFTING YARDS.

A request has been made for dimensions of drafting yards for sheep. The dimensions on the plan illustrated have been designed to accommodate from 5,000 to 6,000 sheep, with provision for drafting three ways. AA are two receiving yards, each 90 feet by 67 feet 6 inches; BB are the first two forcing yards; and CC the second two forcing yards. The race is 12 feet long and 18 inches wide, and should



be boarded up and brick or corduroyed. DDD are check pens, two swinging gates each 3 feet long being at the end of the race, with a space of 25 inches between the posts. Ample yards are provided for receiving the drafted sheep. The sizes of gateways are as indicated. Where the dimension is given, it can be taken as being the same as the corresponding one close by, or can be deduced from the figures given on the plan.—"Australasian."

THE LARGE YORKSHIRE.

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

The Large Yorkshire or Large White is one of the largest of the British breeds of pigs. It has a long and abundant coat of white hair on a white or pinkish skin. This pinkish tinge is characteristic, and shows good quality and breeding; now and then a few blue or dark spots show on the skin; these are undesirable and objectionable.

The breed originated in Yorkshire, England, and has been improved by careful breeding and close attention to feed and housing. Prominent amongst those that devoted the greater part of their lives to the improvement of the Yorkshire type of pig when improvement first began were the Tuleys, Wainmans, Matthew Walker, Lieut.-Col. Cooke, R. E. Duckering, the Earl of Radnor, the Earl of Ellersmere, J. and F. Howard, Sanders Spencer, A. C. Twentyman, D. R. Daybell, and Sir Gilbert Greenall. These breeders exhibited largely at shows, and in many ways popularised and encouraged the breeding of a better class of pig.

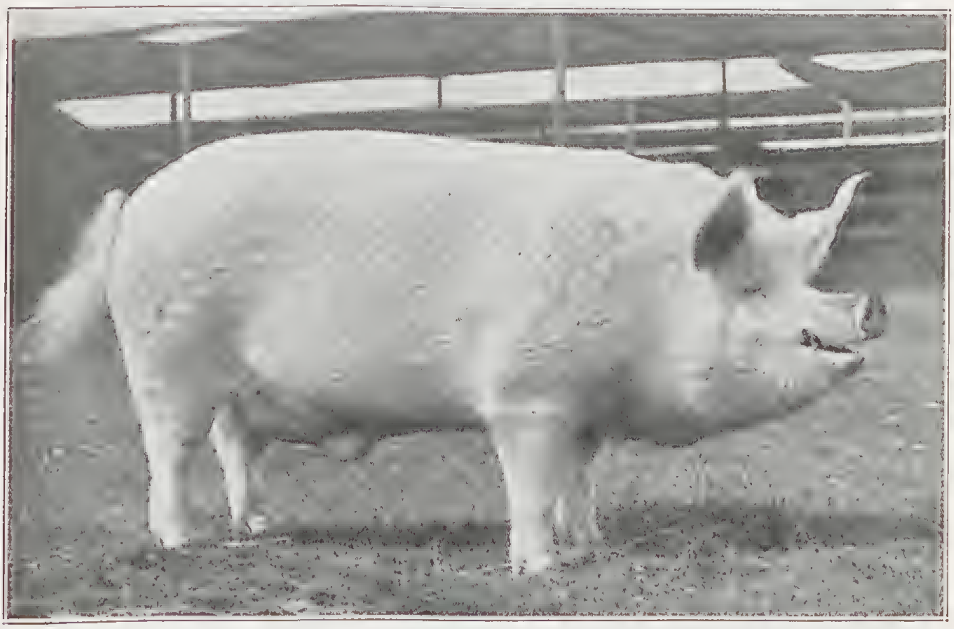


PLATE 15 (Fig. 1).—A TYPICAL LARGE WHITE BOAR OF THE LATEST ENGLISH TYPE.

Note his length, depth, and strength, the comparatively thick coat of fine silky hair, and the strength and boldness of character. Boars of this description are prepotent, active and vigorous withal, masculine in bearing and gait.

The breed is extremely popular in Great Britain and Ireland, and in cold climates generally, where a large heavy bacon pig is required, but in Australia it has not, so far, been widely distributed, and has not gained the popularity for which it is noted abroad. This is not the fault of the breed; it is due largely to prejudice and to the fact that in general the white pig is not as popular as the darker coloured or red pigs, this especially so in the States of New South Wales, Queensland, and South and Western Australia.

Earlier importations also were not altogether of a desirable type; they were long and inclined to be slab-sided; their legs were weak and their progeny were weak constitutioned, and did not acclimatise as well as had been expected. However, recent importations have largely overcome the prejudice to the breed, for they are of a very much better type. Large Yorkshires have never been popular in Queensland except among a few enthusiasts, but in Victoria and in portions of New South Wales they are gaining in popularity, though types that are weak in constitution, have inbent knees, flat sides, and a soft skin which scalds and sunburns badly during the warm weather, are extremely unpopular and unprofitable.

Again the Australian demand has for some years now been for a medium bacon pig that will mature early and be ready for market at from five to five and a-half and six months at around 100 to 125 lb. dressed weight. For this purpose the medium breeds, the Berkshire and the Middle Yorkshire, have been most in demand all along; more recently still, crosses with the Poland China and Duroc Jersey have been tried, while in general the Tamworth Berkshire cross has been largely recommended. Nowadays the Gloucester Old Spot has entered the field and the Large Black; so that, as these latter breeds all resemble the Large White in type and conformation, it is evident that the future of the pig industry here will see considerable competition among what we have become accustomed to calling the "Large" breeds as separate and distinct from the medium types.

For the purposes of our bacon markets, the Large Yorkshire crosses will no doubt prove popular if they can compete for early maturity on even terms with the other breeds and crosses referred to, though overseas experience demonstrates that as a bacon pig the Large Yorkshire and its crosses are much better at around 150 to 160 lb. dressed weight than at 100 to 125 lb. With the possibility of export markets

PLATE 16 (Fig. 2).—A TYPICAL LARGE WHITE SOW, A WINNER AT ENGLISH SHOWS.

Note the fine-quality skin and hair, the well built-up roomy body, the development of teats and udder, and the feminine matronly character of this sow. Large white sows are invariably prolific and are possessed of strong maternal instincts.

opening up, there is the possibility that the Large White will boom ahead in popular favour, though its popularity will have to be gained in very severe competition with the older established and more widely distributed (with us in Australia) breeds—*i.e.*, the Berkshire, the Middle Yorkshire, &c.

The Middle Yorkshire has so far filled the bill very satisfactorily with those who favour a white pig; and as they carry similar valuable characteristics to the Large White and are more suited to our local markets, they will probably be the Large White's most persistent rival. In any case, it will only be the comparatively heavy-coated, firm-skinned, hardy types that will find favour here in the warmer climates of the North.

As will be noted by reference to the extracts from overseas publications, Large Yorkshire crosses have on many occasions been successful in carcass competitions; it is our observation that the crossbred pig gives excellent results; he carries good proportion of high quality flesh intermixed with firm grained white fat; the percentage of offal is light and the bone fine.

Selection of Boar or Sow.

In the selection of boar or sow, special attention must be given to those possessing sturdy constitutions—a quality that is denoted by a wide, deep, capacious chest, width between the ears and the eyes, the forelegs strong, straight, and wide apart, with no sign of inbent, weak knees. The legs must be set well on the outside of the body, back long and straight, with well sprung ribs, roomy barrel, and deep sides, hams thick and compact, with tail set well upon the rump. Both boar and sow should show twelve to fourteen well-developed teats with a deep level underline; flanks must be deep and loose. The coat of hair must be thick and silky. The head must be well developed, the face slightly dished, the snout of medium length and somewhat pointed, the muzzle broad, the eyes bright and kindly, and the jowl light and running well into the neck. The ears must be of medium size and but slightly inclined forward, and fringed with fine silky hairs. The boar's breeding organs must be well developed—no sign of rupture or of abnormal swellings being allowed to pass without critical examination. Never use a boar showing any weakness in this respect, as any weakness would probably be of an hereditary nature; look for quality both in flesh, skin, and hair, and rigorously cull any stock not coming up to the mark.

There is a tendency in some of the Yorkshire strains to produce a percentage of young stock varying somewhat from the true type. Thus in some strains of Large Whites it has been noted that one or two boars or sows may "throw back" to a heavier, thicker set type resembling the Middle or Small Yorkshire. These animals should not be used for stud breeding purposes, otherwise the result will be unsatisfactory and annoying.

PLATE 17 (Fig. 3).—A PRIZE-WINNING LARGE WHITE SOW IN ENGLAND, "WORSLEY BOURNE QUEEN," 744.

1st and Champion at Royal Norfolk Agricultural Show and 1st and Champion Suffolk and Essex, and 1st other Shows in England. Note her great length and the splendid development of ham and hindquarter generally.

It is only strains that "are prepotent, prolific, vigorous, and contented" that will find a place in our herds.

Large Yorkshires have been bred for more than one hundred years in England. In America they have been styled "the hog that made Chicago." Their great length enables them to carry large litters, and the sows frequently have from ten to fifteen pigs at a litter, with ability to raise them all. The writer has handled one sow that farrowed twenty-one pigs in one litter, of which fourteen were reared, the remainder being weaklings. This sow had a remarkably quiet and easy-going, contented disposition. After close observation under many tests, one of the American experiment stations says of the Yorkshire type: "The pigs of this breed were noted for prolificacy and quick growth. They headed the list in feeding trials, gaining 123¾ lb. in 112 days, and required the smallest quantity of grain feed. The test proved their carcass to be of great length, sides of even depth throughout, and full of flesh; great length between shoulder and ham, fat even on the back, bone moderate, head small, forearm rather long, belly moderately thick, and shoulders moderate in size."

LARGE WHITES ARE PROLIFIC.

Prominent among the characteristics sought after in the selection of breeding-stock are docility, prepotency, and prolificacy. In regard to the former, the Yorkshire breed of pig has often been referred to as the quietest and most contented race of pigs in existence. On this score breeders have no need to fear, for the Yorkshire sow upholds the reputation of the breed in this direction as well as in being prolific; as a breeder and milker the Large White sow yields to none. The breeding record of a noted English herd is eloquent of this recommendation. Records kept covering the birth of 586 pigs showed that 416 were weaned. One sow produced eighty-six pigs in seven litters, of which sixty-seven were weaned, or an average of 12.3 per litter farrowed and 9.6 weaned. Another sow had forty-four pigs in four litters, and weaned thirty-seven of them. Still another had thirty-five pigs in three litters, an average of 11.7, and weaned twenty-nine of them.

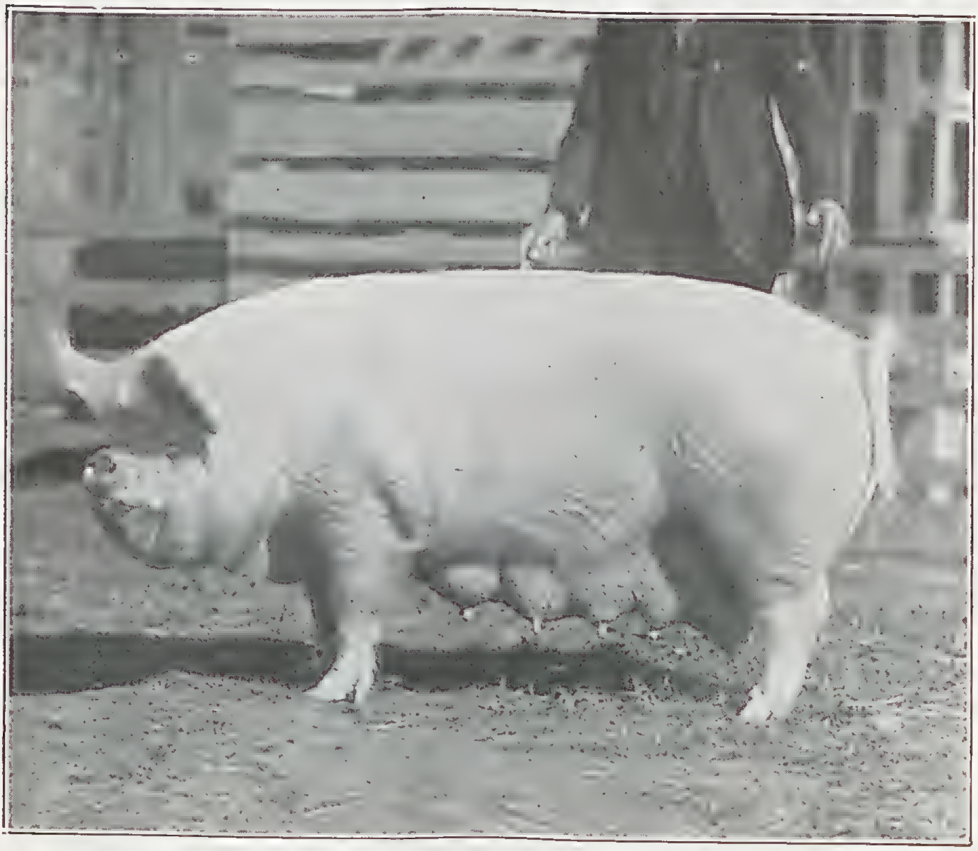


PLATE 18 (Fig. 4).—THE RESERVE CHAMPION MIDDLE YORKSHIRE SOW AT THE ROYAL AGRICULTURAL SHOW, MELBOURNE, VICTORIA, SEPTEMBER, 1926. MR. J. H. THORBURN'S "OATLANDS ENID," 2740.

This photograph of a prize-winning brood sow of the Middle White type is inserted to illustrate the difference in type and conformation between the Large and the Middle Yorkshire breeds. Specially note the head and turned-up snout, the thick more compact body, and the medium instead of large body development.

It frequently happens that sows produce up to eighteen pigs in one litter, while as many as twenty-three have been recorded. Although it is not suggested that such large litters are required the Large White sow is a splendid mother, being able to rear strong, healthy pigs, and rear them well. Large Whites—in fact, all Yorkshire pigs—are noted for prepotency and for the powers they have of stamping their type and colour on the progeny no matter what the breed of the sow to whom the boars are mated.

White produces white in quite a remarkable way in the pig world. That pigs of this breed are hardy and vigorous and suited to a variety of climatic conditions is evidenced by the fact that they are bred to-day in such widely-separated and distant places, as Canada, the United States of America, Russia, Sweden, Denmark, and Switzerland, where winters are of the severest known, and to Africa, South America, China, Japan, India, and to Australia, where summer conditions are much more trying and where the temperatures are higher. The National Pig Breeders' Association of England say it is safe to say that there is no continent in the world to which English breeders have not sent consignments of Large Whites at some time or other. The surest indication, they state, of the popularity of the breed in other countries than England, Scotland, and Ireland, is the regularity with which foreign customers return for further consignments.

The popularity of the breed in England is the result of many years' progressive work in mating, selection, culling, and preparedness on the part of English breeders to adjust their methods to the ever-changing requirements of the consumer. There has always been a sound, level trade for Large White pigs, though this is not to be taken as indicating that this trade has as yet extended to more than one or two spots in Australia. Truer words than that England is the stud farm of the world were never spoken. It is not an idle boast but an actual fact that British breeds of live stock are unsurpassed for type, excellence of quality, prepotency, and hardiness.

Standard of Excellence.

The standard of excellence of the Large White pigs, as recently revised by the Council of the National Pig Breeders' Association, is as follows:—

Head—Moderately long, face slightly dished, snout broad, not too much turned up, jowl light, wide between the ears.

Ears—Long, thin, slightly inclined forward, and fringed with hair.

Neck—Moderately long, fine, and proportionately full to shoulders.

Chest—Wide and deep.

Shoulders—Level, obliquely laid, medium width, free from coarseness.

Back—Long, level, and wide from neck to rump.

Loin—Broad.

Quarters—Long and wide.

Hams—Broad, full, and deep to hocks.

Tail—Set high, stout and long, but not coarse, with tassel of fine hair.

Ribs—Well sprung.

Sides—Deep.

Flank—Thick and well let down.

Belly—Full, but not flabby, with straight underline.

Legs—Straight and well set, level with outside of the body, with flat bone.

Pasterns—Short and springy.

Feet—Strong and even.

Action—Firm and free.

Skin—Fine, white, free from wrinkles, black hairs or spots, and as free as possible from blue spots.

Coat—Long and silky.

THE LARGE YORKSHIRE POPULAR IN OTHER STATES AND IN THE DOMINION OF NEW ZEALAND.

Writing recently a prominent Victorian authority mentions that within the last three or four years the Large Yorkshire pig has made pronounced headway in Victoria. This is evidenced by the increase in the number of breeders of pedigree Large Yorks from four to twelve, and of exhibitors at the Melbourne Royal Show from two to five or more during that period. Victorian breeders have exhibited some very fine specimens of the breed at Melbourne Show, stock the direct progeny of imported parents coming from the leading studs abroad; the imported stock have also competed on several occasions and have been very successful.

It is stated that there has been a considerable amount of perplexity as regards type in Victoria, both by judges at shows and also by purchasers of young stock descended from some of the best and most typical imported parents. The principal contention is the head, which those not familiar with the Large Yorkshire think should closely resemble that of the Middle Yorkshire. As a matter of fact, it should not, the head of the Middle Yorkshire being shorter and heavier, the ears more upright or pricked, the nose more turned up, and the jowl heavier, as will be noted by a comparison of the standards of excellence.

Prominent exhibitors of Large Yorkshires in Victoria include The Dookie Agricultural College; R. Guthridge, Bianca, Silvan; E. Zelman, Hepburn Springs; Trevor Harvey, Jerseyholme, Boisdale; T. M. Noble and Son, Maffra; and Messrs. T. C. Read, T. L. Webb, and Messrs. Hester Brothers.

The principal breeder of Large Yorkshires in New South Wales is The Hospital, at Gladesville.

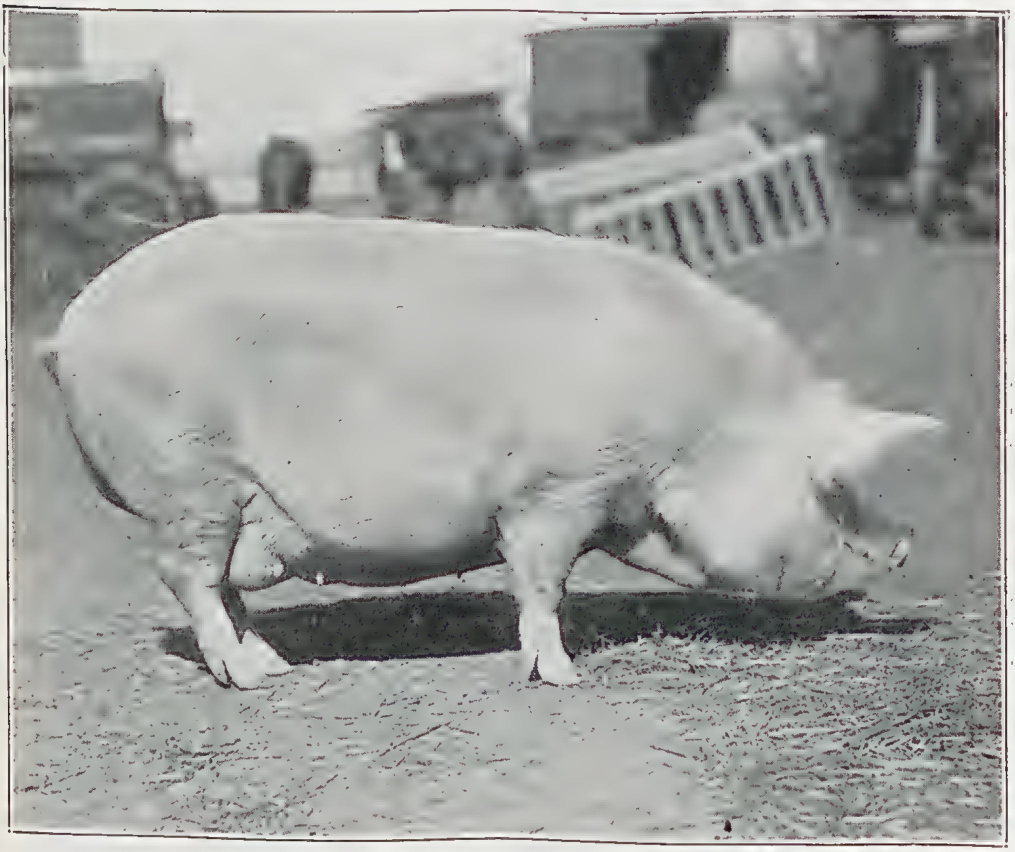


PLATE 19 (Fig. 5).—TREVOR HARVEY'S CHAMPION LARGE YORKSHIRE SOW, "GLADVILLE BARONESS," 3392, MELBOURNE SHOW, 1926.

This sow is the progeny of parents who were the direct representatives of imported stock, and she shows the same characteristic type and development as the photographs of the English types as illustrated in Figs. 1, 2, and 3.

There are no breeders of the Large Yorkshire in Queensland, and no stock have been registered (up to volume 15 of the Herd Book) by breeders in any of the other States.

It might be stated that, in several Australian Royal Show schedules, under the heading of "Breeds," the term Yorkshire refers to the Middle Yorkshire breed, and that where other types of Yorkshires are catered for they are referred to as Large Yorkshires only; there being no Small Yorkshires in Australia at all. We do not use the term "White" at all in referring to either the Large or Middle Yorkshires, though they are referred to officially in England as the Large White and the Middle White; in fact, special reference is made to this in the latest English publications, it being mentioned that the "Large White Yorkshire" pig is now known in England as the "Large White" pig; the "Middle White Yorkshire" pig is now known in England as the "Middle White" pig.

FACTS CONCERNING THE LARGE WHITE PIG FOR BACON PRODUCTION.

In an interesting and attractive brochure published recently by The National Pig Breeders' Association, 92 Gower street, London, W.C. 1, special mention is made of quite a number of important facts about the Large Yorkshire breed; a breed now attracting considerable attention in Australia and New Zealand.

It is suggested, for instance, as being good policy to breed from Large White gilts (young sows prior to having produced their first litter) and sows in order to obtain big litters. It is stated also by the author, Mr. Alec. Hobson, that there is no more popular or better known breed of pig in the world than the Large White. It is universally recognised as the bacon pig par excellence, while its ability to satisfy the varied requirements of the general farmer in this (England) and other countries, justifies the reference it has earned as the "Shorthorn of the pig world." Being extraordinarily prepotent, the Large White pig is used very extensively for the improvement of stock.

What English Curers Say.

Without exception, says Mr. Hobson, bacon-curers throughout the world recommend pig producers to use a Large White boar as the surest means of obtaining the required length of side, with an even proportion of lean to fat, which the discriminating consumer demands.

Discussing the bacon market generally, it has been stated that although pig breeding has always been regarded as an important branch of agriculture, it is only within comparatively recent years that serious attention has been accorded to the question of establishing the pig industry as a whole on a sound footing; this applies equally in Australia also, and particularly in the Northern State.

In regard to the footing which Danish bacon has on the English markets, it is asked what was the first and most important problem with which the Danes were faced when once the broad questions of policy in regard to the English markets had been determined? It was, of course, to find the right class of pig which, when crossed with their native breed, would give them a standard type of animal easily convertible into the lean, sizeable bacon demanded by the English housewife. The fact that the Danish "grading-up" stock has for so many years been drawn entirely from England is as significant as the preference which has always been given to the Large White breed for this purpose.

As regards early maturity, prolificacy, hardiness, and ability to put on flesh at an early age, the Large White, it is claimed on behalf of English breeders, is unsurpassed.

BACON PIG CONTESTS.

Extensive reference is made in the pamphlet "Facts Concerning the Large White Pig for Bacon Production" to numerous bacon pig carcass contests during 1926, in which the Large White has been signally successful. These include successes at the Royal Counties Show, in which Large Whites won the Silver Cup for pen containing the three most typical bacon pigs in the show (in this case the winning trio were Large White-Large Black crosses) the reserve for the Silver Cup, the first, second, and third prizes for the best pen of three bacon pigs of any pure white breed; the first, third and reserve prizes for the best pen of three bacon pigs being the first cross from any pure-breed, the first three prizes in the carcass competition, on which the judge submitted a very favourable report.

In Messrs. Venner & Son's Ideal Bacon Pig Competition for the three best bacon pigs, Large Whites were again successful in winning Silver Cup and first prize, second, third, fourth, fifth (divided), sixth, and the balance up to the tenth prizes awarded. In these contests also the judge's report was very favourable. The carcasses were judged on the following basis: Firmness of fat and quality of meat, 30 points; length of back, 20; leanness of back, 20; thickness of streak, 10; lightness of fore-end, 5; plumpness of gammon (portion of ham here called the cushion), 5; fineness of bone, 5; fineness of rind; up to 10 points deducted for seedy cut, *i.e.*, dark stain in the region of the udders more noticeable in carcasses of black breeds than of white pigs.

In numerous other contests, also, the Large White has acquitted itself favourably including the carcass contests at the Melbourne Show, Victoria, September, 1926.

Additional Remarks by English Bacon Curers.

In a leaflet recently issued by Messers. Marsh and Baxter Ltd., the largest firm of bacon curers in England and perhaps (it is stated) in the world, it is mentioned that "of the numerous pure breeds of pigs kept in this country (England) the Large White most nearly approaches the ideal bacon pig''; and on the subject of crosses which they recommend, it is important to note that the Large White figures first in each case, *i.e.*—(1) Large White on Middle White; (2) Large White on Welsh breed; (3) Large White on Large Black.

In every case it is stated by Messrs. Marsh and Baxter for the English market the Large White boar should be used. Young sows of the Large White-Middle White and Large White-Large Black crosses if mated with a Large White boar will also yield pigs of an excellent type and such pigs are eminently suitable for feeding for the bacon trade.

In a pamphlet on ''Bacon Pigs'' Messrs. C. & T. Harris (Calne) Ltd., one of the largest of the English bacon curing firms, emphasise the value of the Large White Pig. They recommend the use of the Large White boar for crossing in every case.

From an Australian point of view, of course, it must be remembered that our local demands vary a good deal from those of the English markets. The Large White and its crosses are not well known here as yet. Nevertheless, we require a long, fleshy, early-maturing carcass with well-developed hindquarters and middle piece and a light forequarter, so that doubtless as time goes on, the Large White will find a more extensive sale here and become more popular.

In a letter recently received from the secretary of the National Pig Breeders' Association in England and in referring to the extraordinary successes of the Large White pig in numerous open bacon pig competitions, it is mentioned that the results afford striking evidence of the superiority of this breed in the production of high-class bacon. There are upwards of 800 herds of pedigree Large White pigs in England and the quality of the stock available for export has never been higher than it is to-day.

OTHER REFERENCES TO THE BREED.

In an attractively illustrated informative brochure, ''British Pigs for Profit,'' published by the National Pig Breeders' Association of England, extensive reference is made to the Large White—also sometimes called the Large White Yorkshire—and to the fact that it is not easy to find any complete reference to the early history of this breed, though it is evident the breed can claim direct descent from the native pigs in the county of Yorkshire and surrounding areas. Many are the records, however, of the extraordinary weights to which specimens of the old type of Large White reached. Twelve cwt. 2 qr. 10 lb. has been referred to as being an exceptional achievement, but it is known that at some of the shows held in the north of England during the early years of last century even this phenomenal performance was eclipsed.

Writing in the ''Pig Breeders' Annual,'' Mr. H. G. Robinson says: ''The development of the modern breed is a triumph in the art of selection. One of the pioneers of the Large White was Joseph Tuley, a weaver of Keighley, who probably produced the first specimen that was shown at the Windsor Royal Show in 1851. His exhibits met with great success, and this in turn created a big demand for the 'new sort,' which speedily began to bring what in those days were abnormal prices.''

The Large White as we have him now being extraordinarily prepotent is used very extensively for the improvement of stock, whether the requirements are for pork or bacon. It is referred to in England as being a particularly suitable pig for the small holder who only feeds a few animals at a time, while on the other hand many of the largest pig farms in England, where contracts have been made to supply bacon-curers or pork butchers with regular supplies of stock for slaughter each week, find that the Large White is the most suitable type on account of its readiness to put on flesh, its docility, and the ease with which it can be managed.

Early Maturity.

In early maturity the Large White has made extraordinary progress, and the breed is capable of growing to a tremendous weight. Breeders of the Large Yorkshire claim that it is doubtful whether any breed except perhaps the Middle White can put on more weight for a given quantity of food consumed than this breed. In England the breed is kept principally for supplying the requirements of the bacon market, where a pig is judged according to proportion of lean meat to fat meat which it yields. In the United States of America, where maize is one of the chief foodstuffs for pigs, the packers (bacon-curers and pork butchers) have signified their appreciation of Yorkshires by paying a bonus to the farmer who will breed them.

Bacon—What the English Manufacturers Say.

With its length of side, clean shoulders, fine flat bone, and superior quality, the Large White pig stands pre-eminent as the bacon pig of the world. It is an undisputed fact that the best bacon can be and is produced in England, so that it is not surprising to find the bacon-curers in almost complete unanimity as to the suitability of the Large White or its crosses for their requirements.

In the manufacturing districts of England, Scotland, and Wales there is a big demand for heavy pigs from which large joints of pork can be cut, for this class of meat is one of the staple foods of the manual labourer who needs the sustenance from the fat which such joints yield. It is worthy of note, therefore, that the breed which is principally used to supply this market is the Large White, although it is eminently suited also for the bacon trade where lean meat is needed. It is one of the few breeds which can be fed on to heavier weights at a comparatively early age without undue expense to the feeder.

General Utility.

Further extracts from "British Pigs for Profit" state that the majority of pigs kept by small holders, and even by miners and others working in factories and mills, will be found to be either of the Large White or the Middle White type, if only on account of the economical feeding propensities of these breeds and their production of joints which satisfy the shrewd housewife with many mouths to feed.

PLATE 20.—MEMBERS OF THE JARVISFIELD SCHOOL PIG CLUB IN THE AYR DISTRICT IN NORTH QUEENSLAND.

Considerable enthusiasm has been created in the Burdekin District as a result of the success of the boy and girl members of the Jarvisfield Pig Club. It has been the means of creating a widespread interest in Pig Raising as an adjunct to the production of Sugar and other crops in Central and Northern Queensland. A movement is now on foot to organise the farmers in the districts concerned to see if it would be possible to raise sufficient pigs to warrant the erection of a bacon factory at Ayr or some other convenient centre.

PLATE 21.—GATHERING AT THE OFFICIAL OPENING AND PRIZE GIVING OF THE MAPLETON DISTRICT SCHOOL PIG CLUB FETE, MAPLETON, DEC., 1926.

The prizes were presented by Mr. J. D. Story, I.S.O., Public Service Commissioner, who is seated to the right of the Chairman (standing at table), Councillor J. T. Lowe, Chairman of Maroochy Shire Council, Nambour, Q. The Instructor in Pig Raising, Mr. E. J. Shelton, is seated next to Councillor Lowe, and immediately in front of the table are grouped the Boy and Girl members of the Mapleton Pig Club.

PLATE 22.—A PRIZE-WINNING BACONER AND HIS OWNER, MASTER KENNETH SENESCALL, AT THE MAPLETON PIG CLUB FETE, MAPLETON, DEC., 1926.

Boys and Girls throughout Queensland are becoming keenly interested in the development of Pig Clubs, of which quite a number have already been formed. Many more clubs will be formed during 1927. Those interested may obtain all information on application to the Organiser and Instructor in Agriculture (Mr. F. E. Watt), Department of Public Instruction, Brisbane, or to the Instructor in Pig Raising (Mr. E. J. Shelton), Department of Agriculture and Stock, Brisbane.

General Notes.

The New Council of Agriculture.

The newly-constituted Council of Agriculture is comprised of thirteen members, of which the list is as follows:—F. H. Hyde (representing the Northern Pig Board), J. Purcell (Butter Board), H. H. Collins (Atherton Tableland Maize Board), G. E. McDonald (Cotton Board), F. H. V. Goodchild (Broom Millet Board), A. McGregor Henderson (Arrowroot Board), J. Archibald (Wheat Board), W. Muir (Peanut Board), H. Keefer (Cheese Board), T. Muir (Canary Seed Board), R. A. Chapman (Egg Board), Geo. Johnson (Queensland Cane Growers' Council), and A. G. Gordon (Committee of Direction of Fruit Marketing).

A Hint to Clean Milkers.

In a short article in a recent "Farm Feeding" (England) was a suggestion that one of the best ways out of the wet-milking difficulty was to get milkers to smear vaseline on the hands before they began to milk. This being a mild antiseptic probably helps to keep the bacterial counts down. It also will have the effect of preventing mammitis, or inflammation of the udder—or garget as it is called in some places—which is caused by the entrance of certain bacteria into the udder via the teat. It is well known that cows which are kept under clean conditions suffer from mammitis much less often than cows kept in a dirty, unhealthy shed. The bacteria which cause the disease, like most other bacteria, thrive in dust and dirt generally, but they can only enter the teat in the milk, and if the teat is always dry-milked the chances of there being a drop of milk left on the end of the teat are greatly minimised. Furthermore, if the teat has become well impregnated with vaseline, as indeed it will, there will be almost no chance for the bacteria to be able to live on the teat at all, for they will be destroyed by the antiseptic.

Milk and Cream Testing—Examination Results.

Following is the result of examination in the theory of milk and cream testing, held at various centres on the 6th November, 1926:—King, Norman J., Taylor street, Buranda; Vogel, Wm. Ambrose, State School, Teviotville; Norris, Herbert Lionel, H.T., State School, Tully; McAllister, Robert John, Agricultural High School and College, T.P.O. South; Grey, Richard Wm., State School, Marmor; Spragg, Wm. George, Station road, Booval; Allen Leonard C., State School, Tarzali, via Cairns; Ferguson, John, Agricultural High School and College, T.P.O. South; Harvey, Fredk. Lawrence, State School, Bracewell; Sigley, Gordon Robert, Agricultural High School and College, T.P.O. South; Spencer, John Cutbush, Agricultural High School and College, T.P.O. South; Price, Reginald Allan, Agricultural High School and College, T.P.O. South; Vidler, Edwin Lyle, Department of Agriculture and Stock, Brisbane; Pommer, Oscar Norman, Agricultural High School and College, T.P.O. South; Young, Wm. Geo., jun., Abbotsford street, Toogoolawah; Horneman, Waldron, Agricultural High School and College, T.P.O. South; Pinwill, Margaret Alexandra, Woodmillar, Gayndah; Taylor, Royston Alfred, care of Land and Income Tax Office, Brisbane; Brecknell, Francis Thos., care of H. Mooney, Martha and Charlotte streets, Paddington; Grace, Daniel Sydney, Agricultural High School and College, T.P.O. South; Warren, Fredk. Jas., Coal Falls, Ipswich; Rauchle, Chas. August Gustav, Leyburn, via Clifton; Green, Reginald Wm. John, Geham; Heath, R. C., Kingaroy; Ferguson, D., Butter Factory, Grantham; O'Keefe, Cornelius Daniel, Reef street, Gympie; Graham, Thomas Gerald, Agricultural High School and College, T.P.O. South; Harris, Chas. W., Box 49, P.O., Beaudesert; Munro, A. C., Box 10, P.O., Toogoolawah; Bird, Alfred Chas., Biggenden; Harper, Wm. Joseph, Moola, via Kaimkillenbun; Wenham, Reggie Henry, care of Maclagan Valley Co-operative Dairy Co., Maclagan; Skepper, Leslie Bertram, care of Biggenden Butter Factory, Biggenden; Lynch, Paul Patrick Gerald, Yerra, Gayndah Line; Kyte, Robert H., State School, Mount Appalan, Degilbo; Rauchle, Thos. Charles, Leyburn, via Clifton; Carew, P. V., Boonah; Connolly, John Patrick, Flowerburn, Highfields, via Toowoomba; Hill, L. O., Bororen, N.C. Line; Powe, Alwyn John, Port Curtis Co-operative Dairy Association, Gladstone; Grant, Wm. Macrae, State School, Millaa Millaa; Olsen, Stan., Downs Co-operative Dairy Association, Dalby; Wockner, Jas. Henry, Kulpi, via Oakey; Gilchrist, Cyril Thos., care of J. Hennessy, Ramsay, via Cambooya; Bucheister, Roy N., Wyreema; O'Dempsey, John Thos., State School, Douglas, via Goombungee; Miller, Cecil, Mill Hill, via Warwick; Andersen, Frederick Jessen, care of Butter Factory, Maryborough.

Hatching by Electricity.

Poultry-keepers who have in view reduction of the cost of production are coming to realise more fully each year the value of appliances designed to save labour and simplify the work of the farm. As the heating element in incubators, electricity is more in keeping with modern times than kerosene lamps, for it entirely eliminates the necessity for the constant care and attention which the latter require, the only work left to be done being the usual cooling and turning of the eggs.

It has been claimed that chickens hatched by electricity have more stamina than others, but this statement cannot be substantiated, experience at the College not showing any noticeable difference in development as compared with those hatched in other machines.

The great drawback in the use of current is that it may be cut off at any time as the result of circumstances over which the operator has no control. To guard against this it is advisable to install a lamp-heated system for use in emergency. Hot-air incubators may be easily converted into the dual-purpose type (the lamp system being retained) by anyone possessing an ordinary amount of skill with tools, and without any great knowledge of electricity.—Poultry Instructor, Hawkesbury Agricultural College.

Staff Changes and Appointments.

Constables W. A. Suchting and F. Lewis have been appointed Inspectors of Slaughter-houses.

Mr. H. V. King, of Toowoomba, has been appointed Government Representative on the Darling Downs Dingo Board, and Mr. L. A. Mackenzie, of Telson, Dingo, has been appointed Government Representative on the Leichhardt East Dingo Board.

The following transfers of District Inspectors of Stock and Inspectors of Stock have been approved, to take effect as from the 17th January, 1927:—

District Inspectors of Stock—

- S. W. Buhot, from Clermont to Toowoomba;
- H. C. Hawthorn, from Barcaldine to Warwick;
- L. D. Carey, from Cloncurry to Emerald;
- E. J. Tannock, from Emerald to Charleville;
- E. C. Lake, from Charleville to Bowen; and
- W. C. Woodhouse, from Bowen to Cloncurry.

Inspectors of Stock—

- C. E. Ellis, from Crow's Nest to Clermont;
- F. R. Dunn, from Pittsworth to Barcaldine; and
- H. J. D. McBean, from Hampton to Pittsworth.

Organisation and Marketing Act—Regulations.

Additional regulations have been issued under "*The Primary Producers' Organisation and Marketing Act of* 1926." These are necessary in consequence of the Act named having come into operation on the 1st of the present month, and are more or less copies, with necessary amendments, of the superseded regulations under the old Primary Producers' Organisation Act of 1922.

The regulations provide that at its first meeting the Council shall elect its president, who may be any citizen of Queensland.

The president shall have all the rights and privileges which pertain to membership of the Council. The annual meeting of the Council shall be held after the close of the financial year and during either the months of July or August, and the first annual meeting of the Council shall be held in 1927.

Provision is made for an executive committee and for special committees to deal with such matters as may be referred to them by the Council. No special committee or any member or officer of the Council shall incur any expenditure without the authority of the Council. Agreements and official documents connected with the business of the Council shall be signed by the president or vice-president and be countersigned by the secretary. The fees, allowances, and travelling expenses payable to members of the Council shall be fixed by the Council, but the maximum fees, allowances, and travelling expenses shall be £2 2s. per sitting day, £1 11s. 6d. per travelling day, and first class railway fares.

Every primary producer who desires to be enrolled as a member of a local producers' association shall apply to the secretary of such local producers' association or to the secretary of the Council.

The Council may require returns from commodity boards, and the form of precept by the Council on commodity boards is set forth.

The regulations provide fully for the method of calling and conducting meetings.

Life of a Stand of Lucerne.

The time during which lucerne, once properly established, will continue to yield payable crops will be found to vary with the nature of the soil and subsoil, and the use to which the plants are put. On the best soils, such as the deep, well-drained alluvial soils of the Hunter Valley, the period for which it will pay to crop lucerne before breaking up the ground is much longer than on granitic uplands with an unfavourable subsoil or rock close to the surface. Grazing any kind of stock on lucerne is much more injurious to the life of the plants, owing to the consequent trampling, than removing the cuttings for hay. While, therefore, it may be said that the average profitable life of a lucerne paddock is seven years, this estimate will be found to be the mean between rather wide extremes.

Lucerne gradually dies out, the termination of the life apparently being due to the plants losing their vitality, as all plants do; but the termination of its profit-yielding period is governed by other factors as well. The continuous growth of the one class of crop exhausts the fertility of the soil, although lucerne, unlike clover, does not appear to cause land to become "sick" in the ordinary sense of the term. After the land has been utilised for other crops for a time it can again be successfully laid down to lucerne.

How to Get the Best Out of Your Job.

Respect it.

Take pleasure in it.

Don't feel above it.

Put your heart in it.

See the poetry in it.

Work with a purpose.

Do it with your might.

Go to the bottom of it.

Do one thing at a time.

Be larger than your task.

Prepare for it thoroughly.

Do it cheerfully, even if it is not congenial.

Do it in the spirit of an artist, not an artisan.

Make it a stepping-stone to something higher.

Endeavour to do it better than it has ever been done before.

Do not try to do it with a part of yourself, the weaker part; be all there.

Keep yourself in condition to do it as well as it can be done.

Believe in its worth and dignity, no matter how humble it may be.

Accept the disagreeable part of it as cheerfully as the agreeable.

Choose the vocation for which Nature has fitted you.

See how much you can put into it instead of how much you can take out of it.

Remember that it is only through your work that you can grow to your full height.

Train the eye, the ear, the hands, the mind—all the faculties—in the faithful doing of it.

Remember that work well done is the highest testimonial of character you can receive.

Use it as a tool to develop the strong points of your character and eliminate the weak ones.

Remember that every vocation has some advantages and disadvantages not found in any other.

Regard it as a sacred task given you to make you a better citizen, and to help the world along.

Remember that every neglected or poorly done piece of work stamps itself ineffaceably on your character.

Write it indelibly in your heart that it is better to be a successful cobbler than a botched physician or a briefless barrister.

Refuse to be discouraged if the standard you have reached does not satisfy you; that is a proof that you are an artist and not an artisan.

Educate yourself in other directions than the line of your work, so that you will be a broader, more liberal, more intelligent worker.

Regard it not merely as a means of making a living, but first of all as a means of making a life—a larger, nobler specimen of manhood.—O.S.M. in "The Dawn."

Tuberculosis in Pigs—Control Measures.

There is no practical method of treatment of tuberculosis in animals, but by attention to the following precautions the disease may be kept under control:—

As cattle are the main source of infection, the tuberculin test should be applied to the herd and all reactors removed.

Do not allow pigs to roam about pastures and yards used by cattle unless it is definitely known that there is no tuberculosis in the herd.

All skim milk and other dairy products should be heated to 180 degrees Fahr. and kept at that temperature for fifteen minutes before being fed to pigs.

All refuse, slaughter-house offal, and similar food should be boiled before it is given to pigs.

Where tuberculosis is found to be present in the herd, all suspected animals should be slaughtered, and where this is done under qualified supervision the carcases which have only a slight infection of the head glands will be passed for human consumption, the affected parts only being condemned. The pens should be thoroughly disinfected and limewashed, disinfectant being added to the lime. All litter and rubbish in the yards should be burned and the ground loosened and treated with quicklime.

Fresh air and sunlight are great enemies of the tubercle bacillus. Hence pens and sties should be open and airy, and have no damp dark corners to which the air and sun cannot penetrate.

Some Rules for Feeding Horses.

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 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 laxative food, 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. A good example of the results of this is seen in so-called "wild melon poisoning." The horse's stomach is not adapted for the digestion of coarse food, and any coarse food that it eats is digested in the large intestines. Farm-horses, as a rule, eat far too much rough bulky fodder, and many suffer in consequence. A working farm-horse does not require more than 12 lb. of hay a day, and the rest of the ration should be made up of grain, such as oats, or half oats and maize.

Milk Secretion—Interesting American Experiments.

Interesting studies in relation to the process of manufacture of milk by the dairy cow are referred to in a news bulletin of the Federal Department of Markets and Migration, Melbourne.

The udders of two cows killed at the United States Government's dairy experiment farm were removed immediately after slaughter and mounted in a position for post mortem milking in a test to determine whether milk is manufactured during the few minutes required for the milking process, as is generally taught, or whether it is secreted continuously and collected in the udder previous to milking.

It is quite generally held that the capacity of a cow's udder is not more than a half pint to each quarter, and, therefore, half the milk must necessarily be manufactured during the milking operation. In these tests it was found, however, that a cow's udder is capable of holding from 11 to 20 quarts of milk. One of the cows had normally been giving about 12 lb. at a milking. When her udder was milked after being completely severed from all body connections a total of 10.27 lb. of milk was obtained, or more than 85 per cent. of her normal production, indicating that this amount had been collected and stored as milk previous to her slaughter. The post-mortem milking of the second cow yielded practically 50 per cent. of her normal production. A considerable quantity of milk still remained, due to the difficulty with which it was released.

In the opinion of officers of the Bureau of Dairy Industry, these tests indicate that milk secretion is to a considerable extent a continuous process, and that a large proportion of the milk secured at any milking is collected and stored within the mammary gland before milking is commenced; also that the liberation of the milk from the gland is not dependent either upon a nervous or mechanical stimulation or upon internal muscular contraction.

Extensive studies of the mammary gland are being made by the Bureau in connection with the relation of a dairy cow's conformation and anatomy to her milk and butter-fat-producing capacity.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

Italy to Study Export Markets.

It is reported that the Italian Government has declared its intention of setting up a bureau to aid Italian export trade. This bureau will be known as the National Institute for Export. It is believed that its main object will be the scientific study of foreign markets. It is also reported that during the last few months the tariff on raw materials not produced in Italy has been greatly reduced.

The Demand for Honey.

While honey was known and used in biblical days, long before sugar was thought of, it is only in recent years that its use in the home has become widespread. Its food value as against many of the ordinary sweets and its utility in recipes have been factors influencing its use.

Thus in the last ten years the production of honey has doubled in America, and an enormous export business in this product has developed. In both home and foreign markets the demand is tending toward liquid honey rather than comb. The reasons for this are many, chief among them being convenience in serving, neatness of appearance, production of standardised blends, and, from the manufacturer's standpoint, a better opportunity for branding.

According to a New York firm of manufacturers of machinery for the treatment and blending of honey, more and more honey is being sold every year in America in glass jars with a standard label. This practice, it is stated, raises the question of the standardised product. The following description is given of how honey is standardised by one of the large American blenders.

After the honey has been extracted it comes to the plant in 5-gallon cans, a net weight of 60 lb. These cans are set in a room that is heated by steam pipes, and are inverted on a trough. As fast as the honey liquefies it runs out of these troughs into a wide, flat, glass-lined tank, which has a hot-water jacket. Here the honey is allowed to thoroughly purify itself, through skimming. When the temperature of the batch has risen sufficiently it is pumped into glass-lined filling tanks. Then the product is heated to a fairly high temperature, usually 155 to 160 degrees, which is suitable for filling the glass jars. The tanks are equipped with Monel metal strainers to remove any final impurities.

Contrary to common belief, liquid honey is not honey strained from mashed-up honeycombs. It is produced by subjecting the combs to a process in which the fluid is thrown out by centrifugal force. The machine used for extracting it has a mechanically-vibrated, steam-heated knife for uncapping the combs of honey. A boiler furnishes steam to this knife. Then there is the honey extractor which whirls the uncapped combs, and empties them as described, leaving the combs intact to be filled again by the bees. There is also a receptacle for draining this honey from the cappings, and a pump which transfers the honey from the bottom of the extractor to the glass-lined blending and filling tanks.

The time required for complete liquefying and blending depends considerably upon the condition of the granulation and the temperature at which the honey is originally put into the liquefier.

Practice varies as to the temperature to be used in filling, and some operators run the product up to higher temperatures than 160 degrees, in which case the use of a special agitator to prevent scorching is very important. Improper processing in plain metallic equipment is apt to ruin the delicate flavours.

The glass-lined feature of the equipment is very important in cleaning. Merely heating up the tank slightly melts any honey deposits, and a hot water or steam hose rinses out the tank very thoroughly.

It is considered by the firm referred to that with standardised, blended brands on the market it only remains for intensive advertising to put honey on the table of practically every American family. They point out that many food authorities recommend the daily use of honey, and that they have backed up their statements by elaborate research and investigation. The following statement regarding the food value of honey is credited to one of the most eminent of these medical authorities:—

"In an examination into the digestibility of honey, it was found that bread with honey was digested and left the stomach as quickly as bread alone, although the addition of the honey had practically doubled the food value of the product from the energy standpoint. The use of honey with bread, and in similar ways, would, therefore, appear to be generally preferable in the case of children to the eating of sweets. Honey serves to make a highly nutritious bread more palatable, leading to a greater consumption of body-building foods, instead of depressing the appetite, as is likely to be the case with sweets which are eaten between meals. At the same time, honey furnishes to the body very considerable amounts of energy in the most available form. The high place given to it in the diet is well deserved."

DUSTING WITH CALCIUM CYANIDE FOR BANANA THRIPS CONTROL.

By JOHN L. FROGGATT, B.Sc.

As a result of earlier observations made on the life history and control of the banana thrips (*Anaphothrips signipennis* Bagnall) dusting with sulphur and pyrethrum powder was recommended for its control. Further study of the control aspect of the problems, however, led to preliminary trials with other materials, included amongst which was calcium cyanide; these tests indicated that with this latter chemical quicker and more certain results could be obtained than was the case with either of the two previously recommended.

The preliminary trials with calcium cyanide were made in the Gympie area in April, 1926, and in the Innisfail area in May of the same year. The results were so promising that field trials were laid down in the latter district towards the end of October, 1926.

HABITS OF THE THRIPS.

Before dealing with the details of the field trials, it may be advisable to give a brief résumé of the habits of this insect, as they bear directly on the scheme of control work laid down.

The eggs are deposited in the plant tissue, and the larvæ on emerging form colonies with some of the adults; these colonies are found both on the pseudostem under the leaf-sheaths, and on the fruit in the bunches, especially in the base of the hands. The larvæ when full fed travel down into the soil where they pass through the pupal (or chrysalis) stage; the adults, after emerging, crawl back on to the plant to carry on the next generation.

LETHAL ACTION OF CALCIUM CYANIDE.

On exposure to air, calcium cyanide gives off hydrocyanic or prussic acid gas which acts extremely rapidly and is very deadly to the thrips. The preliminary trials showed that a light cloud of the dust on an exposed colony of thrips will destroy every individual comprised in it within five to ten seconds, and if the dust be blown lightly upwards under the opening bracts on a young bunch, four to five seconds will suffice to kill every thrip present under the bract, or in a young hand of fruit.

FIELD TRIALS TO DETERMINE THE PRACTICABILITY OF DUSTING ON A PLANTATION SCALE.

Two trial plots were laid down in different parts of the Innisfail district; the arrangement being the same in each case. In the first plot the stools were over two years old and were carrying a considerable amount of fruit; in the second plot, the stools had, for the most part, not thrown their first bunches.

Each plot was divided into three sections of fifty stools arranged in five rows of ten stools, with two rows of ten stools between the sections to act as check rows.

In plot 1 the area had not been chipped for some time, although spraying the weeds with arsenic solution had been done. In plot 2 the area had been recently chipped, and was again chipped on 26th October. The differences in cultivation accounted, in part at least, for certain differences in results obtained in the two plots.

Climatic conditions over the period of the trials were hot and dry until 16th November, when muggy, showery conditions prevailed until the 23rd November.

The dusts used in the preliminary trials were calcium cyanide "A" and "B" dusts, the latter containing sulphur, but as the "B" dust showed no advantage over the "A" dust in these early small scale trials, it was not included in the field trials in October. The stems and bunches were dusted with calcium cyanide, but, in order to determine the action, if any, of soil treatment on the soil-frequenting stage, the trials were extended to include soil fumigation; calcium cyanide flakes and para-dichlorobenzene were tested for that purpose.

When the trials were instituted in October thrips were fairly numerous and showed a marked increase in numbers in the first fortnight of November.

On plot 1 treatments were given on the 21st and 29th October and on the 8th November, and the final examination was made on the 17th November. On plot 2 treatments were given on the 26th October and on 2nd and 12th November, and the final examination was made on 19th November.

DETAILS OF TREATMENT.

In all sections of the two plots, the stems and bunches were dusted with the "A" dust, one pound doing about two hundred and fifty stools; in addition to the dusting of stems and bunches, soil treatments were applied in two sections, as follows:—

In section 1 of each plot, half an ounce of calcium cyanide flakes was buried in the soil at a depth of 3 to 4 in., and about 6 in. out from the base of the plant. In section 2 no soil treatment was used. In section 3, half an ounce of paradichlorobenzene was buried in the soil at a depth of 3 to 4 in. and about 6 in. out from the base of the plant.

The soil treatment was carried out by digging two or more holes to the required depth round the plant, and distributing the dose between them; the holes were then filled in, and the soil pressed down with the foot.

Dusting was carried out with a hand bulb-blower, the rubber bulb being about $4\frac{1}{2}$ in. in maximum diameter, and the neck being fitted with a rubber stopper through which projected a length of copper tubing about 6 in. long and $\frac{3}{16}$ in. in diameter. In operation the neck of the bulb is held in one hand to obtain direction of the blast, while the bulb is rotated and pressed with the other hand; in this way a steady stream of dust can be maintained, and directed as desired. When dusting the stem each lower leaf-sheath was drawn slightly away so as to permit of the dust being blown well down towards the base, and then let return to its original position.

Only a dust-cloud should be blown onto the plants and fruit; if proper care is not exercised and a coating of powder is left on the fruit, scalding will result due to the quicklime produced by the chemical decomposition of the calcium cyanide as expressed in the following formula:—

Calcium cyanide + water yields quicklime + "prussic" acid

$$Ca(CN)_2 + H_2O = CaO + 2HCN.$$

The results obtained in both plots were very similar but were rather more striking in plot 2 than in plot 1. The final examination of both plots showed that in section 1 only an odd small colony was noted and the number of thrips present was very low. In section 2 only an odd small colony was observed, although the number of thrips present was somewhat higher than was met with in sections 1 and 3. In sections 3 only an odd small colony was present and the number of thrips, although slightly higher than in section 1, was comparatively low. In no case in any of the treated sections were thrips generally numerous. In the untreated check rows, colonies, often large, were found on practically every stool and bunch, and the number of thrips present was high.

It was evident that thorough and systematic dusting of the stems and bunches, even without soil treatment, greatly reduced the thrips population. The details of the results of the examinations of the field plots will be found in the two tables accompanying these notes.

COST OF TREATMENT.

Calcium cyanide "A" dust and calcium cyanide flakes are sold at the present time in Brisbane in tins at the rate of 8s. for 5 lb. As 1 lb. of dust should do at least 252 stools, the cost is approximately 9½d. per 100 stools per treatment. The calcium cyanide flakes, at the rate of half an ounce per stool, cost 5s. per 100 stools per treatment, and paradichlorobenzene at the rate of half an ounce per stool works out at 4s. 8d. per 100 stools per treatment.

For dusting stems and bunches one operator should do 50 stools per hour or slightly over an acre per day in plantations where the stools have been planted 12 ft. by 12 ft. apart. With a combined dusting and soil treatment a little less than one acre per day per man should be completed under the above conditions.

CAUTION TO BE OBSERVED IN DUSTING.

It must always be borne in mind that calcium cyanide is poisonous, and must, therefore, not be handled carelessly. Care should be taken, when dusting, to so arrange the work that the operator is moving up into the wind as much as possible, so that the dust is being blown away from him. The hydrocyanic acid gas is liberated at a comparatively slow rate, and thus allows a margin of safety. The principal danger lies in the inhalation of the dust in breathing, but this may be readily avoided by the exercise of a little forethought.

FIELD APPLICATION OF THE TREATMENT.

As a result of these trials and from other observations made, it would appear that treatments should be made at intervals of not more than three weeks apart for the effective control of the banana thrips.

Treatment should be commenced as soon as the flower-bracts lift off the hands on the young bunch, or even a little before the bunch is thrown.

The most effective control is obtained by dusting the bunches and "stems" under the leaf-sheaths with calcium cyanide "A" dust combined with burying half an ounce of calcium cyanide flakes in the soil at a depth of 3 to 4 in., and at a distance of about 6 in. from the base of the plant, the dosage of flake cyanide being divided into two or three parts.

Even without soil treatment, dusting of the "stems" and bunches will give a very marked measure of control.

ACKNOWLEDGMENTS.

In conclusion acknowledgement must be made of the great assistance received from those growers who so readily co-operated in every way possible in carrying out the field trials.

KEY TO TABLES.

In the tables showing the results of the field trials with calcium cyanide dust for banana thrips control, the following symbols have been used:—

S. For stem.

B. For bunch.

1. For odd adults but no colonies.

2. For thrips numerous.

3. For small colonies.

4. For large colonies.

x. For stool missing.

s. For thrips scarce.

vs. For thrips very scarce.

S. 3.1. Signifies small colonies composed of a few individuals.

S. 3.2. Signifies small colonies composed of a number of individuals.

The above symbols apply to both plots.

In plot 1, if there is more than one numeral after B, each refers to a separate bunch.

PLOT No. 1.

	Check.		Section III.					Check.		Section II.					Check.		Section I.				
Row.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A	x.	x.	x.	S. 1.	S. 1.	S. 1.	S. 1.	S. 3. B. 3.	S. 3. B. 1.3.	S. 1. B. 1.1.	S. 1. B. 1.	S. 1. B. 1.3.	S. 1. B. 1.	S. 1. B. 1.1.	S. 3.2.4.	S. 1.2. B. 3.3.	S. 1. B.1.1.1.	S. 1. B. 3.	S. 1. B. 3.1.	x.	S. 1. B. 1.
B	S. 3. B. 3.	S. 3. B. 3.	S. 1. B. 1.	S. 1.	S. 1. B. 1.1.	S. 3.2.	S. 1.	S. 1.	S. 1.3. B. 3.3.	S. 1. B. 1.	S. 1. B. 1.1.	S. 1. B. 1.	S. 1.	S. 1. B. 1.1.	S. 1.	S. 3. B. 3.3.	S. 1. B. 1.1.	S. 1.	S. 1. B. nil	S. 1. B. 1.1.	S. 1.3. B. 1.
C	S. 3.1. B. 3.	S. 3.2.	S. 1.2.	S. 3.1.	S. 1.	S. 1. B. 1.1.	S. 1. B. 1.1.	S. 3.2. B. 3.3.	S. 3. B. 1.	S. 1. B. 1. nil	S. 1. B. 1.1.	S. 1. B. nil	S. 1. B. 1.3.	S. 1. B. 1.3.	S. 3.	S. 1. B. 1.	x.	S. 1.	S. 1.	S. 1.	S. 1.
D	S. 3.2. B. 1.	S. 3.2.	S. 1.	S. 1.	S. 1.	S. 1.	S. 1. B. 1.1.	S. 3. B. 3.2.	S. 3. B. 1.1.	S. 1. B. 1.1.	S. 1.	S. 1. B. 1.	S. 1.	S. 1. B. 1.	S. 1.	S. 3.	S. 1. B. 1.	S. 3. B. 1.	S. 1.	S. 1.	S. 1.
E	S. 3. B. 3.	S. 3. B. 3.	S. 1. B. 1.	S. 1. B. 1.1.	S. 3. B. 1.	S. 1.	S. 1. B. 1.	S. 3. B. 3.	S. 3.2. B. 3.	S. 1.	S. 1. B. 1.1.	S. 1. B. 1.1.	S. 2. B. 3	S. 1. B. 1.	S. 3. B.3.3.	S. 3.	S. 1.	S. 1. B. 1.3.	S. 3.	S. 1. B. 1.	S. 1.
F	S. 3.2.	S. 3.	S. 1. B. 1.	S. 1. B. 1.	S. 1.	S. 1. B. 1.	S. 1. B. 3.1.	S. 3.	S. 3.2. B. 3.	S. 1.	S. 1. B. 1.	S. 1.	S. 1.	S. 1. B. 1.	S. 3. B. 3.	S. 2.3. B. 3.3.	S. 1. B. 1.	S. 1.	S. 1. B. 3.	S. 1.	S. 1.
G	S. 3.	S. 1.	S. 1. B. nil	S. 1. B. 1.	S. 1. B. 1.1.	S. 1. B. 1.1.	S. 1.	S. 3.	S. 3.2. B. 3.3.	S. 1.	S. 1.	S. 1. B. 1.1.	S. 1. B. 1.	S. 1. B. 1.1.	S. 1.	S. 1.	S. 1. B. 1.	S. 1.	S. 1. B. 1.	S. 1.	S. 1.
H	S. 3.	S. 3.2. B. 1.3.	S. 1. B. 1.1.	S. 1.	S. 1. B. 1.1.	S. 1. B. 1.	S. 1. B. 3.	S. 3. B. 3.	S. 1.	S. 1. B. 1.1.	S. 1.	S. 1. B. 1.	S. 1. B. nil	S. 1.	S. 3. B. 3.	S. 3.2. B. 3.	S. 1.	S. 1. B. 1.	S. 1.	S. 1. B. 3. nil	S. 1.
I	S. 3.	S. 1. B.1.3.3	S. 1. B. 1.	S. 1. B. 1.	S. 1. B. 1.	S. 1.	S. 1. B. 1.	S. 1. B. 1.	S. 1.	S. 1.	S. 1.	S. 1.	S. 1. B. 1.	S. 1.	S. 4.	S. 1. B. 3.	S. 1. B. 1.1.	S. 1.	S. 1. B. 1.	S. 1. B. 1.	S. 1. B. 1.
J	S. 3.	S. 1.	S. 1. B. 1.	S. 1.	S. 1. B. 1.1.	S. 1. B. 1.1.	S. 1.	S. 3.2.	S. 3. B. 3.3.	S. 1. B. 1.	S. 1.	S. 1.	S. 1. B. 1.	S. 1. B. 1.	x.	S. 1. B. 1.	S. 1. B. 1.	S. 2.	S. 1. B. 1.	S. 1. B. 1.	S. 1.

PLOT No. 2.

Row.	Check.		Section III.					Check.		Section II.					Check.		Section I.				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A	S. 3.1.	S.3.2.	S. 1.	x.	S. 1.s.	S. 1.s.	S. 1.	S. 3.2.	x.	S. 1.	S. 1.	S. 1.	S. 1.s.	S. 2.	S. 3.2. B. 3.	S. 3. B. 3.	x.	S. 1.	x.	S. 1.vs.	x.
B	S. 3.	S. 3.	S. 1.	S. 1. B. 3.1.	S. 1.	S. 1.	S. 1.vs.	S. 4.	S. 4.	S. 1.	S. 1.	S. 2.	S. 1.	S. 1.	S. 3.2.	S. 2.	S. 1. B. 1.s.	S. 1.s.	S. 1.s.	S. 1.s.	S. 3.1.
C	S. 4.	S. 4.	S. 1.	S. 1.	S. 1.s.	S. 1.	S. 3.1.	S. 3.1. B. 3.2	S. 3.2.	S. 1.	S. 1.	S. 1.	S. 1.	S. 2. B. 3.1.	S. 3.2.	S. 3.	S. 1.s. B. 1.s.	S. 1.	S. nil	S. 3.1.	S. 1.
D	S. 3.2.	S. 4.	S. 1.	S. 1.	S. 1.s.	S. 3.1.	S. 1.	S. 4.	S. 3.2.	S. 1.s.	S. 1.	S. 1. B. 3.	S. 1.	S. 1.	x.	S. 3.	S. 1.	S. 1.s.	S. 1.s. B. 1.s.	S. 1.vs.	S. 1.vs.
E	S. 3.2.	S. 3.	S. 1.	S. 1.	S. 1.	S. 1.vs.	S. 1.	S. 3.	S. 3.	S. 1.s.	S. 1.s.	S. 1.s.	S. 1.vs.	S. nil	S. 3.	S. 3.	S. nil	S. 1.vs.	S. 1.s.	S. 1.vs.	S. 1.vs
F	S. 3.	S. 1.	x.	S. 1.	S. 3.1.	S. 1.s.	S. 1.	S. 3.	S. 3.	S. 1.s.	S. nil	S. 1.s.	S. 1.s. B. nil	S. 1.	S. 2.	S. 3.	S. nil	S. 1.vs.	S. 1.s.	S. 1.	S. 1.vs.
G	S. 3.2.	S. 1.	S. 1.	S. 3.1.	x.	S. 1.	S. 1.s.	S. 3.	S. 3.2.	S. 1.s.	S. nil	S. 1.	S. 1.	S. 2.	x.	S. 3.2.	S. 1.	S. 1.s.	S. 1.s. B. nil	S. 1.s.	S. 1.
H	S. 3.2.	S. 3.	S. nil	S. 1. B. 3.1.	S. 1.	S. 1.	S. 1.s.	S. 3.	S. 4.	S. 1.	S. 1.s.	S. 1.	S. 3.2.	S.1.	S. 2. B. 3.2.	S. 3. B. 3.	S. 1.vs.	S. 1.vs.	S. 3.1.	S. 1.vs.	S. 1.
I	S. 4.	S. 3.2.	S. 3.1.	S. 1.	S. 1.	S. 1.	S. 3.2.	S. 3.	S. 3.2.	S. 1.	S. 1.	S. 1.	S. 1.	S. 1. B. 1.	S. 3.2.	S. 3.	S. 1.	S. 1.s.	S. 1.	S. 1.	S. 1.
J	S. 3.2.	S. 3.1.	S. 3.1. B.1.vs.	S. 1.	S. 1.	S. 1.	S. 1.	S. 3.	S. 3.	S. 1.s.	S. 1.	S. 1.	S. 1.s.	S. 2.	S. 3.2.	S. 3.	S. 1.s.	S. 1.vs.	S. 1.	S. 1.	S. 1.

Answers to Correspondents.

Spraying—Eradication of Pests.

J.L.G. (Sunshine, Vic.)—

The Director of Fruit Culture, Mr. A. H. Benson, advises that the only information immediately available is that contained in the departmental pamphlet on the Destruction of Fruit and Vegetable Pests. Many types of spraying outfits are at present on the Queensland market and are used for the spraying of the several varieties of fruits, vines, and vegetables. Regarding the value of spray pumps for the suppression of noxious weeds, such as box thorn, sweet briar, and prickly-pear, as far as our experience goes arsenical sprays will kill the growth above ground, but will not destroy the roots of box thorn and sweet briar. In the case of prickly-pear, however, if it is bruised before it is sprayed the whole plant will be destroyed.

BOTANY.

Ivory Wood.

G.D.G. (Baralaba)—

The specimen represents the Ivory Wood (*Siphonodon australe*), a native of the drier scrubs of Central and Southern Queensland, etxending into New South Wales. The wood is white and close-grained, hence the vernacular name.

Portuguese Elm.

W.R., Murgon—

A packet of seeds of the so-called Portugese Elm (*Celtis sinensis*) has been forwarded. These may be sown in boxes or flats (kerosene tins cut lengthwise) or into specially prepared beds, and planted out when deemed big enough. The tree is deciduous and loses its leaves in the winter. We have no seeds on hand at the present time of the Phytolacca Tree (*Phytolacca dioica*), but if you wrote to Mr. Dick, Purga, via Ipswich, he would no doubt send you some. He charges something like two shillings for a large packet. It germinates fairly freely, but the seed is hard and some people find it germinates quicker if soaked in hot (not boiling) water for some hours before sowing.

Love Grass.

J.H.McK., Sunnybank—

The main bulk of the material seemed to consist of *Eragrostis leptostachya*, one of the so-called "Love Grasses." When mature it is not liked a great deal by stock, but given favourable weather it keeps sending up shoots from the old roots and these are keenly fed on by stock and are said to be very nutritious. In association with Couch it has the reputation of being a good dairy grass. With this were a few other pieces of a Panicum sp.; most of the native Panic grasses make useful forage in the mixed pasture.

Wood Sorrel.

W.D.D., Innisfail—

The specimen sent is the common Wood-sorrel (*Oxalis corniculata*), a plant with a very wide distribution over the world. It has, practically speaking, no value as a fodder, and a closely related species—e.g., the common Wood-sorrel of England (*Oxalis acetosella*)—is considered dangerous on account of the high content of oxalates, which may cause serious illness and diarrhoea, and in the case of sheep even be fatal. It is also recorded that the milk of cows feeding on Wood-sorrel is with difficulty converted into butter. Wood-sorrel is very common in Queensland, but we have never heard any complaints against it.

Acacia Arabica

INQUIRER, Rockhampton—

Your specimen is *Acacia Arabica*, a tree with a wide distribution through Tropical Africa and Arabia to India and Afghanistan. In India the gum is gathered and forms one of the sources of East Indian gum arabic, but it is not, as one would suppose from its specific name, the principal source of supply, which is mostly obtained from an allied species—*Acacia Senegal*. The wood is very durable and is used in India for a variety of purposes. The beans are fed to sheep and the bark is used in tanning and dyeing. Unlike many Acacia trees, it is a very long-lived species. The tree does remarkably well in many parts of Queensland, and in one or two places, such as at Bowen and Lake's Creek (near Rockhampton), has run out quite extensively. There is a large tree at Barcaldine. All writers stress the remarkable drought-resistant qualities of the tree.

In the "Queensland Agricultural Journal" for April, 1926, Mr. Pollock (the Instructor in Agriculture) has an article on this tree, in which he states that all classes of stock greedily eat the pods, and he recommends it as a sheep fodder. It is spread by cattle eating the pods and voiding the seeds.

Eucalyptus Acmenioides.

"QUERIST" (Brisbane)—

The specimen forwarded is *Eucalyptus acmenioides* var. *carnea*. The quality of the timber is similar to that of the common type of *E. acmenioides*. The trees vary a good deal according to the soil in which they are growing; they mostly occur, however, on poor soils, and their growth is rather poor.

Rhododendron Lochae.

R.S.G., Geelong, Victoria—

So far as we know, *Rhododendron lochæ* only grows in two places, viz., some of the higher parts of the Bellenden Ker Ranges and on the top of Mt. Spurgeon. These places are rarely visited, except occasionally by naturalists, and even then, unless the plant is in flower, it can be easily overlooked. Both places, however, are comparatively easy of access.

Plants Identified.

A.J.H., Canungra—

The specimens are—

Chenopodium murale, Goosefoot or Fat Hen. This latter name in Queensland is supplied to several rampant agricultural weeds. The plant is not known to possess any harmful properties.

Hydrilla verticillata, a common water weed for which we know no common name.

Potamogeton crispus, "Curled Pond-weed."

Myriophyllum variæfolium, "The Water Milfoil."

None of these three water weeds is known to possess any poisonous or harmful qualities.

Gossypium Sturtii.

S.C.A. (Trinidad, B.W.I.)—

Gossypium Sturtii is quite a rare plant in Queensland, only now and again collected in the extreme south-western portions of the State. It is much more abundant in South Australia, and Prof. T. G. B. Osborn, Professor of Botany and Government Botanist, The University, Adelaide, South Australia, might be able to obtain seeds for you.

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 counteract to some exent 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 cyaniding, 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 evry 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 ocupy 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.

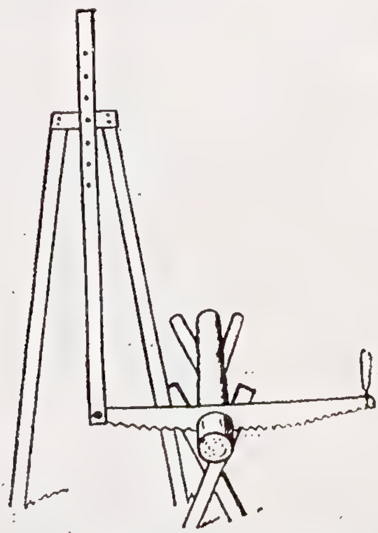
Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual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

ONE-MAN SAW.

A very handy sawing device for sawing up the trunks of small trees into short blocks for fuel, to be operated by a single man, is rigged from the ordinary two-man crosscut saw, as shown in the accompanying illustration taken from "Country Gentleman." Two scantlings, each 8 feet long, are driven into the ground about 3 feet apart with their upper ends leaning almost together. Two 3-inch strips are nailed across the sides of the tops of these posts, through the centre of which is bored a ½-inch hole. A bolt of the same size is passed through this hole and through a hole in a 2 inch x 2 inch scantling standing vertically—this scantling being on the outside of the cross strips—providing a free-swinging support for the end of the saw blade. This is shown in the illustration.



There are several holes in this pendulum scantling for adjusting the blade up or down. One of the handles is removed from the blade and a small bolt is passed through the small hole in the end of the blade and through the lower end of the scantling. Either a sawhorse may be used or cross stakes may be driven in the ground as illustrated to hold the logs while being sawed. As the saw moves back and forth the swinging scantling holds the end of the saw steady. The device is easily rigged, and is very much appreciated when once tried by those who need to cut wood for fuel.

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.

1927.	January.		February.		Moonrise. Jan.	Moonrise. Feb.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5.1	6.49	5.26	6.46	2.33	3.44
2	5.2	6.49	5.26	6.45	3.17	4.48
3	5.3	6.49	5.27	6.45	4.6	5.57
4	5.3	6.50	5.28	6.44	5.2	7.5
5	5.4	6.50	5.28	6.44	6.4	8.13
6	5.5	6.50	5.29	6.43	7.9	9.17
7	5.6	6.51	5.30	6.42	8.16	10.22
8	5.6	6.51	5·31	6.42	9.21	11.24
						p.m.
9	5.7	6.51	5.31	6.41	10.25	12.25
10	5.8	6.51	5.32	6.40	11.27	1.27
					p.m.	
11	5.9	6.51	5.33	6.40	12.29	2.27
12	5.9	6.51	5.34	6.39	1.31	3.25
13	5.10	6.51	5.34	6.38	2.31	4.19
14	5.11	6.51	5.35	6.37	3.34	5.1
15	5.12	6.51	5.36	6.37	4.34	5.54
16	5.13	6.51	5.36	6.36	5.30	6.34
17	5.13	6.51	5.37	6.35	6.22	7.11
18	5.14	6.51	5.38	6.34	7.0	7.45
19	5.15	6.51	5.38	6.34	7.58	8.10
20	5.16	6.50	5.39	6.33	8.35	8.46
21	5.16	6.50	5.40	6.32	9.11	9.15
22	5.17	6.50	5.40	6.31	9.45	9.49
23	5.18	6.49	5.41	6.30	10.15	10.22
24	5.19	6.49	5.42	6.29	10.46	11.1
25	5.19	6.49	5.42	6.28	11.16	11.42
26	5.20	6.48	5.43	6.27	11.50	nil
						a.m.
27	5.21	6.48	5.44	6.26	nil	12.31
					a.m.	
28	5.22	6.48	5.44	6.25	12.25	1.25
29	5.23	6.47	...	...	1.0	...
30	5.24	6.47	...	...	1.53	...
31	5.25	6.47	...	...	2.45	...

Phases of the Moon, Eclipse, Occultations, &c.

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

4	January	●	New Moon	6 27 a.m.
11	"	☾	First Quarter	12 43 a.m.
18	"	○	Full Moon	8 26 a.m.
26	"	☽	Last Quarter	12 5 p.m.

Perigee, 7th January, 1 6 p.m.
Apogee, 23rd January, 1 18 p.m.

When the Sun rises on 4th January it will be under circumstances quite unusual. Instead of the full-orbed Sun the greater part of its face will be darkened by the intervening Moon and only about one-fifth of the usual brilliant orb will bring modified daylight at Warwick and Toowoomba. Right across the Pacific Ocean and part of South America the magnificent phenomenon of an annular or ring-shaped eclipse of the Sun will occur.

The fact that the Earth and Moon will be in Perihelion at the time of the Eclipse is the principal reason why an annular instead of a tota l eclipse will result.

An occultation of Epsilon Tauri, a small star of magnitude 3·6, will take place about 40 minutes after midnight. The star will disappear before the bright edge of the Moon reaches it, the cause being the dark or unlit portion of the Moon preceding the brightened surface.

Mercury will be in superior conjunction with the Sun on the 28th, that is on the path of its orbit beyond the Sun and farthest from the Earth. Mercury will not be directly behind the Sun but two degrees, or four times the diameter of the Moon, above it.

2	February	●	New Moon	6 54 p.m.
9	"	☾	First Quarter	9 53 a.m.
17	"	○	Full Moon	2 18 a.m.
25	"	☽	Last Quarter	6 42 a.m.

Perigee, 4th February, 10 6 a.m.
Apogee, 20th February, 4 6 a.m.

By the middle of February Jupiter and Mercury will set so soon after the Sun as to be unobservable. Venus also will be low down near the western horizon.

Jupiter and Mercury will be in conjunction on the 13th, at 10 p.m., about three hours after they have set.

The most distant planet, Neptune, will be opposite the Sun on the 15th. Owing to its great distance from the Earth, it is only a small telescopic object. On the 16th it will be in conjunction with the Moon at 9 p.m., when it will be eight times the diameter of the Moon above it and, apparently, in the constellation Leo.

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.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Risk of Bunchy Top—Warning to Banana-growers.

As the weather conditions are now very favourable for the development and spread of Bunchy Top, every banana-grower in that part of the Southern portion of this State in which this disease has been found, as well as those in the districts adjacent thereto, is hereby warned that unless he keeps his plantation under constant supervision in order to detect the first trace of Bunchy Top, so that the immediate destruction of every affected stool may be carried out promptly, there is every probability of the disease obtaining a firm hold in any such plantation. On the other hand, if the recommendations of the Bunchy Top Control Committee are carried out to the letter, there is no reason why the further spread of this very serious disease should not be controlled. Bunchy Top can only be spread from an affected stool by means of the Black Banana Aphis, which has fed on such stool, and if no affected stools are permitted to remain in the plantation there is no source from which these insects may transfer the virus, which is the immediate cause of the disease. Unfortunately, despite all the advice that has been given to growers, a few evidently do not realise the seriousness of the position, and orders have already had to be issued for the immediate destruction of infested plants in several plantations. Growers need not become unduly alarmed, however, for there are several instances where the committee's recommendations had been carried out to the letter in which the disease is absolutely under control.

"Ignorant Cockies."

In the course of the proceedings at a recent meeting of a public body just across the Border, one speaker referred rather contemptuously to some district farmers as "ignorant cockies." This expression called forth many indignant protests from farmers, who resented keenly the ill-mannered remark; but, while the indignation is natural, are not farmers themselves often to blame for depreciatory references to themselves and their industry—blameable to the extent of accepting such derogatory appellations continually without protest? In fact, is it not quite common at country meetings for farmers to call themselves "cockies" and describe their own vocation as "cockying"? Even in Press communications many a good letter is spoilt by the pen-name adopted in a spirit of flippancy by the writer—"Cow Cocky," "Cane Cocky," "Poddy Dodger," and similar self-depreciatory pseudonyms. The world too often takes us at our own valuation, and self-depreciation never gets us anywhere.

In his contact with the world in general, in his contribution to the wellbeing of humanity, in his share in commercial and industrial enterprise, in his place in the realms of literary, artistic, and scientific achievement, and as a citizen of the Commonwealth, there is no warrant for the Australian placing himself under the influence of or developing what is called, in the psychological jargon of the day, an inferiority complex. Australians have demonstrated their character and capacity in every field of human endeavour, both in peace and in war; they have shown themselves in no way inferior to other peoples either in intelligence or attainment. On the contrary, possessing as they do all the positive characteristics of the composite British peoples, the elements of the Australian race, they have many points decidedly in their favour —and that may be said without overweening conceit and only on the evidence of the facts. While all this may be fairly claimed of Australians in general, the same may be said of farmers, as a class, in particular. When leaders were wanted in the A.I.F., boys from the Bush supplied the demand. When the Australian Air Force came into being, the service that called for the highest degree of daring, courage, resource, and enterprise was manned largely by lads from the farm and the station. The man who organised the transport services of the greatest mounted force the world has known—the Australian Light Horse and its co-operating Imperial units in Palestine—and won the expressed recognition of the nation, is a Queensland farmer. In the field of invention and in every avenue of peaceful enterprise, urban or rural, the land has supplied more than a fair share of the brains and brawn that established great undertakings, backed them, and led or forced them through to complete success.

The thoughtless gibe which we have taken as our text would naturally rankle in the minds of those to whom the epithet was applied, but again it is asked are not farmers in some measure themselves responsible? What real protest have they ever made against the continual caricaturing of themselves in cheap city prints by artists whose conception of the farmer—the national food provider and economic shock absorber—is of the "Dad and Dave" order? Why do they call themselves, or allow themselves to be called, "cockies"? In the last generation the stage "Irishman" was an inhabitant of every music hall—a standing insult to a great race of people. Through vigorous objection that grotesque travesty was banished from places of amusement never to return. Why do farmers endure without effective protest, even though some of their number unconsciously or thoughtlessly encourage it, the continual, humiliating caricaturing of themselves and their calling—one of the greatest and noblest to which man may set his hand and brain.

Scientific Research—Its Influence on Agriculture.

"Remarkable interest is being shown in all parts of the world in agricultural research—not only for the sake of research to contribute new knowledge, but for the practical application which research has in increasing production. Java has the best organised and most utilitarian agricultural research station in the world. South Africa has accomplished wonders in stamping out stock diseases, and the breeding of special wheat has increased the Canadian yield by over 20,000,000 bushels a year. A group of Scottish farmers have contributed £23,000 towards the cost of maintaining a plant-breeding station near Edinburgh, and farmers in North Ireland have contributed £80,000 towards the endowment of an agricultural research station near Belfast." Thus Professor A. E. V. Richardson, the South Australian, who holds the Chair of Agriculture at the University of Adelaide, in the course of an interview with the Brisbane Press on his way home from a world tour of inquiry. He also said the main object of his visit was to investigate the progress of agricultural research and agricultural education in those countries he visited. Generally, in all the countries he visited, there had been a great increase in the interest displayed in agricultural education and research. It was particularly noticeable in Great Britain, South Africa, the United States of America, and Japan. Java had always been wonderfully organised from the point of view of agricultural research.

"The great lesson we have to learn," he continued, "is the value placed on agricultural research in other countries, and the great increase in production that has been brought about by systematic organisation. Enormous progress has been made in the wheat industry in Canada by the breeding and production of a new variety of wheat. The Marquis wheat—a production of Dr. Saunders—has displaced all other varieties in Canada, and is spreading to the wheat-growing regions of the United States. It is estimated that the production of this new variety has increased the annual yield by over 20,000,000 bushels. In Sweden the production of a new variety of wheat that is prolific, hardy, and early maturing has led to the trebling of production during the past twenty years, owing to the wheat belt being pushed further north by the production of the new variety. Similar developments in the realm of plant-breeding have been shown in the enormous increase in the rice crops of Japan, which now exceeds 340,000,000 bushels—nearly twice the Australian wheat crop. Sir Rowland Biffen, of Cambridge University, has been successful in producing a prolific variety of wheat of high milling quality, and this is rapidly superseding the older varieties, particularly in the eastern half of England.''

The immense practical work in agricultural research in Java impressed Professor Richardson particularly.

Professor Richardson, continuing, said that the British Government had made substantial contributions to the Dairy Research Institute at Reading University, and as the result of recent researches there had been a great improvement in the milk supply to the city, and a considerable increase in the production of dairy farms.

In South Africa the losses of cattle, sheep, and horses through sickness had formerly been enormous, but during recent years the losses had been almost entirely eliminated through the investigational and agricultural work of the Veterinary Research Institute near Pretoria. It was estimated that the monetary value of the Research Institute, under Sir Arnold Theiler, in reducing stock disease had paid the whole cost of agricultural research and education in South Africa since the inception of the Union Government sixteen years ago.

The Work of the Departmental Economic Committee.

The Departmental Economic Committee appointed recently by the Minister for Agriculture and Stock, Hon. W. Forgan Smith, has already entered upon its work. At its inaugural meeting on 18th January the chairman, Mr. E. Graham (Under Secretary, Department of Agriculture and Stock), suggested the scope of its survey in the course of his opening address. A need, he said, for a general inquiry into the basic factors of land settlement, agricultural production, and marketing system existed, and it would be the business of the committee to make that inquiry. Farmers, both collectively and individually, and all those connected with the agricultural industry were concerned with its present economic position. Farmers themselves had not been loth to recognise that position which was not entirely satisfactory. There was room for improvement in methods and in other directions, and the taking of what might be called an economic survey was a task which confronted the committee. Farmers were not altogether responsible for the unsatisfactory state of their industry. Economic factors were often against them, and in efforts to solve the problems created by those factors it was felt that such a committee would be of great assistance.

Exact knowledge was required to be placed at the disposal of farmers and settlers in respect to crops, acreages, stock-carrying capacity, suitable areas for the different classes of husbandry, and so forth.

The committee might give some consideration to the general difficulties of the industry—collect data on which definite conclusions could be based. It might also classify the several forms of farming into groups, and consider everything relating economically to each group, and place itself in a position of being able to give directive and advisory service to those engaged or about to engage in land pursuits.

There was need for representation of the Lands Department on such a committee so that there would be complete understanding and co-ordination between officers of the two departments concerned in the welfare of agriculture. The size of farming areas and land classification might, for instance, be subjects for mutual consideration and exchange of opinion.

It was felt that what was required were intelligent direction and economic harmony in the agricultural industry.

The committee would also be in the position of giving sound advisory service to the farmer on the economics of his industry, in relation particularly to the varying production cost factors in different districts, the advisability or otherwise of adjusting production to demand in respect to certain of his crops, and primary factors affecting crop cultivation, areas to be cropped, cycles of over and under production, and cycles of high and low demand in relation to certain crops.

For its first subject of inquiry the committee decided to take the dairying industry, the present economic of which is now under review.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has made available the following report (23rd December, 1926) from the officer investigating cane diseases (Mr. N. L. Kelly):—

Bundaberg and Maryborough.

The condition of the Bundaberg canefields due to drought, just before the recent rains, and disease, is not promising. A comprehensive scheme of irrigation is worthy of serious consideration in minimising the harmful effects of the frequently recurring dry seasons. Good cultivation, and co-operation of the farmers in the control of disease and in other matters can do much.

As regards Gumming Disease which has an undoubted grip on N.G. 15 and M. 1900 and to a lesser extent on D. 1135 and N.G. 16 in the Woongarra, Rubyanna, and around Fairymead and Branyan, being absent in all probability from Bingera, the check caused by the recent drought is valuable in pointing out those fields that are heavily diseased. In a "two-years" variety like N.G. 15, death almost always overtakes some sticks in an infected stool before maturity, especially during dry weather; and furthermore, if one stool in a field is infected there is no guarantee that any stool is healthy. This is shown by the fact that in a five-acre field of first ratoon N.G. 15 inspected in June, only about a quarter of an acre showed "gum streaks." Now (November) most of the stools in the field have one or more sticks dying from gumming, the gum "sweating" best usually in the lower portion of the stick where the reddened "fibres" (vascular bundles) are most frequent. Other stools not thus affected show the leaf streaks. But the effect of drought has been minimised in this case by trash conservation. In another field, not thus protected, the cane, 8-months old plant, shows the streaks on every stool, though no death of stools is yet to be seen. Again in quite young plant and ratoon M. 1900 and N.G. 15 considerable bleaching (chlorosis) of the leaf tissues was seen. In these two latter cases it was not to be expected that the gum could be "sweated" from the cut ends of the stem unless there had been marked reddening of the vascular bundles. Where there are very few chlorotic stools it may be payable to eradicate them, for there is a possibility, but no guarantee, that they are the only diseased ones. No fields were seen which could be guaranteed clean, but there are many which are probably so. However, adequate control can only be undertaken by a resident officer who would make a complete survey and obtain the history of every block. In the meantime, farmers are advised before planting to get into touch with the Experiment Station, where they will receive every possible assistance.

Mosaic Disease was first described by Wakker, of Java, as Yellow Stripe Disease, in 1896, and circumstances point to its having been in that country for many years previous to that. It has been prevalent in every considerable sugar growing country, but has not been recorded until much more recently, probably due to the ignorance of the disease. It was first definitely recorded in Queensland in 1913, by Messrs Carne and MacBride (then of the C.S.R.) in B. 208, Rappoe, &c., on the Herbert River. It was then well distributed. Whether it was introduced in the first place; and, if so, by whom, is an open question. Certain it is that corn and cane have actually contracted the disease from sorghum through the corn aphis (E. W. Brandes, of U.S.A.). A similar transmission probably took place at Mossman, where one field of H.Q. 426 within which "volunteer" corn had been growing, was found with a few stools diseased. As the field from which the "sets" had been cut was healthy, the evidence is strong. In any case, as Brandes has said regarding the position in America, "no particular blame attaches to those who are responsible for the importation of this obscure disease."

Mosaic occurs on all types of soil, though a very rapid spread has been noticed on the river flats of Fairymead, Rubyanna, and Avoca. In thirty-four stools of E.K. 28, where one was infected in May, three were found to be diseased in November. In Maryborough there is a smaller proportion of infected fields, the evidence pointing to Shahjahanpur No. 10 at Magnolia and Q. 813 at The Pocket, as the first carriers of the disease to the district. Shahjahanpur No. 10 is strongly to be discouraged. Eradication of diseased stools and careful selection of seed will soon rid Maryborough of this disease.

Fiji Disease was found on fifteen farms, and suspected of being present in an incipient phase on five or six others at Bidwell, Magnolia, The Pocket, Tinana, and Nerada. It was probably brought into the district from Beenleigh or New South Wales in D. 1135. Already M. 1900 has contracted the disease, being quite as susceptible as D. 1135, and was definitely infected in four farms, and suspected in one other. Every diseased stool of these varieties soon becomes a total loss. The fast that other varieties can and do contract the disease should convince farmers that the disease is an infectious one, though the means of transmission from stool to stool have never been definitely determined. The causal organism is unknown. In the galls under the leaves—which have been mentioned in the May report as the critical sympton of the disease—there have been found bodies which, however, have not yet grown or shown signs of life on the nutrient media on which microbes usually grow. One serious feature of the disease is the long period of incubation, canes often being infected for more than six months before the characteristic galls appear. In one field of first ratoon M. 1900 only one infected stool was found, and that one not remarkably stunted, the soil being rich. From another part of the field seed had been cut in September, and this must be considered infected for some time yet, say 12 months. In any case it cannot be guaranteed clean, being a quarter of a mile from infected D. 1135. This illustrates the seriousness of the disease, and the measures suggested for its control are drastic, because, as yet the disease is isolated. Every field inspected was apparently infected to a smaller extent than three per cent.

Control.—1. Plough out after harvesting every field which has been found infected, except plant and perhaps first ratoon cane.

2. Make periodical inspections of infected fields of plant and first ratoon cane for the purpose of eradicating diseased stools.

3. Do not attempt to select clean seed from an infected field. Some farmers have already unsuccessfully attempted to do this. No D. 1135 should be planted or sold for planting purposes by any farmer whose farm is diseased or suspected of being diseased. This applies to M. 1900 in those farms where it was found to be diseased. Petite Senneville, Q. 813, H.Q. 285, and in some cases M. 1900, on diseased farms were found to be healthy to all appearances, and may be replanted without much risk.

By putting these measures into operation, the growers will stamp out the disease, quickly and without undue loss; which is the most desirable end both to the grower and to the Bureau.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (14*th December,* 1926) from *Mr. R. W. Mungomery, Assistant Entomologist in charge of the Southern Entomological Laboratory at Bundaberg*:—

Pentodon Australis Blackburn.

Reference was made in last month's report to the damage inflicted on young plant cane by the "black beetle," particularly so on some of the Pialba cane farms. While this district was being inspected in October, several of these beetles were taken gnawing at the tender cane shoots. Generally one beetle was found associated with each affected plant, but in one instance a pair were found together. When captured early one morning these beetles were placed in soil in temporary containers, and on examining them the same afternoon two were noticed to be in cop. All of these were ultimately brought back to the Bundaberg laboratory, and when being removed from their containers, a few eggs were found intermingled with the soil. The beetles were then transferred to a large cage in which cane sets were placed in order to give them conditions as nearly approaching field conditions as possible. Egg-laying commenced almost directly afterwards, and at first was at a maximum, but since then the production of eggs has diminished very rapidly, and on my last inspection (10th December) though all the beetles were still living, only a few eggs were found.

The cage has been kept under constant observation and eggs removed from time to time, and these being fertile produced tiny grubs about a fortnight after being extruded. Thus it has become possible to establish a relationship between the larval or grub stage and the imago or perfect insect. Unlike some of the other cane beetles which deposit their eggs in one batch, this Dynastid lays its eggs singly throughout the soil, and each egg is enclosed in a small pellet of earth, the grains of which the pellet is constituted being cemented together by some secretion from the female beetle. The inside measurement of each pellet is slightly larger than that of the egg when first deposited, but this evidently is done instinctively to allow for the swelling of the egg which takes place during the development of the embryo.

Grubs which resulted from these eggs have since been feeding voraciously and some have already reached the third instar, so that their life-cycle is evidently a very short one in comparison with some of the other Scarabaeid grubs found here. Technical descriptions of the various stages will be given later when the grubs have been reared through their pupal and imaginal conditions.

Notes on Cane Grubs.

Grubs have made their appearance at Avoca during the last spring and have been responsible for a fair amount of damage to first ratoon M. 1900 Seedling. The first noticeable damage appeared in patches towards the end of August and the beginning of September, and these grubs proved to be the larvæ of an undetermined Melolonthid, which is common in many parts of the Bundaberg district, and also at Gin Gin. Later, however, the remainder of the field became affected and showed further unmistakable signs of grub injury. This gave growers the impression that the grubs were moving en masse throughout the block of cane. This theory is commonly held by growers, more particularly in the Northern areas, where cane, in fields attacked by the "greyback" cane grub, dies out in widening circles, the doomed portion increasing day by day. Such an assumption has, by experiment, been proved erroneous and grubs for the most part remain in the stools where they originally commenced feeding. The circumstance of one patch dying and this being succeeded by another is explained by either of two conditions. In the first place one patch may carry a heavier infestation of grubs than another, in which case the more heavily-infested stools succumb quicker than the less heavily-infested stools; or, in the second instance in a field having an even infestation of grubs, a sudden loss of moisture in one part will show up grub damage before it will be noticed in another portion of the field which has not dried out so quickly.

Neither of these explanations would suffice for the case under consideration, and on examining the field again, subsequent damage was found to have been caused by grubs of *Lepidiota frenchi*, a species quite distinct from the former grub. These "frenchi" grubs were observed at the Elliott Heads to be hibernating as late as the middle part of September and were then in the second stage. On the advent of warmer weather they moulted and assumed the third stage, and once more commenced feeding at the cane roots, but this time more ravenously. This last feeding has been responsible for the damage which has just recently become evident. On the other hand, the other species of grubs were more or less active throughout the winter months, thus causing their damage to show up previous to that of the "frenchi" grubs.

The farm on which the above infestation occurred had not previously suffered damage from "white grubs" during the past twelve years, which constitutes the present owner's experience there, therefore other growers, although they may not yet have suffered through the ravages of grubs, should not indulge in any false sense of security against these pests. Other pests during this time of the year are likely to become troublesome and ratoons failing to come away evenly in conjunction with the remainder of the field are sure signs that something is amiss, and growers should investigate by digging out an affected stool. If, then, advice be needed, Southern growers should communicate immediately with the Southern Sugar Experiment Station, Bundaberg.

At present cane beetles are to be found in their underground chambers or cells at a depth of about 15 to 18 inches, where they have changed from the pupal stage. These are now awaiting good soaking rains, when a general emergence will take place. Mating and egg-laying will follow, so that any control measures that have in view the killing of the female beetle or the prevention of oviposition in cane fields, will automatically bring about a corresponding reduction in grub infestation during the coming year.

The following report (17th December, 1926) on a visit to the Tully canegrowing district has been furnished by the Assistant Entomologist, Mr. A. N. Burns, of Meringa, to the Bureau of Sugar Experiment Stations:—

Leaving Gordonvale on Monday, 29th November, a survey was made commencing that same afternoon, and continuing on the two subsequent days, of the Tully district cane areas, the chief object being to collect insect pests of cane occurring there.

Monday afternoon.—Visited several farms near the mill and a few back towards Feluga. On one farm only were pests causing damage to cane observed, and their injury was confined to the leaves of young ratoons, grasshoppers being responsible. I was informed at the mill that grasshoppers had for some little time been in evidence at this particular farm, so decided to investigate the extent of and nature of the damage sustained. About half an acre only was affected, and then so lightly that control measures were quite unnecessary. In some scrub adjoining this farm, feeding-trees of the grey-back cane beetle (*L. albohirtum* Waterh.) were shaken, but they yielded only a few beetles and about a dozen examples of the green cockchafer beetle (*Anoplognathus smaragdinus* Ohaus). In the evening a search for beetles was undertaken with the result of only a couple of grey-backs. It is evident that the emergence of these insects in the Tully area this season is very light indeed, for few only have been observed and plenteous rains had fallen—some six inches in the ten days before my visit to the district.

Tuesday.—Lower Tully and Euramo districts were inspected, by rail motor, and no pests of any importance were observed. On two farms a few Army worms (*Cirphis* sp.) were found feeding on the leaves of young plant cane, but these were comparatively few in number, so hardly any injury occurred. One travelling through the canefields cannot help being greatly impressed by the fertility of the district and the evenness and excellent condition of the cane. The whole district impresses one with its progress, for during the past twelve months almost 4,000 acres more land have been put under cane than in the previous year, and the growth of the township is remarkable.

Wednesday.—Visited more farms in Tully itself, directing special attention to one farm brought under notice as having had grubs. Through the courtesy of the farmer I was able to collect a fine lot of beetles from feeding-trees near the cane; these were the Christmas beetle (*Anoplognathus boisduvali* Boisd.). They had stripped the leaves off many of the feeding-trees, the tree attacked being the "Myrtle" (*Eugenia* sp.), which seemed to me to be rather unusual, for their favourite trees in the Mulgrave area are Eucalypts of several species. These beetles were very probably the imagines of the grubs previously noted by the farmer, for the description he gave coincided exactly with that of the grub of *Anoplognathus boisduvali* Boisd. At this farm also my attention was drawn to two distinct species of ants which were eating holes in the ends of newly-planted sets. Both species were numerous, and have yet to be identified. The smaller one of the two is probably a species of *Pheidole* judging by the similarity of the major and minor forms of worker to those of the common little brown house and canefield ant, *Pheidole megacephala.*

These ants, which in all probability are native species, have likely only temporarily directed their attentions to eating cane sets, for in all probability with the advancement of cultivation they will be driven back to the heavily timbered areas.

I would like here to take the opportunity of thanking the manager and chief cane inspector of the Tully mill for helpful information given, and kindness in placing at my disposal facilities for being able to visit outlying branches of the mill area.

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, 22nd December, 1926:—

Prolonged drought conditions have again operated as a natural check on the numerical increase of our grey-back cockchafer, *Lepidoderma albohirtum* Waterh., and in the event of dry weather continuing, damage from this pest is not likely to exceed that experienced last season.

Instead of receiving the average rainfall of 9.87 inches during the five months which constitute a critical period in the life-cycle of this cane-beetle—viz., June to October (see report by the writer in "Australian Sugar Journal," vol. XVIII., pp. 546, 547), we registered only 6.28 in.; while the precipitation covering the months November and December, has, up to the present date (December 13th) been 1.63 in., as against 11.92 in., which is the average rainfall for these two months. During November and December of 1925 we had 5.98 inches, so that unless rain falls during the latter half of this month (December, 1926) we may reasonably expect even less grub injury this coming season than was caused by our grey-backs during last season.

"Army Worm" Outbreak at Hambledon.

A rather serious infestation of the caterpillars of *Cirphis loreyi* and *C. unipuncta* occurred during November last about half a mile from the Hambledon mill.

Most growers are familiar with these caterpillars, which occasionally travel in immense numbers, moving forward like a vast army, taking everything before them and leaving corn paddocks, canefields, or cereal crops completely stripped, only the bare midribs of cane or maize leaves &c. being left on the ground.

The moth of *Cirphis unipuncta*, which is the commoner of these two species, measures about 1½ in. across the outstretched wings, which vary in colour from pale-yellowish or reddish-brown to buff or creamy-grey, and are characterised by having a tiny but distinct white spot near the centre of each upper wing.

Eggs of the earlier broods of this insect are generally laid on rank grasses in damp low-lying situations, from whence the swarms of caterpillars, after having quickly eaten the herbage around, move forward in search of fresh fields. At this stage they are usually half grown, and when in countless numbers able to effect great injury to young ratoon or plant cane, &c.

Fortunately, the caterpillars responsible for the present outbreak at Hambledon were found to be nearly full grown, and numbered only from three to six to each stool of cane. The crop, moreover, being well advanced could afford to sustain the percentage of defoliation inflicted without suffering great damage.

The control measures advocated by this Experiment Station, and which proved satisfactory, were those of spraying a strip of cane in front of the advancing caterpillars with arsenate of lead (2 lb. in 50 gallons of water, and administering poison-bait consisting of Paris green 1 lb., molasses 2 quarts, bran 20 lb., to which enough water is added to bring the mixture to a mass just moist enough to crumble between the fingers.

When using the lead arsenate spray, care should be taken to see that it be well stirred or agitated before it leaves the nozzle, in order to keep the arsenic from settling, and ensure even distribution of the poison. The poison-baits are usually scattered in fragments about the size of a walnut against the base of cane stools along the line of advance, or in furrows ploughed immediately in front of the army. The side farthest from the caterpillars is usually trimmed with a spade to a perpendicular face, or made to overhang slightly, and deep holes about nine inches square are dug at intervals along the bottom of the furrows. When the caterpillars tumble in thousands into one of these furrows their progress is stopped by the vertical face, and while travelling along the trench seeking an outlet they fall into the holes. When these become filled to the top a little kerosene or benzine is poured over the struggling mass, which soon succumb to the fumes and can then be shovelled out to make room for another batch.

New Cane Termite.

Until quite recently the only white ant known to destroy cane sticks by devouring the interior cellular portion was *Mastotermes darwiniensis* Frogg., the so-called "Giant Termite" of the Burdekin district. We must now add to our list of cane insects another species of Termitidæ, which Mr. G. F. Hill has identified as being *Coptotermes acinaciformis* Frogg.

This insect proves troublesome at times in canefields, where it not only attacks the sets after planting, but will occasionally tunnel in growing cane sticks to a height of three feet or more above the ground. An instance of such damage was first brought under notice by Mr. G. Bates, Assistant to Entomologist, who during September, 1926, observed that several sticks in a couple of stools of Clark's Seedling (H.Q. 426) on a farm at Aloomba had been killed by these termites.

The cane was planted about eighteen feet from a line of fencing, several of the posts of which were found to be infested by *C. acinaciformis*.

The winged form of this termite—according to Froggatt—"is of a general light-brown colour, and clothed with fine hairs. It measures just over half an inch from the front of its head to the tip of the closed wings."

Description of Soldier.—Head pale shining yellow, reddish on frontal portion; antennæ 16-jointed; mandibles projecting horizontally, black, about three quarters the length of head; crossed over each other near basal portion, smooth, free from teeth, and curved near the points. Length of head and first two thoracic segments taken together about half that of the entire body (exclusive of mandibles).

Plate 23.—Termitarium or Nest of "White-Ant" (*Coptotermes acinaciformis* Frogg.)

Laid open to show internal mass of galleries and chambers surrounded by external casing of hard earthy matter elaborated by the termites. (Height of nest about 5 feet.)

Abdomen whitish or pale cream-colour, with a narrow longitudinal centro-dorsal white band, edged on each side with a row of small triangular pale brown blotches. Length of body 5 mm. (about three-sixteenths of an inch).

The worker form of this species is whitish with pale cream-coloured head and antennæ. Its body is about the same length as that of the soldier.

This very common termite has a wide range of distribution throughout Australia; from Mildura in Victoria; Kalgoorlie in the West; Magnetic, Banks, Bathurst, and Thursday Islands; and several localties in Northern and Southern Queensland. The nest of termitarium of this species, which is more or less conical in form, varies in height from four to six feet in the Cairns district. Internally it consists of innumerable thin plate-like woody-looking or papery fragments of irregular shape and size, forming a compact mass which is covered externally by a strong layer of cemented clay from two to three inches thick. (See illustration.)

Control Measures.—Fumigation of the termitarium with benzine or calcium cyanide provides an effective remedy against this termite. Such application is very simple and inexpensive, as one merely has to break a hole of about six inches in diameter in the top of the mound, pour in about a pint of benzine, and cover over the hole with wet soil or clay to keep in the fumes. When using the latter fumigant, from two to three ounces of ''cyanogas'' (flaked form) are placed in the hole which is then sealed with mud. Another method is to blow ''cyanogas'' in dust form by means of a knapsack dust blower into the termitarium. Experimentation carried out here recently with the abovementioned fumigants, against *Coptotermes acinaciformis,* yielded a mortality of from 97 to 100 per cent.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Emergence of Greyback Cane-beetles.

Emergence of the beetles this season has again been delayed, no rain having fallen at Meringa in October and only 0.79 inches during the following month up to 22nd November. At one time it looked possible that they might have appeared on the wing towards the end of November. No emergence, however, has occurred during October since the years 1917 and 1918.

A fall of two or three inches of rain would be followed at once by the customary appearance of this pest in canefields and amongst the foliage of feeding-trees, so that growers should without delay be prepared to collect these beetles daily from any favourite food-plants chancing to be growing on or near headlands.

It would be a good plan to isolate such trees as broad-leaved or weeping-figs by cutting out surrounding vegetation within a radius of two or three chains, in order to induce these beetles to concentrate on them, which would facilitate the collecting from same.

During the first week, from 20 to 30 per cent of grey-backs taken in this way will be females, but by the end of the second week the sexes are usually met with in about equal proportions; while during the third and fifth weeks after a general emergence about 75 per cent. collected will probably be females.

Appearance of Small Brown Cockchafer.

The well known cane-beetle *Lepidiota frenchi* Blkb. will be in evidence during this month in countless numbers on forest country, and in canefields in which its third-stage grub proved injurious to young ratoon and plant crops last season.

Although one of our serious cane-beetles, second only to the grey-back in economic importance, this insect fortunately oviposits as a rule in uncultivated soil densely covered by grass or weeds, &c. Thus it behoves growers to maintain during December and January a system of clean culture on areas devoted to cane, and more particularly on land reserved for early planting.

Both *albohirtum* and *frenchi* lay their eggs during these months, and are strongly attracted by a luxuriant growth of vegetation between the rows, so that land remaining in a weedy condition is almost sure to become badly grub-infested.

During the present season, however, cane will be free from attack by *frenchi,* on account of this insect having a life-cycle of two years; so that no damage need be expected from it until September, 1927, when third-stage grubs of this species will again be actively feeding.

Farmers, Take Notice !

Growers seeking advice, or applying for the liberation of Tachinid parasites to be made amongst borer-infested cane, are asked to forward at the same time a sample of the insect causing the damage. Moth-Borer injury is frequently mistaken for that caused by the Beetle Borer, since both these insects are found tunneling in cane sticks. No less than six different insects attack the shoots of young ratoon and plant cane, all of which effect very similar damage, being responsible for the occurrence of "dead-hearts."

When uncertain of the habits or name of any insect found injuring cane, it should be dropped into a small bottle containing methylated spirits and water (half and half), and posted to the Entomologist at Meringa Experiment Station for identification and advice.

[The foregoing notes were unavoidably omitted from the last issue. Though now somewhat late, they are still of general interest, besides it is desired to preserve their continuity.—Ed.]

Occurrence of Shoot-Boring "Bronze Beetle."

Growers should be on the look-out for damage caused to young ratoons and plant cane-shoots by the small chrysomelid beetle (*Rhyparida morosa* Jac.), which is betrayed by the presence of "dead hearts." Complaints regarding the depredations of this insect have been received during the last couple of years from growers in the Cairns, Proserpine, and Herbert River districts.

The beetle, which measures about a quarter of an inch in length, may be seen at any time during its adult period eating holes in the leaves of "blady grass" and in cane leaves close to headlands; while its larvæ habitually tunnel in the succulent basal portion of the former plant.

Such "dead hearts" usually occur in patches of more or less limited area, not often exceeding ten square chains.

A closely related species, *R. limbatipennis,* is known to effect similar damage to cane-shoots in the Proserpine district; this beetle, however, being if anything a trifle smaller than *R. morosa* and of a light brownish-yellow colour, instead of blackish-bronze.

Growers chancing to notice any decided infestation of either of these beetles in canefields are asked to communicate with the Entomologist at Meringa Experiment Station, either by letter or 'phone (95, Gordonvale).

Effect of Drought on Cane Beetles.

Prolonged dry weather has again checked the numerical increase of our grey-back cockchafer, and damage from this pest is not likely to exceed that experienced last season (see report for period November to December, 1926).

As a result of a few showers that fell at Meringa between the dates 14th to 20th December (amounting in all to 1.72 inches), some grey-backs were collected from feeding-trees close to the laboratory. Owing to want of sufficient moisture in the ground these beetles had experienced some difficulty in tunnelling to the surface. The few stragglers met with at present, however (21st December) cannot be considered as evidence of a primary emergence of this insect having taken place.

During this month farmers should try to have the soil loosened up and free from weeds, maintaining such cultural conditions for at least one month from date of emergence of the beetles. Work the soil close to cane rows while grubs are in the first instar, and quite small. This period, which commences about a month after 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.

Clean Cultivation During Flighting Season.

Maintain clean cultivation, particularly on land reserved for early planting, and which on that account sometimes receives less attention than that given to areas supporting the present season's crop.

A dense growth of weeds between cane rows attracts egg-laden females of both *albohirtum* and *frenchi* (grey-back and French's cane beetles), the latter cockchafer being very fond of ovipositing in such places. Upon ploughing these areas later on (April to July) grubs of *frenchi*—being then in the second instar and rather small—are often disregarded; although, as a matter of fact, they still have six months in which to feed before pupating, and after the weeds have been buried are obliged to feed on the roots of the newly-planted cane, effecting most damage while in the third instar, from October to December.

FIELD REPORTS.

Mr. A. P. Gibson, Southern Field Assistant, reports (30*th December*, 1926):—

Babinda.

Babinda boasts having the greatest official average annual rainfall of Australia. The last ten years this has averaged 154 inches. Thirty inches had fallen since the local factory commenced grinding and 115 inches have been recorded to the end of November.

Soils.—The quality of a soil largely depends on the rock from which it is formed, and the crops that may be profitably grown are dependent on rainfall and climatic conditions. Here there are two distinct classes of soil—(1) The well-known undulating volcanic, brick-red fertile soils of Bartle-Frere and Bellenden-Ker—these have been formed by the long weathering of igneous rocks having haematite (red oxide of iron), hence its reddish colour; (2) alluvial—the remaining soils, cultivated or uncultivated, are of this kind, the make-up of which is the result of the constant crumbling on the higher elevations of granite, a crystalline rock; the detached matter held in suspension has been washed to the lower levels and subsequently deposited according to the velocity of the stream, hence the reason why its texture is found to be all the way from coarse to a very fine silt. This rock is composed mainly of three minerals—felspar, silica (quartz), and mica—therefore its soil is usually good in potash.

The Crop.—What is left of the 1926 crop looked wonderfully green and had made much cane. The rainfall being well distributed and not excessive had permitted the crop to grow speedily right up to August, when it was slowed down by the dry spell which then allowed of its fully maturing. Carry-over cane at first weighed disappointingly light for the reason, and because of the almost complete cessation of growth; the first estimate was reduced to 10,000 tons. Eighteen inches of rain fell during September, and awakened new and speedy crop growth, thus increasing the weight of cane and ensuring the harvesting of many doubtful late-cut paddocks and again advancing the estimate to 190,000 tons.

Harvesting and Grinding.—These operations were proceeding smoothly, most of the cane being burnt prior to harvesting. One hundred and sixty thousand tons had been milled to the 29th November, and another 30,000 tons yet expected. The quality of cane has been exceptionally high.

Ratooning and Cultivation.—Where possible, the trash is burnt and the soil interspaces are tilled by power-drawn ploughs or subsoilers. The rotary cultivator would possibly speed up and cheapen this class of work, especially in the less refractory soils. Loggy and stumpy lands are being freed of encumbrances. Explosives and fire are wonderful helpers. Tenth ratoons were harvested in parts this year, and the last crop removed was considered very satisfactory; such paddocks are becoming "gappy," and for the benefit of variety and soil should be renewed. Land kept continuously under cane without renewing permits the thorough entrenching of pests and disease germs, and the long growing crop is so weakened that it is subjected to disease. The lengthy empty spaces in some ratoons are being filled by stools removed from elsewhere; when the weather is suitable they at once grow and are not smothered. Farmers, however, should see that such stools are disease free.

Drainage.—Planters do not give enough consideration to the great value of this; a judicious system improves the crop and decreases disease losses. Leaf Scald appeared more prevalent on ill-drained soils.

Planting.—The crop is being constantly renewed by cuttings, therefore it is in our hands to improve crops by always using the best. Big areas had been planted; germination was erratic in some fields and remarkably good in others. Most of the cane raised is Badila. A percentage of H.Q. 426 and the Goru family is grown on soils considered too poor for Badila; if the Leaf Scald disease continues to spread as at present in such varieties, it would be really advisable to eradicate them. Q. 813 and E.K. 28 are worthy of a trial on the medium quality lands.

Manuring.—The application of fertilisers is commonly deferred in these parts until the stubble of plants or ratoons is well established, different mixtures at various rates per acre are then added to both sides of the cane row. The estimated quantity of manure for a day's application is sometimes loaded on to a wagon and drawn to a convenient spot by the tractor, after which it hauls the combined driller and manure-depositing machine. Some ten acres are manured daily in this manner. Farmers should make use of the sugar-mill residues more than they do; ashes and filter press cake especially are of great value to the soil. Leguminous crops are not largely grown, but are essential in helping to restore the depleted organic matter.

Diseases and Pests.—The gathering and destroying of dead cane in fields is of immense importance in helping to control our many diseases and pests. Leaf Scald continues to spread rapidly in parts, mainly in H.Q. 426 and the Goru family; fortunately to a much lesser degree in Badila, the present king of Northern canes. This disease presents a variety of symptoms that vary according to the severity of the attack. They are covered by what is known as (1) the chronic stage—when the leaf blades are almost white or have whitish streaks; (2) acute or wilting stage, when the plant quickly dies.

Top Rot.—Most of the troubled stems had lost their tops and are now dead; in isolated parts such decayed canes were covered in a fungus known as cane spume; this is generally considered to be a secondary disease.

Scarlet Red Leaf Streaks.—The foliage of Badila stools contained scarlet red streaky leaves, these appear to start at the topmost extremity of the sheath. Such markings are generally noted throughout the Northern areas from December to February, and are considered to be the early symptoms of Top Rot. The leaves of many paddocks of cane were found pitted with minute holes seemingly occasioned by small beetles. It is highly possible that these and Army worms may be assisting to spread the Leaf Scald disease by leaf inoculation. Pupæ of the tachinid fly (one of the known weevil borer parasites) were found in borer-channelled cane in the mill yard.

Recommendations.—Again we must impress on the farmer the vast importance of exercising more care over plant selection, also the necessity of going over the fields at intervals and removing and destroying sickly or diseased cane.

Herbert River.

This district has grown wonderfully, as most others also have, upon the recent tide of development of the sugar industry. In consequence, its sugar output has been doubled. Wonderful progress was noted in Ingham; the town has been modernised and has spread. The main street is wide and pretty, being beautified by the evergreen far-spreading shade trees.

Rainfall.—The year's precipitation has been far below the average. Up to the 15th December Ingham had registered 51.47 inches and Halifax 52.81. The area is drained mainly by the Herbert River. Its cane land is extensive, parts being isolated. The black to brown soil is alluvial and varies much in depth, texture, and quality. Generally speaking, it is level but bumpy. The great importance of draining is realised, for it has made cane-growing possible and profitable on the shallower and more retentive soils. The judicious system of hilling, upon which some dozen lines of cane are planted, permits water in excess to get away.

The 1926 cane tonnage will fall far short of the 444,000 tons crushed by the two local mills last year. This year it is likely to be some 127,000 tons less. Such a reduction is attributed to (1) the unusually long spell of dry weather; (2) severe July frosts; and (3) widespread arrowing. Macknade finished its crop of 158,475 tons on the 11th December, and is now assisting Victoria, its sister mill; in consequence it is hoped that the district crop will be milled by Christmas. The cane area has a most helpful network of railroads, which cheapen and speed up crop transportation. Some cane lands are distant, therefore requiring lengthy lines, much rolling-stock, and many powerful engines, to bring forward enough cane to ensure the continuous running of the two factories, also to take away the manufactured sugar to Lucinda Point, whence the coastal freighters accept delivery. When the area was first inspected, the weather was hot and dry, and the cane leaves parched; timely rains (amounting to 4 inches) however, revived the crop.

Cultivation.—Cultivation generally is good and the fields clean. It should not be forgotten that the mulching of soil interspaces as soon as practicable after rain is of great benefit, for it controls weed growth, prevents soil baking, and assists in conserving soil moisture. Farmers should exercise more care when turning animal-drawn implements on headlands, thus preventing headland cane damage.

The newly planted cane possessed a fine, healthy colour, but had not germinated too well. This was due to prevailing dryness followed by the continuous and excessive rains of September. The cane is planted in drills varying all the way from 4 to 5 feet apart, and the following varieties seem to be giving satisfaction:—Badila, grown on the deeper and better lands; Korpi, Nanemo, Oramboo, H.Q. 409, Q. 813, Goru family, and a little Pompey. The practice of mixing variety canes and planting them is not a good one and should be avoided.

Diseases and Pests.—Most of the matured cane had been harvested, therefore little disease could be found. The elimination of H.Q. 426 variety, a cane very susceptible to gumming, had apparently been the means of almost cleansing this area of this disease. It is refreshing to inspect an area so free from Leaf Scald, what little there is here may be eradicated by the ever-careful plant selection. Many streaky scarlet red leaves were noted, mainly in N.G. 15.

Pests.—Rats were rather bad in places, and besides eating the cane stem were found destroying the ratooning shoots, especially in unburnt, trashy areas. *Pentodon Australis* (black beetles) were widespread in this area and in places many primary plant shoots and also those of ratoons had been killed by them.

Alterations.—Firewood is becoming scarce and more costly to procure, consequently the local factories are preparing to burn a quantity of coal. To bring this fuel and other necessary mill requirements direct to the Victoria millyard by the Government rolling-stock, some 2 miles of 3 feet 6 inches line railroad had been constructed, connecting the mill with the North Coast line.

The company's tramway line passing thorugh the main street of Ingham is to be removed to another route, and the work on the new track has already commenced. The lengthy new wooden bridge spanning the Herbert River at Halifax is nearing completion.

The Southern Field Assistant, Mr. J. C. Murray, reports (*16th December*, 1926):—

Nambour and Yandina.

As the districts of Nambour and Yandina have been dealt with in considerable detail in previous reports, comment will be confined to conditions prevailing on the high lands and the creek and river flats. High lands embrace those areas between Nambour and the Mapleton Range, and these will be dealt with first. The soil is a chocolate loam with no great depth but considerable productive powers. It has never been intensively farmed up to the present, although well-cultivated areas are now showing at intervals. Very little green manuring has been done, and not much artificial manuring. No silos are in evidence, which is surprising considering this is largely a dairying district. Farmers should remember that these are the best possible insurance against drought.

Cane varieties growing on the area under review include M. 1900 Seedling, D. 1135, H.Q. 285, and Q. 813. All look well. Growers would find that the Java variety, E.K. 28, would do well on this undulating country.

No serious occurrence of disease was observed. Mosaic was in evidence here and there. This was pointed out to the farmers, and methods of control indicated. Complaints of loss by Gumming disease were not heard. Serious cane fires occurred in these areas during the season. These fires disorganise the cane inspector's work, and, whereas the burnt-out growers may get their cane off, other men who are just as entitled to a cut have to wait. The lower-lying areas are Petrie Creek, Maroochy River, and Yandina areas. Conditions generally on these farms are the same. The growers are finding there is one advantage about the present dry spell; it is an excellent time for combating the weed growth.

No serious losses were reported through gumming. There is plenty of evidence of the disease, mostly in the D. 1135. Growers in these areas are requested to be very careful in regard to Mosaic disease. If they allow it to spread after all the information they have received on the subject then they are careless indeed.

Cane varieties showing good growth in these areas at the present time are Badila, Q. 813, H.Q. 285, and Uba. Q. 970 is also making a good showing.

Cooroy and Eumundi.

These districts are unimportant from a cane-growing point of view. The farms are mostly dairy, hardly any farmers having more than 6 or 7 acres of cane. The cane gave a good c.c.s. value this year. A most surprising thing is that dairy farmers have not long ago found the value of a patch of cane from a stock-feeding point of view.

Leaf Scald disease was noticed on one patch of H.Q. 285. The following comment on this disease is by Mr. North, Pathologist to the C.S.R. Company:—"The one critical symptom which enables a positive identification to be made consists of whitish streaks on the leaf-blades or leaf-sheaths. They are straight, narrow, well-defined streaks ranging from one-eighth of an inch in width down to a barely susceptible mark, and often extend throughout the entire length of the leaf-blade and leaf-sheath. As the leaves grow older the streaks usually tend to broaden and become more diffused, losing their sharply defined, even margins. Sometimes irregular reddening of the tissues also occurs, especially in the centre of the streak.

The Central Field Assistant, Mr. E. H. Osborn, reports (19*th November*, 1926):—

Ayr.

The Ayr rainfall figures to date, *i.e.*, 15.94 inches, are made up as follows:—January, 142 points; February, 811 points; March, 162 points; April, nil; May, nil; June, 13 points; July, nil; August, nil; September, 466 points; October, nil; November, nil. This shows the important part that irrigation plays in this area, and moreover gives an idea of how very costly cane-growing can be under practically continuous waterings.

Some very good density returns were being obtained, Badila especially giving excellent results, even from several low-lying and rich soils carrying very heavy tonnages per acre.

Everywhere irrigation plants were in operation. Steam plants, suction gas, and the ever-useful tractor being very much in evidence. When the very large number of tractors is noticed, and the splendid work that they are doing in pumping and all sorts of cultivation work, it emphasises their immense usefulness in an area such as the Burdekin.

Varieties.—Of the newer canes E.K. 28 is being planted out in a much larger degree than formerly, especially in medium to poor land. Local growers speak well of its striking qualities, rapid growth in erect form making it stand up well to irrigation, as well as its quick recovery after a check in growth, with a freedom from side shoots when such a check occurs. One of the best results was obtained from an April planting of 11 acres, cut in July and August, and yielding 34 tons per acre for an average of 16.1 c.c.s. In the same area a 5-acre paddock cut 40 tons per acre in September for a c.c.s. of 16.0.

Q. 813.—A small area of this was seen carrying good length and very fair barrel, and will probably give about 35 tons per acre, but as the adjoining land yielded a 51-ton per acre crop of Badila with a very high c.c.s. it is not likely to be grown in any quantity in such lands.

Q. 903 was also showing a nice sample of cane upon this farm, but seems rather erratic in density. On this particular farm Nuttall Brothers, the owners, are doing useful work in continually testing new varieties under local conditions and in quantities large enough to give average results.

Pests and Diseases.—White ants are still doing a great deal of damage to isolated farms, notably at Jarvisfield and Brandon. In both cases the pest seems to be going further afield. At Jarvisfield a small block of early plant Badila was so badly affected that six rows nearest the creek were absolutely eaten out, and further away through the remainder of the block many dead shoots were very evident. At Waterview damage upon a larger scale has been inflicted, despite poisoning with recommended mixtures.

Moth Borers.—Damage to odd shoots in many fields of young cane was observed, but upon investigating the shoots no trace of grub or caterpillar could be found.

Top Rot in the Red Streak stage was seen in a block of young Badila on an area where it usually is to be found to a certain extent. Many stools were showing the streak markings in leaves, but only odd shoots had died out. Growers here say that when the cane is attacked before "making cane," and at about October or November, only odd shoots suffer, but if the disease is seen after cane has been formed there is a certainty of greater losses.

Leaf Stripe was noticed in a young paddock of B. 208, to probably a 5 or 6 per cent. infection, at Klondike, and odd stools were noticed in other blocks of this variety.

Mosaic was noticed only in an odd stool of H.Q. 426 ratoons.

Home Hill.

Crops looked on the average rather better than those upon the north side, both up and down the river.

The earlier planted young cane looked very well, but inclined to be going back; most of the recently planted cane will require very good conditions from now on to make into a good crop for 1927. Inkerman had just finished milling operations after a very satisfactory run to millers and growers, for although the individual grower did not harvest as much cane as last year, yet a much better density and a slightly higher price for sugar made the average conditions better.

It was pleasing to hear from nearly all the growers interviewed that the irrigation working conditions were now far more satisfactory than they had ever been; in fact, so much so that the writer was told by several farmers interviewed, who were not included in the system, that they have applied for power.

Neither up the southern side of the Burdekin nor the northern side had any serious delays occurred. In fact the writer saw a gang at Jarvisfield cutting standover Badila very twisted, and with a fair proportion of withered-up stalks, yielding probably a 12-ton crop. The cutting was very fair and all the damaged cane thrown out, and yet under Award rates; which speaks very well for the type of cutters employed and the good relations existing between employers and employees, incidentally also favouring the small-gang system.

Varieties.—The same varieties are practically grown upon the Home Hill area as upon the northern side. Some very fair results have been cut from E.K. 28 hereabouts, as the following figures reveal:—

	c.c.s.
11th September	16.1
18th September	16.1
25th September	16.4
2nd October	14.6
9th October	15.8
16th October	15.5

or practically 15.8 c.c.s. for a 40-ton crop on this class of country. The owners are so satisfied with these results that a further area has been planted out.

Diseases and Pests are practically similar to those upon the Ayr side of the Burdekin, and were seen only in very minor quantities.

A peculiar, or rather a characteristic, thing happened in connection with the Red Streak stage of Top Rot. Some growers, after suffering certain losses in Badila from Top Rot through a period of several years, thought that they would try plants from elsewhere, and about four years ago obtained a few sets of Badila from the Tweed River. These were planted and replanted until it now represents 1 acre of last April plants, and though it looks very healthy as regards general growth, it is heavily infected with Red Streak, quite a number of odd shoots having quite died out, the particular piece of ground never having been cropped before. The great risk of introducing fresh diseases into another district without the plants having been thoroughly examined by a competent official was in this case further emphasised.

The Central Field Assistant, Mr. E. H. Osborn reports (*18th December*, 1926):—

Giru.

Nearly all the available pumps were working, but in many cases there was only an indifferent water supply. The local mill had just completed its crushing of 31,773 tons of cane for an average c.c.s. of 14.6, while for 1927 some 54,000 tons are hoped for. Some 430 acres of early and 507 acres of late planted cane have been planted in the Giru area proper, whilst the Ingham railway line suppliers are represented by 412 acres of early and 405 acres of late cane.

Giru expects to have 858 acres of ratoons, and the Ingham railway line 943.

Varieties.—Following are the percentages for 1926:—

	Per cent.
Badila (N.G. 15)	50.0
Clark's Seedling (H.Q. 426)	30.0
Goru	5.1
H.Q. 409	5.5
B. 208	4.9
E.K. 28	1.7
Q. 813	1.3
Others	1.5
	100.0

Badila gave very consistent returns throughout the season, whilst B. 208 and H.Q. 426 were also very fair. E.K. 28 is credited with having stood the drought very well, giving good tonnage results but a density of somewhere about 14.5.

Pests.—Moth borers in odd shoots had done a certain amount of damage hereabouts.

Diseases.—None prominent in the area, but the dry conditions probably mitigated against detection to a certain extent.

Ingham Railway Line from Rollingstone to Tobanna.

When this area was inspected in the third week of November the cane looked far ahead of the local cane near Giru mill, the results certainly of the better rainfall conditions that had been experienced at Rollingstone, namely:—

	Rollingstone.	Giru.
	Points.	Points.
January	395	714
February	782	1,800
March	342	180
April	—	250
May	20	—
June	22	—
July	—	—
August	—	52
September	478	808
October	—	—
November	—	104
	20.39 inches.	39.08 inches.

The 104 points for November fell during my visit, and it was wonderful to see the way the cane and the pasturage responded, brightening next year's prospects very considerably.

Crops from Rollingstone to Tokalon were backward in growth but of a very healthy colour. While in this particular area I was informed that an additional 900 acres of this land had been assigned to the Invicta mill, thus allowing at least a living area to the many small suppliers along this line, as well as ensuring a more reliable cane supply to the mill.

Though tonnages were small, the quality of the cane was satisfactory, Badila especially giving good returns.

Pests.—White Ant damage of a minor nature was noticed in a couple of Rollingstone farms. The attack was checked by using a poisoning mixture of molasses, arsenic, and caustic soda.

Grubs.—Damage was noticed on a portion of a field at Yuruga, but no beetles had been noticed so far.

Diseases.—Leaf Stripe in an odd stool of B. 208 ratoons was seen at Helen's Hill, but the owner was ploughing affected cane out.

Gum.—Suspicious looking leaf markings were noticed in H.Q. 426 and H.Q. 409 ratoons at Toobanna and Tokalon, but gum did not appear when sweated. Growers were advised.

Varieties.—Badila, as already mentioned, gave good average returns throughout. H.Q. 426 (Clark's Seedling) was also good, but is worth watching for disease. E.K. 28 was very fair for weight and c.c.s. H.Q. 409 was only medium in weight and c.c.s., and evidently won't stand dry weather too well. 7R 428 (Pompey), two truckloads from some poor forest land gave 40 tons per acre, but only 13.74 c.c.s. Korpi, Nanemo, and Oramboo in very small quantities were sent to the mill, but did not impress the line growers to any extent, and the same can be said of Goru.

Mackay.

Calen, Kolijo, and Mount Pelion, on the North Coast Railway, were inspected during the second week in December, and although very dry, looked better than other parts of the Mackay area. St. Helen's River was still running, and the pasturage in general was very fair, with some remarkably good and fat dairy stock to be seen. When it is taken into consideration that this section of the country has only been opened up for canegrowing some four years, its progress is only another tribute to the sugar industry's capabilities of settling our own people upon the land. Unfortunately the St. Helen's River flows between Calen and Kolijo, mitigating against centralisation for township purposes, and thus it is that while

Calen possesses the local school (built by the farmers' own labour) and is the railway siding for the greatest quantity of cane, yet at Kolijo is the staff station, general store, with post office and telephone facilities, and also a butcher's shop.

To emphasise how the area is growing, I was informed that the school has fifty-four children enrolled. Cane land is situated on both sides of the river banks and following its fertile flats down, being more extensive in area upon the Calen or northern side. The soil is mostly from a dark to lightish-brown in colour, deep in many places but fairly shallow in some others. It is also fairly gritty, and, resting as it does in the majority of cases upon a gravel subsoil, requires a good rainfall to enable the cane to do its best.

The tenure of the land is either freehold or perpetual leasehold, and quite a number of substantial, well built homes are to be seen upon the several farms. With the exception of a few large growers upon the Calen side of the river, who use tram rails and trucks for harvesting, nearly all the rest of the cane to both centres is shifted by motor lorry.

Mount Pelion.

This centre does not seem to have had as much rain as either Calen or Kolijo, consequently the crops were not as far forward. The country is also far more broken, with possibly the exception of the Murray Creek flats, of which several are fairly extensive. Both here and at Calen and Kolijo very heavy frosts had affected last season's cane adversely. Badila is the most popular cane upon such flats, and in all three areas were hit badly, with the result that the sugar contents were low.

Cane Varieties.—As already stated, Badila is the main cane upon the flats, giving phenomenally high returns in many cases, but through the very dry conditions, and later on the frost, was not too satisfactory as regards value. These values were in several cases affected by severe fire losses, and subsequent delay in harvesting. Pompey (7R. 428) also gave very high tonnage results upon the low lands, but inferior density returns. Upon the poorer forest soils the density was 14.5 to 15. Ratoons of both these canes looked green and vigorous and should develop into fair crops. Q. 813 and H.Q. 426 (Clark's Seedling) seem to have been planted in about equal quantities, and gave very satisfactory returns upon the medium soils. M. 1900 was only medium.

Diseases.—Mosaic was noticed in one stool of young plant B. 208 at Calen in three short rows of this variety, and rooted out by the owner.

Brown Rot, described by Mr. Cottrell-Dormer some two years ago as an unidentified fungus attacking Badila in new scrub land at St. Helen's (Kolijo) and Mount Pelion, was seen in small patches (generally only a few stools showing damage) upon the following farms:—At Calen, of nine farms visited the fungus had done damage upon four; that is, in plant cane and first ratoons in two cases each. At Kolijo, of four farms, two carried it in first ratoons. At Mount Pelion, of nine farms, only one showed damage in first ratoons. All these cases were in Badila and in new scrub or very heavy new forest country heavily stumped. As the fungus is spreading, though slowly, its importance was stressed to the interested growers, who, in most cases, rooted out the dead or partially dead stools. Keen interest seems to be taken in the various works of the department in this progressive area.

Pests.—Wallabies were responsible for damage to a lot of cane in these areas, despite wire netting and plenty of kangaroo dogs.

Cane Beetles.—Several growers reported noticing grey-backs upon the wing a day or two after the rain of 7th December.

The Director of the Bureau of Sugar Experiment Stations has received the following report (23rd *November,* 1926) *from Mr. N. L. Kelly, Assistant to Pathologist:—*

Cairns and Mossman.

Leaf stripe has been present in the Mossman district for many years, and is now appearing in several fields around Cairns, in 7R 428, having spread in two cases into D. 1135 adjoining. The losses caused by this disease, mainly seen in the premature death of infected stools, are considerably increased in ratoon crops. Because of the noticeable spread in humid climate the disease must be combated immediately. Those farmers who have noticed young cane with leaves of abnormal pallor—an appearance which is due both to the pale-yellow stripes and to the faint mildew which appears on the under surface of the leaves—should notify an officer of this Bureau at once. Recommendations for control will be made according to the circumstances of the case. One farmer near Hambledon, where the disease was present in 1 per cent. of the stools of a 5-acre field of 7R 428, has agreed to dig out the diseased stools. This measure can generally be recommended in young plant or first ratoon cane where the degree of infection is less than, say, 3 per cent. When above that percentage, it is a question whether the cane should be allowed to remain in after harvesting. In any case seed that is only lightly infected rarely shows the disease until the plant crop is about nine months old. This occurred in a field of 7R 428 on the Sawmill Pocket road. The disease spread to a small area of D. 1135 adjoining, and the young ratoons are now showing very poorly. Some stools failed to ratoon, dry weather and disease each playing a part. Around Mossman Leaf Stripe is to be found in B. 147 in all the subdistricts, having spread into Q. 813 and D. 1135 in two fields at Saltwater and into one field of N.G. 24A., which is fairly resistant, at Mossman. The B. 147 at Brie Brie and Mango Park appeared healthy, though no guarantee can be given as yet. It is extremely difficult, in planting cane from a slightly diseased field, to be certain that only clean cane has been planted. The disease may be in the incubation stage in several of the stools selected as apparently healthy. Therefore every farmer should set aside a small area of his farm to be used as a nursery, and to which he should give careful attention. The digging out of stools that show Leaf Stripe or Leaf Scald will be repaid in the production of a crop which should be free of every major disease.

Leaf Scald is present in all subdistricts to the south of Kamma; Sawmill Pocket, Hambledon, White Rock, West Cairns, and Edgehill being infected to a lesser extent, but the Freshwater district is more heavily infected. Similarly it is to be found in

Plate 24.

Two stems of Badila infected with leaf scald. The one on the right illustrates the chronic stage of the disease with leaves heavily blanched. The stem on the left is in the acute or wilting stage.

A cane stalk which has been in the chronic stage for some time, and dying.

all parts of the Mossman district. H.Q. 426 and N.G. 24 are suffering most, though the N.G. 15 of the Cairns district is practically all slightly infected. In isolated cases D. 1135 at Aloomba and 7R 428 at Saltwater were found to be infected.

Fig. I. shows two stems of Badila infected with Leaf Scald, that on the right being in the chronic stage, with the leaves of the top and of the buds heavily blanched, while that on the left is in the acute or wilting stage, the inner leaves being almost, and the outer leaves being quite dead. Fig. II. shows a stem which has been in the chronic stage for some time, and is now dying.

There is no doubt that H.Q. 426 gives good results in a great variety of medium lands in both Cairns and Mossman districts; but unless a farmer exercises great care at the outset, these good results will be gradually counterbalanced by disease. For absolute safety this cane should be planted from first ratoons which have received careful attention since planting.

Gumming.—Although the season was unfavourable for a speedy identification—based on the ''leaf streaks''—a careful inspection of two fields of eleven months' old plant H. 109 at Aloomba revealed that already several sticks of cane have dead tops, and topmost eyes that have shot considerably. In many cases these are heavily bleached—chlorotic. Thus, in North Queensland, at any rate, the death of the cane tissues commences at the top and proceeds slowly downwards; unlike that due to Leaf Scald, which is a rapid wilting. In any case, Gumming was easily confirmed by the presence of ''gum cavities,'' and by the ready ''sweating'' of the yellow globules of gum from the cut ends of a section of the stem. The large number of ''misses'' in these fields showed that the ''sets'' had been fairly heavily infected. Every effort should be made to ''plough out'' these fields now, as the losses incurred in other fields by the spread of this dangerous disease may considerably outweigh the expense of replanting. It is only necessary to be certain that no old stools are left living among the freshly planted cane for safety in next year's crop. In my opinion the millers should have the right of refusing cane which has been planted against the advice of a duly qualified officer.

Mosaic was found in H. 109 at Aloomba, Shahjahanpur No. 10 at Hambledon, and H.Q. 426 at Mossman; in each case, in one field only.. H.Q. 458 seems a promising cane for medium and poor lands in both districts, a particularly fine crop being seen at White Rock.

RURAL CREDITS—STATEMENT BY THE ACTING PREMIER.

The Acting Premier and Minister for Agriculture (Mr. W. Forgan Smith) in the course of a recent Press announcement said:—''I note by this morning's Press that, speaking at Cooroy, Dr. Earle Page, Federal Treasurer, made reference to the Rural Credits Scheme in so far as it affected Queensland. If Dr. Page is correctly and adequately reported, I can only say that he handles facts in a very careless manner. So far from the Queensland Government being opposed to the Act because his Government passed it, we have been endeavouring for some time past to secure for Queensland producers the benefits which the Act purported to give. Up to the present Queensland Commodity Boards have not found it possible to make their financial arrangements through the Commonwealth Rural Credits Department, and marketing credits have had to be arranged otherwise with the assistance of State Government guarantees. Difficulty arose from the outset in connection with the interpretation of that provision of the Federal Statute which provides that produce financed upon 'must be placed under the legal control of the Bank.' Everything hinges upon what meaning can be applied to that provision. It could be interpreted to mean that such legal control might involve giving the Bank authority to decide when, how, and for what price goods may be sold. I take the view that this provision should not embrace any more than the ordinary security taken by the commercial banks in the usual way of business. The Commonwealth authorities also held the opinion that by reason of some alleged weakness, either in our Queensland marketing legislation or in the constitution of the commodity boards, there was some obstacle in the way of the granting by Queensland boards of the requisite form of security in compliance with the Federal Act. This matter has been under discussion for some time, and opportunity was taken of the recent visit to Queensland of the Chairman and Governor of the Bank to bring the matter to finality. After discussion, it was decided to refer this to eminent counsel for a joint expression of opinion on the question as to whether the Queensland Act is adequate to enable the giving by boards of the form of security required. The opinion was duly received, the joint advice being to the effect that our Queensland legislation is adequate to enable the authorisation of boards by Order in Council to give the form of security desired by the Rural Credits Branch of the Commonwealth Bank in accordance with the provisions of the Commonwealth Act. The Commonwealth Bank has now agreed to accept this opinion. I might mention here that the E. S. and A. Bank financed the Atherton Maize Pool Board, the security offering being accepted by that institution as completely satisfactory.''

SUGAR-CANE DISEASES OF NORTH AMERICA AND THE WEST INDIES.

Report of Mr. A. F. Bell, Travelling Research Scholar, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby.

The outstanding feature of the disease situation in North America and the West Indies is the fact that the diseases found are so few in number. Especially is this so in view of the haphazard methods of introduction of varieties which have prevailed in the past, and to a great extent prevail at the present time. The outlook for the growers is not particularly bright in any of these countries, and the immediate future calls for the closest scientific control of all phases of sugar production. Porto Rico, by virtue of participating in the United States preferential tariff of 1.78 cents per pound on raw sugar, is in a much more favourable position than its neighbours.

Mosaic.

By far the most widespread and the most important disease is the ubiquitous Mosaic which is causing extreme damage in certain localities. In spite of the ravages, however, the disease has not been without value in demonstrating the effectiveness of commonsense agriculture as a means of control for this type of disease. There is abundant evidence to show that Mosaic can be completely controlled, even under what appear to be the most unfavourable conditions.

The highest degree of infection, and the greatest difficulties in the way of eradication, were found in Louisiana. Here it was extremely difficult to find a healthy stool, and doubtless this complete infection is largely responsible for the hazardous condition of the Louisiana sugar industry. Practically the entire crop is composed of two varieties, D. 74 and Louisiana Purple, both of which are approximately 100 per cent. infected, and thus it is impossible to carry out any comparative tests to determine the losses due to Mosaic. Although it has been shown in Porto Rico that it is feasible to take seed from a field carrying as high as 90 per cent. infection, providing that the seed is rigidly selected and strict attention paid to the roguing of the young cane arising therefrom, it is obvious that this method of control is impossible under the conditions existing in Louisiana. Therefore it follows that any supplies of healthy or disease-resistant cane must be imported or raised from seedlings. Owing to its being some 7 to 10 degrees outside the tropical zone, cane does not arrow in Louisiana, and so it was necessary to seek some other locality for the carrying out of any breeding programme. The experimental station of the State University and the U.S.D.A. are now co-operating in order to alleviate the distress, and endeavour to restore the industry to its former position. To this end an experimental station has been established at Canal Point, in Florida, where introduced canes will be propagated for resistance trials; in addition a number of sedelings are raised annually and these will be tested out with the introduced varieties. At the time of visit the station was not very large and the number of seedlings raised was strictly limited; moreover the situation is rendered somewhat trying by the prevalence of floods in that particular part of Florida. The selected canes are despatched to various parts of Louisiana for a thorough testing in the field, the University Farm, Southdown, and Cinclare being three important centres. In addition to this the staff of the University experimental station are engaged in an effort to select disease-tolerant strains within the diseased varieties D. 74 and Louisiana Purple. Certain stools of diseased cane appeared to be tolerant to Mosaic and to produce a good stand in spite of of it; it was thought that these had possibly arisen as the result of a bud mutation and that continued selection would give a clone which would produce a good crop, although infected with the disease. At the time of my visit the selected canes certainly presented an improved appearance over the non-selected, but it must be remembered that, besides selection for any possible tolerance, there is also involved selection against Root Rot, Red Rot, and Borer infection. It cannot be said that this experiment shows any great promise and it is apparent that any relief must come from the new resistant varieties.

The reason for the rapid and complete spread of the disease in Louisiana does not appear to be far to seek. It is an established practice of the farmers to grow about half cane and half corn, and, moreover, to interplant the corn and the cane in comparatively small fields. An examination of the corn disclosed the presence of Mosaic in practically every field and on tearing away the leaves one could find large numbers of corn aphids, and experiments have shown conclusively that the corn aphid is capable of transmitting the disease. It is inevitable that these aphids should transfer to the cane, even though it be but a temporary transfer owing to the insect preferring the corn leaves as a source of food. In addition the corn plants wither and die before the cane is harvested, and it is natural to assume that any aphids which might be present at that time would of necessity transfer to the cane. Owing to the comparatively low current values for sugar it is unlikely that the farmers will be persuaded to give up the growing of corn and this will be an ever present force militating against complete control. Recent experiments are demonstrating the suitability of Louisiana for the cultivation of the sugar beet, and thus it is within the bounds of possibility that Louisiana will cease to be a producer of cane sugar.

Root Rot.

The complex of troubles known as Root Rot is quite widely spread, but not much definite research or experimental work has been carried out to determine the contributing factors. It is claimed that the effects can be minimised greatly by soaking the seed in .1 per cent. mercuric chloride or commercial fungicides. The Federal station at Houma has the investigation of these troubles under consideration, and is probably conducting a series of researches at the present time.

A considerable amount of trouble is occasioned by borers, but not much by rats. There are also leaf spots and some Red Rot but these have not yet assumed any importance.

Cuba has hitherto enjoyed the position of being remarkably free from a great number of the most destructive diseases of sugar-cane; this is no doubt due to the fact that it has been largely a one-variety country, Crystallina constituting practically the entire crop.

A Remarkable Contrast.

As far as Mosaic is concerned this country presents a remarkable contrast between the entirely successful control by the more progressive estates and the ravages occasioned in the absence of control on the part of the native farmers and the badly administered estates. So far there has been no very serious attempt to organise a campaign against this disease. The Government maintains an experimental station where a pathologist is employed, but the purposes of this station are for general agriculture and it has not the facilities for the carrying out of an educational programme which will reach the small farmers. The Cuba Sugar Club has been formed in recent years, and is co-operating with the Tropical Research Foundation in the maintenance of a field experimental station at Baragua in Central Cuba. This organisation has obtained the services of some very able men, but its dealings will probably be with the larger estates rather than with the small farmers, or "colonos" as they are called in Cuba.

Most of the estates have an agricultural staff who tender advice to anyone forwarding cane to their particular mill. These men find it most difficult to convince the farmers that Mosaic is a disease, and their advice on this matter appears to be largely disregarded. The tendency is for the colono to take the thinnest and poorest quality cane for planting, with the result that actually he is selecting for Mosaic and not against it. It is a conservative estimate to say that on the colonias visited the percentage infection was at least 50 per cent. Grasses and weeds of various kinds grow profusely on the headlands and there is also a considerable amount of corn grown on these properties. The infection was observed to be heavier round the edges of the fields and in the foothills.

After having visited several colonias somewhat on these lines it was a pleasure to enter upon the large farm managed by Mr. J. R. Zell. On this property there was no Mosaic visible, although the surrounding colonias were heavily infected, as was this property when first taken over. The first procedure was to select cane and establish a clean seed bed and then, after planting, to keep the crop free from disease by constant roguing. Two men are constantly employed on this work, and when visited the infection was less than .01 per cent.; however, this extreme degree of care is possibly not quite necessary nor economically justifiable. The United Fruit Company's property at Preston is an example of successful control of the disease on a large scale. Here every effort is made to keep the percentage infection under 1 per cent. No corn is grown, and the headlands are kept free of weeds, while periodic inspections are made. The method of making the inspections is for a horseman to ride up the two boundaries and through two or three places in the field and make counts. If the infection is more than 1 per cent. labourers are sent in to rogue out the affected plants. A very big programme of Mosaic control is now being adopted by a syndicate which operates several mills in Oriente, the eastern province. To take charge of the project, Mr. R. Menendez was brought from his position as Director of the Insular Station in Porto Rico; he is now putting into operation the methods which proved so successful in Porto Rico.

The Moth Borer.

The Moth Borer (*Diatræe saccharalis*) was found to be very widespread, and in the aggregate must cause tremendous losses; there are, however, no figures available on this question and very little is being done to combat the menace. A certain amount of Red Rot was seen, but this seemed to be present only after the cane had been damaged by the Borer.

As the lands are becoming older and more compacted, together with the generally poor cultivation, there is an increasing amount of Root Rots, although in the well-tilled areas there were no complaints. The effect of the root troubles, together with the spread of Mosaic, will inevitably exercise an adverse effect on the ratooning properties of the cane. The Cuban sugar industry has grown up largely on the wonderful ratooning capacity of the cane, and once this is removed it is hard to see how the small farmer can carry on.

New Varieties.

Just now a good deal of attention is being paid to the introduction of new varieties, particularly from Porto Rico, and of these the Barbados seedlings B.H. 10 (12) and S.C. 12 (4) promise to do well. Nevertheless the introduction of varieties from Porto Rico, without adequate quarantine, would appear to be very dangerous, since Gummosis exists in Porto Rico and inasmuch as Crystallina has been shown to be very susceptible to the disease.

The Industry in Porto Rico.

Sugar is responsible for about one half the income of Porto Rico, an island having an area of about 3,500 square miles and a population approaching one and a-half million. It is thus among the more thickly populated portions of the earth, and with most of the best land being used for cane culture the people are dependent on the outside world for most of their food supplies. Within this small area Porto Rico is fortunate in having two experimental stations; the Insular Government maintains one at Rio Piedras and the Federal Government one at Mayaguez. Both of these house pathology laboratories, and Dr. Cook is the pathologist at the former and Mr. Tucker at the latter. By virtue of the presence of these two centres the ætiology of most of the cane diseases of Porto Rico has been studied and comprehensive data gained on the question of varietal resistance and suitability in the varous districts. The stations are open to the criticism that they appear to have no adequate means by which the knowledge gained by the scientific staffs can be imparted to the small farmers. The major portion of the sugar is grown on comparatively large estates which are operated by men who have the training necessary for them to be able to read and apply the information contained in the scientific periodicals; in addition some of them have a pathologist employed in an advisory capacity. As far as the larger plantations are concerned the standard of the field control of disease is high; a few have their own experimental stations and carry on breeding and resistance trials, and rigidly supervise the seed selection and field sanitation.

Sugar culture in Porto Rico has been watched closely by the rest of the sugar world during the last decade owing to the rapid spread and consequent losses due to the Mosaic disease, culminating in the establishment of its true nature and the complete ascendancy of the methods devised for its control. The presence of the disease was reported in the Journal of the Department of Agriculture in 1917 by Stevenson and Johnston. Their attention had been drawn two years previously to an outbreak in a somewhat restricted area, but in the two years it had spread over one-fourth of the island. They state that a small infection in the first year would give a general infection in the second, with a falling-off in yield, while in the third year the crop might be a total loss. For 100 per cent. infection it was considered that the losses ranged from 50 to 70 per cent. No definite cause was found and no methods of control could be suggested. Two years later Stevenson published the results of his further work. He found that infection was ærial and not through the soil, and also that bacteria and fungi were not associated. He abandoned the degeneration theory and expressed his belief that the disease was an infectious chlorosis, due to a virus or an ultramicroscopic organism. The careful selection of healthy seed and the roguing out of diseased canes were recommended as a means of control. In order to save the industry from its threatened extinction the Government had, in 1918, appointed Prof. F. S. Earle as a special commissioner to investigate the disease and devise means for its control. Prof. Earle gathered a staff and divided the work up into a number of projects as follows:—

1. The distribution.
2. An inquiry into eradication as an efficient means of control.
3. Methods of culture best adapted to badly diseased fields.
4. Statistics of sugar production as affected by the disease.
5. Methods of natural or artificial infection.
6. Resistance and immunity.
7. Ecological survey of the insect inhabitants of cane fields.
8. Cage experiments with insects suspected as carriers.
9. Morphological, histological, and cytological studies.
10. Studies on the nature of the disease and the search for a causal organism.
11. Chemical studies of diseased as compared with healthy cane.
12. Soil studies.

The results of these and other studies served to show that the disease was an infectious chlorosis which could be transmitted artificially and in the field was transmitted through the air by insects. No definite causal agent was found although Plasmodia-like bodies were found in association with the disease, and in the discoloured areas there was found to be a lack of chlorophyll and chloroplasts. As a result of these investigations the present methods of clean seed beds, seed selection, and eradication of diseased stools were advised and have been used with conspicuous success. By adopting these methods, Guanica, the biggest Central on the island, has practically eliminated the disease although starting with an initial infection of 90 per cent. In spite of the success of these methods vigilance is never relaxed, and at the present time all cane is inspected and rogued twice a month for as long as is practicable. On going into a heavily infected field the practice would be to rogue twice in the first day and then about five days later. After a field has been cleaned and an inspection shows one cane of a stool to be infected, this cane is cut off but the stool is not rogued out. It has been demonstrated by several tests that this is secondary infection and the rest of the stool does not show the disease later after treatment in this manner.

Mosaic Control.

Some interesting figures with regard to Mosaic control are given in the annual report of the Fajardo Sugar Company for 1924-25. The company's properties were very heavily infected when the problem was attacked in 1918 by the prescribed methods of clean seed and subsequent roguing. In the first year, 1918-19, 29.5 acres were abandoned on account of the disease. Since that year no cane has been abandoned, and the following are the number of inspections and the number of stools rogued out of the fields which had been planted with selected seed:—

	1918-19	1919-20	1920-21	1921-22	1922-23	1923-24	1924-25
Rogued	1756	1223	846	217	134	58	135*
Inspections ..		96	112	103	112	101	108

From this it will be seen that although the number of diseased stools has progressively decreased yet the vigilance of the agricultural staff is as keen as at first. Managers have found by experience that this is necessary to keep their fields clean and maintain their yields.

Gumming Disease.

In common with Australia and other sugar-producing countries, Porto Rico is unfortunate in having present the disease known as Bacterial Gummosis or Gumming (*B. vascularum*). It is not known whence this disease was imported, but its presence was first reported early in 1920 by Mr. Julius Matz, then pathologist to the Insular Experimental Station. Mr. Matz made a detailed study of the disease and published his results in vol. 6, No. 3, of the Porto Rico Journal. The disease was evident in the fields in the eastern end of the island in the summer of 1926, these fields having been planted with gummed sets. There is no doubt that the leaf symptoms exhibited by these particular diseased canes are identical with those used for

* This increase is due to the fact that some further fields were added to the company's holdings.

diagnostic purposes in Australia. However, these leaf markings do not agree at all with those described and illustrated by Matz as being typical, nor were markings corresponding to the latter found on the leaves of the canes in question. The other symptoms, such as the exudation of gum, discolouration and decay of the tissues, and failure to transmit through the soil, agree with those found under Australian conditions. It is the opinion of the agriculturists of the plantations, and this opinion is shared by Dr. M. T. Cook, that any spread of the disease is due to the organism being carried on the cane knives; there is no evidence pointing to the presence of an insect carrier such as is suspected in Australia. As far as can be ascertained there is no connection between rainfall and drainage and the severity of the disease. Although found in most parts of the island Gummosis cannot be said to be doing much damage, and the growers assert that its control is quite easy—due to the large numbers of resistant varieties of cane available. When the presence of Gummosis became known the heavily infested fields were ploughed out and replanted with resistant varieties. The Otaheite, or Cana Blanca, cane proved extremely susceptible and has been eliminated by the disease, while Rayada and Crystallina are following rapidly. With the eradication of these there are now no susceptible canes which are widely grown, and it is unlikely that this condition of affairs will be altered. Matz lists the following canes as highly resistant or immune:—Uba, D. 109, P.R. 233, P.R. 370, P.R. 272, B. 6202, B.H. 10 (12), P.R. 234, B. 3412, P.R. 219, P.R. 230, P.R. 417, P.R. 308, P.R. 209, P.R. 202, D. 433, D. 448, Yel. Cal., P.R. 292, B. 1809, P.R. 309, B. 109, P.R. 229, D. 117, P.R. 318, B. 347.

In addition to these S.C. 12 (4) has been introduced in recent years and has been found to be practically immune. B.H. 10 (12), which is highly resistant, forms half the crop on the basis of its general excellence apart from this property of resistance. The S.C. 12 (4) also gives high yields, and with two such canes as these Porto Rico is in a very favourable position as far as combating Gummosis is concerned.

Eyespot and Dry Top Rot.

The only other diseases of economic importance are Eyespot (*Helminthosporium sacchari*) and the Dry Top Rot (*Plasmodiophora vascularum*). Eyespot has doubtless been in the island for many years, but first became severe in the winter of 1922-23 and again in 1924-25. The disease is most severe during, or immediately following, periods of heavy rainfall; infection takes place in the winter from November onwards. At present the importance is steadily diminishing owing to the eradication of the susceptible varieties such as F.C. 306, D. 109, and H. 109, in such areas in which the disease prevails. The fungus *Helminthosporium sacchari* undoubtedly exists in Australia, but so far it has not assumed any economic importance. The Eyespot disease starts as a very small reddish or occasionally black spot which becomes elongated but usually remains narrow. The centre becomes black and is surrounded by a yellowish zone which may be light green or almost white; the colours blend into one another and vary greatly in relative amounts. As the spots grow old they usually develop ashy coloured centres. They will vary greatly in length from ¼ in. to 3 in. or more, sometimes forming stripes from base to tip. In the young spots the colours are usually bright and clear, but as the spots grow old the colours become dull and disappear with the dying of the leaf. In severe cases the entire leaf, with the exception of the midrib, is practically covered with these spots, the result being the death of the leaf and a checking of the growth of the plant.

The Dry Top Rot was reported by Matz in vol. 6, No. 3, of the "Porto Rican Journal," and it is to be found in all parts of the island. The name of Dry Top Rot is not very satisfactory, inasmuch as similar external symptoms may arise from a variety of causes. The first symptoms are seen in a loss of colour, rolling in or wilting, and finally the drying of the tips of the central leaves. This is followed by the death of the growing points or uppermost joints of the canes which are shorter and thinner than normal. Often the drying of the leaves begins with one or more dead gray longitudinal stripes of about 1 cm. in width, at about the middle of the blades of the innermost leaves. The fibres appear lemon or orange red, due to the presence of *P. vascularum* in the pitted vessels and annular tracheids. The discolouration is usually confined to the lower and subterranean portions of the cane stalk. A section shows spherical orange coloured spores and slightly yellowish granular masses of the plasmodium stage of the organism filling the vessels. The organism inhabits the fibrovascular bundles exclusively. During favourable weather the symptoms are not commonly noticeable, but they soon appear in dry weather. It has been found that the disease is transmitted mainly through the seed, but it is also transmitted through the soil. In control it is advised that healthy cane be carefully selected for planting, that is, cane from fields where the disease does not exist, as seed selection within a diseased field is impracticable. In cases such as old ratoons, where the canes are short, the organism may be found all through the cane, but usually it is found only in the basal portions. Soils which are known to have produced heavily-infected crops should be rotated to legumes or some such crop in order to starve out the disease-producing organism, since all ingestigations have indicated that cane is the only host.

There is also, of course, a certain amount of loss due to root rots of various types, but not much complaint was heard in regard to this as far as the better tilled fields were concerned. The affected canes are characterised by a premature dying of the leaves from the borders in and general symptoms, such as the paling of the leaves and lack of growth, such as might be expected when the roots are not functioning properly. The trouble can be overcome to a certain extent by the use of resistant varieties, but the best means of control is the use of proper cultural methods which keep the plant in a condition to resist the attacks of the root fungi.

The Moth Borer (*Diatræa saccharalis*) and the White Grubs (*Lachnosterna* spp.) are widespread and do great damage. Some men consider that the White Grub causes more damage than any other pest in Porto Rico. On the properties of the Fajardo Sugar Company, 34 acres were abandoned during 1925-26 on account of the damage done by the White Grubs.

The Imperial College of Tropical Agriculture.

The British West Indies are fortunate in that, being very small in general, they usually have but one port of entry; thus it is comparatively easy to erect an efficient quarantine barrier against uncontrolled importation of foreign varieties and diseases. In addition nearly all their cane is grown under the plantation system which is a great help towards control when once a disease has been introduced. As in the case of Porto Rico, B.H. 10 (12) is rapidly becoming the standard cane on account of the outstanding yields obtained. Gummosis was found on the island of St. Kitts, where it was very severe on B. 6032; Otaheite (Cana Blanca) and Crystallina (White Transparent) are also found to be very susceptible. However, with the growing of B.H. 10 (12) and S.C. 12 (4) and the elimination of these susceptible varieties, the disease has not become a serious economic factor. Mosaic appears to have been introduced into practically all the islands at some time or other during the past few years; it is still prevalent in Jamaica, but the other islands appear to have eradicated it entirely by the prompt enforcement of laws compelling the eradication of all diseased stools. Contrary to the state of affairs in most of the British West Indies, Jamaica has a large proportion of its cane grown by the small farmers, and consequently control of the disease has proved much more difficult here than in other centres. The situation was very grave a few years ago, but was relieved by the introduction of Uba, which has constituted most of the crop since then. Although this cane gave a very low sugar content the tonnages were good and there is no doubt that it saved the industry from extinction. B.H. 10 (12) is now being grown, and the Agricultural Department is raising some seedlings from crosses with Uba. The small size of most of the islands and also the small amount of disease present make it impracticable to maintain pathology laboratories. Just now the only pathological investigations are those carried on in Trinidad at the Imperial College of Tropical Agriculture. This institution is, as yet, only in its infancy, but is undoubtedly destined to become a great force for the good of agriculture in the West Indies.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

EFFICIENCY IN SUGAR GROWING.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

Efficiency in the production of cane depends upon a number of factors, the principal of which could be summarised as follows:—

1. Each cane farmer should make a study of his soil, from both a physical and chemical standpoint. The analyses of cane soils are carried out free of charge by the Bureau of Sugar Experiment Stations, and a great deal of useful information can be gained in this way.

2. The equipment of a cane farm should be the best possible, and every attention should be given to the care of implements, preservation of harness, and the health and feeding of farm animals. Ploughs and other implements should not be left out in the weather, but be carefully greased and put under shelter as soon as finished with. The best and latest type of implements should, if possible, be procured, so that work may be done economically as well as efficiently.

3. Labour of the best type should be selected, and the farmer should aim at making his permanent hands comfortable, at the same time giving them to understand that he expects a fair day's work for a fair day's pay.

4. Proper methods of keeping accounts should be adopted on the farm, so that the canegrower knows what he is about and what each operation is costing him. Now-a-days a farmer has to be a sound business man to be efficient, as there are so many different phases requiring attention. He must be familiar with profit and loss, otherwise he will work in the dark.

5. Varieties of cane should be selected which are likely to give the highest results from a commercial cane sugar point of view, and yield of cane per acre.

6. In preparing for a plant crop, the soil should be thoroughly stirred by at least four ploughings, the depth of each being regulated by the depth of soil. In alluvial soils, such as river banks, subsoiling frequently gives excellent results in the shape of enhanced crops. Care should be taken that the soil presents a fine state of tilth just prior to planting.

7. The planting of cane should be very carefully supervised, and only good sound plants free from disease should be used.

8. Fertilisers should be judiciously chosen, and care should be exercised in purchasing, so that the best and most concentrated fertilisers are procured. The farmer should see that he obtains the manure he orders, and should not buy more manure than he intends using. Bags of fertilisers should be prevented from getting wet. Advice as to fertilisers can always be obtained from the Bureau of Sugar Experiment Stations. Rotation should be practised, and green manure crops, such as Mauritius bean and cowpea, made use of for maintaining the nitrogen and humus contents in the soil.

9. It may be necessary on some soils to apply lime for the purpose of sweetening soils, rendering stiff soils more friable, and correcting mineral acidity.

10. The weeding should be carefully and efficiently done, and headlands should be kept clean so as to prevent rats and other pests that injure cane. The canefields themselves also should be kept as clean as possible so that the plant foods in the soil go towards feeding the cane and not towards feeding weeds.

11. Farmers should endeavour to grow their own forage for stock purposes.

12. Vegetable and fruit growing on a small scale is also useful for the dietary of the farmer and his employees, while one or two cows will also prove valuable in providing fresh milk and butter.

13. Every farmer should have a small area for experimental purposes, both for the growing of varieties and the testing out of fertilisers.

It may be objected that to carry out all the above will put too heavy a load on the small farmer, but at any rate these ideals could be kept in view and gradually put into practice. Many farmers of course have adopted most of these objectives towards efficiency and are successful accordingly.

WATER FOR IRRIGATION AND STOCK.

By J. C. BRÜNNICH, Agricultural Chemist.

Every now and then reports are received from the country according to which crops have failed, soils have become unworkable and sterile, on using certain waters for irrigation, and again heavy mortality among stock has been caused by being forced to drink brackish water.

Analysis in such cases always demonstrates that the water was unfit for the use it was put to.

Numerous **analyses of water** are carried out every year in our Agricultural Laboratory and many samples have to be condemned, and it is therefore of the greatest importance that pastoralists and farmers should make use of the Department's services in all doubtful cases.

As it is quite impossible to give with each analysis full explanations of the terms used, and more particularly the reasons why certain waters are not suitable, and why it is practically impossible to improve or purify such water by simple means, it will be of general interest to give here a few **notes on water in general,** and on the conditions under which **waters** are **suitable for irrigation,** or **watering of stock** in particular.

Water is one of the simplest chemical compounds, and consists of a combination of the two gases Oxygen and Hydrogen. It is very widely distributed, and nearly four-fifths of the surface of our earth is covered with water, to an average depth of about 12,000 ft.

Water is one of the most wonderful gifts of nature, and has been recognised as such since time immemorial. Life could not exist without it, as it enters largely in the composition of all living matter. Animal bodies contain from 40 to 70 per cent. of water, and plants even up to 90 per cent.

Chemically pure water is difficult to prepare, and is a perfectly tasteless and odourless liquid. Even **distilled water,** unless prepared with special precautions, will contain small amounts of impurities.

Water is a great **solvent,** and this property to readily dissolve gases, liquids, and solids is of great importance in the household of nature. Water left exposed to the air absorbs gases from the atmosphere, and **rain water** will therefore contain about 4 cubic inches of nitrogen, 2 cubic inches of oxygen, and 1 cubic inch of carbonic acid gas per gallon. If we compare these amounts with the composition of the atmosphere, it will be found that the ratio of composition has been completely changed, as in the atmospheric air we find 4 volumes of nitrogen to 1 volume of oxygen, and only small traces of carbonic acid. This fact that the air dissolved in water is much richer in oxygen is of the greatest importance to the life of aquatic animals. The increased amount of carbonic acid increases its solvent action on soils and rocks.

Rain as it falls, not only dissolves gases, but collects other impurities, as dust, bacteria, and also small traces of salt, ammonia salts, and other nitrogenous compounds.

Next to rain water the water from melting snow and ice, as found in alpine mountain streams and lakes, and having passed only over hard crystalline rocks, is the purest water. As soon as rain water, or other water, passes through the soil, or layers of more soluble rocks, many mineral matters are dissolved, and change the character and taste of the water, which reappears again in form of springs, or is found in wells and bores. The water originally **fresh water,** containing only small amounts of mineral salts in solution, may have changed into a **mineral water,** containing large amounts of mineral matter.

Of such **mineral substances dissolved** the most important are:—

Lime salts, as calcium carbonate (*chalk or marble*) and calcium sulphate (*gypsum or copi*).

Magnesium salts, as magnesium carbonate (*common magnesia*), magnesium sulphate (*Epsom salt or salts*), and magnesium chloride.

Sodium salts, as sodium chloride (*common salt*), sodium sulphate (*Glauber's salt*), and sodium carbonate (*washing soda*).

The behaviour of water when using it washing with soap gives a fair indication of the amounts of mineral substances dissolved. Comparatively pure water, like rain water, readily produces a lather with soap, and is therefore called **soft water.** On the other hand, water containing lime and magnesium salts in solution, as frequently found in springs, wells, &c., are **hard waters,** and when rubbed with soap appear to produce a curdy or flaky precipitate, and only after considerable time a lather can be obtained. This action is a purely chemical one, caused by the mineral salts in the water decomposing the soap.

As a rule, a water of medium hardness, containing mineral salts and gases in solution, is more palatable and better for drinking **purposes** than a very soft water. For household purposes and factory use soft waters are generally to be preferred, as hard waters, besides leading to great waste of soap, on boiling and evaporation give cause to formation of boiler-scale; and some have a corroding action on metals.

One of the most pronounced mineral waters of nature is **sea water,** which contains about 3½ per cent. of solid matter in solution, three-fourths of which is common salt, or expressed in terms more generally used, sea water contains about 2,500 grains of total solids per gallon, of which 1,890 grains are sodium chloride or salt.

Water fit for drinking can be obtained from sea water by a process of distillation, as practised frequently at sea.

Salt, used in excessive amounts, acts like a poison, and therefore animals could not drink strongly **saline** or **brackish water** for any length of time.

Many of our well waters, and waters from shallow bores are saline, but fortunately the **water from artesian bores** are comparatively free from salt. Among about 180 analyses of bore waters, recorded in Dunstan's "Queensland Mineral Index," only ten contained more than 100 grains of salt per gallon, and only six of these more than 300 grains.

The **toleration** of various domestic animals for **salt** has not been accurately determined, and will depend naturally on many circumstances.

We have records that water containing from **600 to 700 grains of salt per gallon caused heavy mortality** among sheep, after using such water for a few months.

Water containing up to **300 grains of salt** per gallon may apparently be **used safely,** although many animals will refuse to drink the water with even this amount. Should water contain from 400 to 600 grains of salt per gallon it should be used for watering stock, in case of necessity, for short periods. Water with still higher amounts is generally unfit for stock.

With regard to the **alkali carbonates,** chiefly soda carbonate, very little is known of its effect on animals, and in the quantities usually found in artesian bore waters no harm appears to be done. Among 180 samples of bore water, already referred to, 109 contained up to 20 grains of sodium carbonate per gallon, the remainder containing more than 20 grains.

The maximum amount of salt recorded in bore water is 1,200 grains per gallon, and the maximum amount of sodium carbonate 576 grains per gallon.

In **Victoria** and **South Australia** water containing **400 grains** of salt per gallon is considered **safe for horses,** with **600 grains safe for cattle,** and **700 grains for sheep.** Water containing as much as 900 grains of salt per gallon has been used for sheep for long periods, and apparently caused no ill-effects, as long as the precaution was taken to allow the sheep to drink only at night time. Evidence collected in **New South Wales** led to the conclusion that **horses** will thrive with water containing **400 grains** of salt per gallon, and **cattle** and **sheep** thrive with water up to **800 grains** per gallon, but the evidence is rather contradictory, as smaller amounts in many cases showed ill-effects and caused mortality.

The fact of our artesian bore waters being more or less alkaline is of greatest importance when such waters are intended to be used for **irrigation,** as **alkali carbonates** (sometimes called " **Black alkali** ") have a very bad action on soil and destroy plant life at certain concentration. Such alkali acts on the humus and the clay in the soil, and often renders it unfit for cultivation, by making it puddle in wet weather, and causing it to dry up into hard cement-like masses after dry spells.

The amount of **alkali carbonate** to be **tolerated** in **irrigation water** depends largely on the quality of the soil, methods of cultivation, and frequency of the use of water.

It is a well-known fact that the **combinations of various salts** in water or soil have an **ameliorating** or **antagonistic effect** on each other, thus minimising the toxic effect of the single salts. It was also found that the **toxic effect** of salts **varies** not only with the **actual amounts** present, but also with the **proportion of the amount** of the different salts to each other. A water containing 28 grains of sodium carbonate per gallon and 50 grains of sodium sulphate allowed some plants to live, whereas water containing the same amount of carbonate and only half the amount of sodium sulphate caused the death of all plants.

Professor Hilgard reports a case from California, where orange trees were killed within three years, by irrigating them with a water containing 21 grains sodium carbonate and 63 grains salt per gallon.

At the Moree Experiment Farm, in New South Wales, opened in 1899 and closed in 1910, bore water containing about 45 grains total solids, of which 34 grains sodium carbonate, per gallon, was used, and even after eight years' continual use excellent crops of oaten hay, wheat, sorghum, and maize were grown. In this case the soil, a heavy black loam, contained about 1½ per cent. of lime. On lighter classes of soil the effect or irrigating with such alkaline water might not have been so successful.

No hard-and-fast rule can be laid down to judge the **suitability of water for irrigation,** but it may be accepted that a brackish or saline water containing about **100 grains total solids,** chiefly consisting of **sodium chloride,** per gallon, is the limit for safe use under favourable conditions. The maximum amount of **soda carbonate** can be taken between **15 and 30 grains per gallon,** according to the nature of the soil to be irrigated and amounts of water to be used.

The injurious action of soda or black alkali may be counteracted to a large extent by heavy applications of **gypsum** to the soil.

The neutralisation of the alkali in the water with strong **nitric acid** has also been advocated, but will on account of expense be never of practical value. On a small scale, to grow a few flowers and vegetables with alkaline bore water irrigation, no other water being available, this treatment of water with nitric acid has proved successful in a few places. But even this treatment has its limits, as continual applications of water containing nitrates (saltpetre), although a great fertiliser, will similarly act on the soil as the alkali carbonate.

In all cases where alkaline bore waters are used for irrigation, the effects on soil and crops should be carefully watched, and the water should never be applied in excessive amounts. The ill-effects of mineral waters on plant life are chiefly due to concentration of the solutions in the soil, and even from waters containing only small amounts of mineral salts, dangerously high quantities may be left in the soil after repeated irrigation in hot, dry weather, which would not be removed until some heavy showers of rain have fallen and the ground is well drained and porous.

Flooding land with **sea water** causes injury to the soil lasting for many years, due to a direct **harmful chemical action** of the salt, and also chiefly to a greatly **impaired physical condition** of the texture of the soil.

Some large areas of land covered with sea water by exceptionally high tides in England in 1921, were under water from two to fourteen days. Land which was originally under grass recovered after three years, but arable land was still unsuitable for cultivation in 1925, although the amount of salt present in the soil in 1924, due to leaching effects of rain, was only 0·05 per cent., an amount harmless to most crops. The soil showed layers of slimy clay, easily puddled into soft mud, which on drying baked into very hard clods. Any attempt at cultivation made conditions worse.

With regard to **analysis of water,** the results are generally stated in **grains per gallon,** and the first value given is the "**total solid matter,**" left on evaporation of water. This solid matter may contain besides mineral salts organic matter and small amounts of combined moisture, which are driven off, on heating the residue to dull red heat. The difference in weight before and after heating is recorded as "**loss on ignition.**"

The amount of "**chlorine**" in the water is given as such, and also calculated as **sodium chloride** or **salt,** although not necessarily all the chlorine is combined with soda, but may be present partially in form of magnesium chloride or calcium chloride. The "**hardness of water**" is expressed as lime carbonate, and when water is supposed to be used for boiler purposes the amount of **temporary hardness,** due to mineral matters being removed on boiling the water, and the **permanent hardness,** due to more soluble lime and magnesia salts, remaining after boiling, are given. Any other alkalinity is recorded as sodium carbonate. When samples of water, intended for irrigation or watering of stock only, are taken for analysis, no special precautions, as recommended for drinking water, are necessary, and any ordinary clean bottle may be used, about a quart of water being required for analysis.

It would be of great interest to **collect further evidence** throughout the State with regard to the **use of alkaline and saline waters** for irrigation and watering of stock. Any signs of disease in crops, or stock, should be carefully observed and reported to an inspector, who then could submit samples of the water in use for analysis, which would be made free of charge. In order to ascertain the tolerated amounts of salt and alkali, inspectors should inquire into cases, where such waters are successfully used, and submit such samples of water for analysis from time to time. In many cases the salinity of well water diminishes after the well has been in use for some time, and all such facts are well worth recording and reporting.

PLATE 25.—MR. S. S. HOOPER, ACCOUNTANT, DEPARTMENT AGRICULTURE AND STOCK.

BROOM MILLET.

Some years ago we were permitted to reproduce an excellent and exhaustive bulletin on broom millet by Mr. G. Marks (then Inspector of Agriculture, Hawkesbury Agricultural College), Manager of the Government Experiment Farm at Grafton, New South Wales, and published by the New South Wales Department of Agriculture. In response to numerous inquiries from different parts of the State on the cultivation, harvesting, and marketing of broom millet it is deemed advisable to reprint Mr. Marks' bulletin in a somewhat abridged form.—Ed.

Requirements of the Trade.

In the manufacture of brooms, three classes of brush are required, which are popularly known as "inside," "cover," and "hurl."

"Inside" millet is used for forming the inside of the broom, and is generally not more than 17 in. long.

"Cover" is the class used for covering the inside and also for forming the shoulders. It is longer than the former, and must be from 17 to 20 in. in length.

"Hurl" is the longest brush, ranging from 20 to 25 in. It must also be fine and straight, and forms the outside covering of the broom. To give a nice finished appearance, only prime hurl can be used.

About 1½ lb. of brush are required to make an ordinary broom, and the three grades are used in about equal proportions.

The soil, climate, and methods of cultivation determine largely the quality of the brush, but in an average season there would be sufficient of each produced to satisfy the requirements of the trade. When grown under exceptionally favourable conditions, a larger proportion of long brush is produced. It may be used as covers, but owing to its length a certain amount has to be cut off, so that its use for this purpose causes unnecessary waste. On the other hand, a dry season will have the effect of stunting the growth, producing a large percentage of "inside" millet, which can only be worked in the inside of brooms. Manufacturers have consequently to purchase elsewhere to satisfy their requirements.

It is not intended to go into detail concerning the manufacture of brooms, as this does not exactly concern the grower. Manufacturers require certain classes, and the farmer should aim at producing those classes which invariably give profitable returns.

Fully 90 per cent. of the millet produced in New South Wales is grown on the rich alluvial lands of the North Coast; and on several of these rivers—notably the Hunter, Manning, and Richmond—the industry may be looked upon as lucrative and permanent. Many farmers have reported their success with this crop, and would not think of reverting to the far less remunerative occupation of maize-growing. The raising of millet need not be confined to these districts, as, with the necessary care, and the aid of a few home-made contrivances, any land which produces 25 or more bushels of maize to the acre will yield profitable returns. On many of our western slopes millet should also thrive, particularly in those localities where irrigation can be carried out. It is advisable, before entering extensively into the production of broom millet, to ascertain from agents or manufacturers the probable requirements of the trade, with the view of obtaining an idea of the prices likely to be obtained during the season. At the same time, should the prices fall after the crop is harvested, the millet may, if properly cured and baled, be stored for a considerable length of time without injury.

The following information may enable beginners in broom millet growing to avoid some common mistakes, and not to neglect any of the important operations which are essential to success:—

What Broom Millet is.

Andropogon sorghum vulgare is a non-saccharine variety of sorghum. It is an annual, somewhat similar in appearance to maize while young; but it has thinner stems and narrower leaves, and, instead of having male and female flowers on separate parts of the plant, they are both found together in the brush at the top. The flowers are of two kinds—perfect and imperfect. The former are set directly upon the branch, and are accompanied by some of the latter, raised upon little stalks. The fine stems of the panicle or brush are the valuable portions; the other parts are incidental. The brush should be composed of seed stems, uniform in size, length, elasticity, and toughness, and of a nice bright colour. The soil and general methods of cultivation will largely affect the character and quality of the product, even though good seed be used. By long and careful cultivation and systematic selection certain desirable qualities have been developed and fixed, which remain

PLATE 26.—A FIELD OF BROOM MILLET AT GOOMERI.

only so long as the conditions which brought these changes about are reasonably observed. When a plant is grown for a particular purpose it should be the cultivator's aim to keep improving it in the direction most profitable to him. This necessitates a careful study of the plant and its requirements, and the conditions which makes for its proper development. In broom millet it is not desirable to obtain a heavy yield of seed, a large development of stalk and leaf, or a sap full of saccharine material, but a special and unusual development of the long, thin stems of which the brush is composed. It makes very little difference whether a large plant is produced or a heavy crop of seed is obtained, provided these stems are long and fine.

Class of Land Required.

The soil requirements of broom millet are similar to those of maize. The best results are obtained from the deep, rich, well-drained alluvial lands of our rivers. It is, however, capable of adapting itself to a variety of conditions, and with proper care and attention, sandy and even gravelly soils, if thoroughly drained, will produce fair returns. Undrained lands make the working and cultivation more difficult; the growth is generally slow and uneven, and there is always the liability of the crop becoming stunted and diseased. To ensure evenness in ripening a soil uniform in character and fertility is essential.

Place in the Rotation.

In the general rotation on the farm, broom millet takes the same place as maize. It is not advisable to adopt the practice of growing it in the same piece of land continuously, unless suitable fertilisers are applied. It has been found, however, in dry seasons, that it does not thrive as well on land following millet as where the previous crop was maize. The reason of this appears to be that, being more drought-resistant, it continues to grow, and thus exhausts the soil of its supplies of moisture and plant-food, when maize would probably cease growing. At the same time, as the brush is usually harvested soon after the flowers have set, the crop can scarcely be classed as a very exhaustive one, particularly if the stalks are cut down immediately afterwards. Where possible, it should follow a leguminous or root crop.

Preparation of the Land.

To obtain the best results, the land must be properly prepared and brought to a fairly fine tilth before sowing. The previous treatment should be such as would destroy weed seeds. The presence of weeds in the early stages seriously interferes with the growth and cultivation of the young plants. Deep ploughing is recommended. This not only ensures greater feeding room for the roots, but it also has the effect of increasing the moisture-carrying capacity of the soil—a fact which must always be remembered, especially in those districts where the rainfall is limited and irregular.

The nature of the subsoil must also be considered. Clays should not be brought to the surface, but can be materially improved by subsoiling. Ploughing operations should be commenced a couple of months before sowing time. This not only allows the land to sweeten by exposure to the weather, but all vegetative growth turned under is generally well decomposed by the time the second ploughing takes place. In early spring the land should be well fined down by means of the harrow, disc, roller, &c.

Sowing and Cultivation.

Sowing should not take place until all danger of frost is over and the soil is thoroughly warmed, so that the seed will germinate at once. September, October, and November are usually the best months. If planted too early, there is not sufficient heat in the soil to cause the seed to germinate, and it will either rot or the young plants will be so weak that the weeds will very quickly outgrow and smother them. It may be sown about the same time as maize, or two or three weeks later, with advantage. Drills 4 or 5 in. deep are struck out with a plough (a double mould-board one is preferable) about 3 or 3½ ft. apart, and the seed planted along these by hand or machine. The latter is preferable, as it sows more uniformly; and, by using a fertiliser attachment, chemical fertilisers may be applied at the same time. An ordinary maize seed-drill, which sows and covers the seed in the one operation, is one of the best for the purpose. During hot or dry weather the seed should be sown soon after the drills are opened, and before the soil has had time to dry. When this system is adopted, hilling can be dispensed with. It prevents a great deal of evaporation from the soil by exposing a smaller surface. Besides this, the plants, having their roots deep in the soil, have plenty of support, and are not so quickly affected by dry weather. The amount of seed varies from 5 to 8 lb. to the acre. When the plants are 6 in. high, they should be thinned out to 3 or 4 in. apart for rich soil, and more space allowed each plant in poor ground. With good, clean, and evenly-graded seed, the sowing may be adjusted so that very little thinning is necessary, thereby saving a tedious and rather expensive operation. The quality of the brush is affected to a very large extent by the manner in which this thinning is carried out. If too much space is allowed, the plants grow very strong and vigorous and produce brush which is coarse and unsuitable for market. On the other hand, if crowded too much they become very fine and weak. To obtain an even crop, it is essential to have uniform sowing and germination, and later on to thin the plants to a uniform distance. Some growers prefer to sow the seeds in ''hills,'' 15 to 20 in. apart in the drills, leaving from six to ten stalks to each. The seed should be covered from ½ to 1 in. deep, the depth depending upon the character and condition of the soil. If it is dry, deeper covering is more necessary than would be the case if the soil were in a good moist condition. Where labour is scarce, several sowings should be made in succession to enable the grower to deal with his crop at regular intervals, and not have the whole area mature at the same time. Rolling the land as the seed is planted ensures a quicker germination and a better stand, particularly if the soil is a little dry. When drilled, the roller at the rear of the machine is quite sufficient. Should heavy rains fall after sowing, and before the seed has germinated, a light harrow should be used as soon as the condition of the soil will admit. When 6 in. high, the crop may be harrowed to keep the soil loose and to gradually fill in the drills, and thus destroy any young weeds. Broom millet makes rather slow growth for the first couple of weeks, and the cultivator should be kept going every fortnight or three weeks, to keep the surface soil loose and friable, to conserve moisture, and prevent weed growth, and in every instance after rains. For large areas, a two-horse spring tine cultivator may be used. When the crop is half grown, under favourable conditions cultivation may cease; in any case the surface roots must not be disturbed by cultivating too deeply. In moist and exposed situations the crop may be lightly hilled, as an extra support is necessary. It is during the early stages of growth that the cultivator is of greatest value, as the soil may then be loosened fairly deeply. The most critical period is when the heads are forming. If dry weather should set in then, the brush will be short and stunted. It may be necessary in some districts to sow early or late in the season so that the crop will not come into flower during such trying conditions. Where irrigation is practised, it is essential to plant in suitably graded land and convey the water by means of open drills between the rows. After each application of water, and as soon as the nature of the soil will allow, the soil must be well cultivated to prevent caking and to conserve moisture.

Manuring.

On soils that are somewhat poor, it is advisable to apply fertilisers. Such crops as cowpeas, field-peas, vetches, and clovers are suitable for green manuring, and may be ploughed under when they have reached the blooming stage or have been grazed off by stock. This latter system works well when mixed farming is carried out, and stock of different kinds are kept. Any vegetable matter should be ploughed under early, to give it ample time to decompose before sowing. Farmyard manure, if available, is also a first-rate manure to apply, as it not only supplies the elements required by the plants, but also improves the mechanical condition of the soil. Chemical manures are also valuable, and are very easily applied. Superphosphate, bone-dust, dried blood, and sulphate of potash will be found

PLATE 27.—A CORNER OF A BROOM FACTORY, FORTITUDE VALLEY, BRISBANE.

the most suitable. The quantities used for maize or sorghum will do equally well for broom millet. The following make a complete fertiliser, and may be applied at the rate of 2 to $2\frac{1}{2}$ cwt. per acre:—

Superphosphate	80 lb.
Dried blood	64 ,,
Bone-dust	50 ,,
Sulphate of potash	30 ,,

The manures should be passed through a sieve, to remove lumps and foreign substances that would prevent them from passing freely through the drills. They should be thoroughly mixed just before sowing, as, if mixed any great length of time before required, they are very liable to "set," especially if the weather is at all damp, and this necessitates breaking up and rescreening before use. It is impossible to state definitely what quantity of manure is required for each class of soil. Growers would do well to conduct experiments on a small scale with manure, mixed in varying proportions, and to notice which give the best results. Soils, even in one locality, often vary considerably in their chemical and physical characters, and by such tests the farmer may soon determine the most suitable mixture for his land. An excessive dressing of manure tends to produce a strong coarse brush.

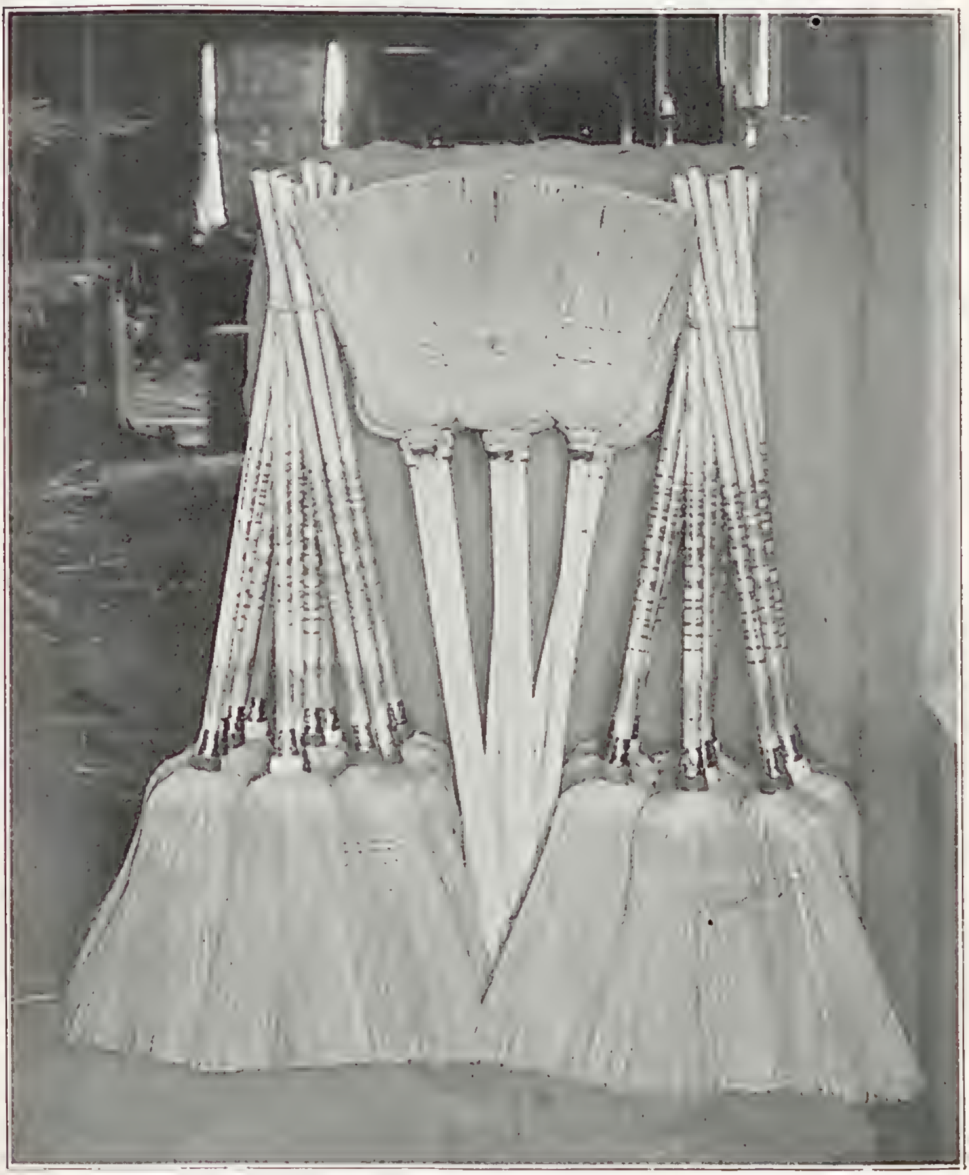

PLATE 28.—A QUEENSLAND PRODUCT—MILLET BROOMS READY FOR MARKET.

PLATE 29.—BENDING BROOM MILLET AT QUEENSLAND HIGH SCHOOL AND COLLEGE, GATTON.

Bending the Heads Over.

The practice of bending the heads over is not carried out extensively in this State, and as a result a large amount of bent brush is sent to market, which can be used only as "insides" or "covers." In many parts of the United States of America this operation is never neglected. When allowed to grow in the natural way, a large percentage of the brush will spread out, and bend over on account of the weight of the seed, and this reduces its market value. This is especially the case if there is good rain when the brush is forming. The rapid growth causes the panicles composing the head to become tender, and unable to bear the weight of the growing seed. Strong winds, at this particular period, will also cause this, and grain-eating birds, when plentiful, are sometimes responsible for a great deal of damage. The illustrations show examples of the brush thus destroyed.

This loss may be prevented by bending the head over, and the weight of the seed in maturing will cause the brush to lie close and straight. The turning must be done between the joints or nodes, as if done on the joints the stem will snap and the top die off. The bending checks the flow of sap a little, but the growth in the head is not materially affected. This operation is performed when the seed is beginning to fill out, and the brush shows signs of spreading.

It should be understood that it is quite possible to grow millet without turning down the heads. Some of the best millet on the market is grown by farmers who do not favour the operation. At the same time, there are seasons when a fairly large percentage is completely spoilt, and such losses could have been prevented by the adoption of this system. The stalks are bent about a foot below the base of the head, and, if the plants are very tall, there may be two bends, as shown in illustration. The heads should hang clear of the ground, so that they will not be damaged by rubbing, or discoloured by the splashing of mud in rainy weather.

Harvesting and Curing.

No matter what care has been bestowed upon the cultivation of the crop, sound judgment must be exercised at time of harvesting. An excellent crop may be brought successfully as far as this stage, and yet the result be unprofitable on account of inattention to, or ignorance of, some apparently unimportant detail. The time to harvest and the various other operations required to prepare the millet for market are such as require some experience in order to do them properly. Even experienced growers are not unanimous on the point of when to harvest the brush, some cutting the heads when in blossom, and others harvesting later so as to obtain better developed seed possessing considerable nutritive value. The time to cut will depend upon the weather and the colour required. Manufacturers generally prefer a millet having a green tinge. It is then much tougher than when allowed to become nearly ripe. To obtain this green colour the millet should be cut when the seeds are in what may be called the dough stage. The brush is then fully developed, but the grain is soft. For some classes of goods a golden colour is preferred, in which case the crop is left till the grain is fairly firm. With a little experience it is easy to harvest a large area, and yet maintain a uniform tint. A strong knife (a pruning knife is very suitable) is used to cut the brush, and at least 6 inches of stalk should be left on. In dwarf varieties the brush should be pulled instead of cut. Select fine weather for this operation. Some growers bend the stalks of drills towards each other diagonally, about 2 or 3 feet from the ground, forming a sort of platform upon which the cut heads are placed to dry. Others cut the whole of the stalks, and lay the millet upon them.

Drying in the Field.

In this State the millet may be properly dried in the field during the greater portion of the summer months. Should thunderstorms occur, the brush must be placed in heaps and covered with tarpaulins, sheets of iron, or other material. The time required for drying depends upon the season, but still, with fine bright weather, two days should be sufficient. The brush must not be allowed to get wet, as rain or dew soon discolours it.

Drying under Cover.

The finest colour is obtained by drying under cover, or away from the direct rays of the sun. The millet is left a couple of hours in the field for some of the moisture to evaporate before being taken to sheds fitted up with racks one above the other, so that the brush may be spread out in layers about 3 inches deep. It must be turned regularly at frequent intervals, and when nearly dry may be placed in thicker layers. This method requires plenty of space and a good deal of attention, and it takes longer to dry.

Removal of the Seed.

The seed is removed by means of a hackler.

The machine consists of a roller studded with small iron spikes, mounted in a frame and made to revolve at high speed. A handful of the brush is held so that the roller comes in contact with the seeds, which are speedily stripped off. A firm at Morpeth specialise in millet machinery, and supply these in hand, horse, or belt power for about £4 10s. and £5 10s. respectively.

For small quantities a handy man can very easily make one, but it is best to purchase one, properly constructed, for treating large amounts.

Grading.

The grading of millet is most important, and must not be overlooked. While grading cannot be done so cheaply or expeditiously on the farm as in the factory, still, in the grower's "own interest, it is essential that some grading be done." It should be sorted into at least three classes—"Inside," "Covers," and "Hurl"; and any which cannot be honestly included in any of these classes should be discarded. Green and golden should also be kept separate.

Baling.

The various grades should be baled separately. For this purpose a press is required. One used for lucerne or other hay can be conveniently adapted for this purpose. It is important, especially where space is charged for in freight, to reduce the bulk as far as possible. The brush is laid with butt ends outwards and the heads overlapping in the middle. Battens may be placed on top and bottom of the bales, and when pressed the whole is secured by five fairly stout wires. The size varies with individual growers; but a bale 46 inches by 30 inches by 24 inches, and weighing from 300 to 400 lb., can be recommended. Each bale should be legibly branded with an indication of the quality. There are several styles of home-made presses in use, but one that is coming largely into favour is made on similar lines to a wool-press, having wire ropes and a lever.

Yield.

The yield ranges from 10 to 15 cwt. of clean marketable brush, and 25 to 30 bushels of seed per acre. The price of broom millet fluctuates considerably with the season; and while it may vary from £18 to £40 per ton, the general average for prime hurl may be set down at £30, cover millet at £25 to £30, and inside millet at £20 per ton. Should the prices, however, be somewhat low when harvesting takes place, the millet may be stored for any length of time without deterioration, and disposed of when higher prices are obtainable.

On account of the seed not being properly developed, it is best to consume it on the farm. Its value may be estimated at 4s. per 4-bushel bag.

Selection of the Seed.

Special attention must be given to the selection of the seed. That obtained in the process of stripping should not be used for sowing. The practice of using such would speedily lead to deterioration and the production of inferior brush.

Good reliable seed can only be obtained by sowing in special areas and allowing the plants to mature their seed naturally. Individual plants may be allowed to ripen their seed in an ordinary field, but there is always a danger of them being hybridised by pollen from plants having inferior brush. In any case, seed should be obtained from those which produce the best heads. By proper cultivation and selection the quality and yield of any variety may be improved. Where seed-eating birds are troublesome, it may be necessary to cover the heads with some light material, such as muslin, when the seed is commencing to fill out. The ends must be tied loosely round the stalk so as not to interfere with the free circulation of the sap. After harvesting, the heads are thoroughly dried, threshed, cleaned, and kept in a place secure from weevils and damp.

Where the conditions for saving seed are not suitable it is best to purchase from reliable seedsmen. There are several varieties on the market, but so far White Italian has given the best results in this State. At the same time, growers are advised to experiment with new varieties from time to time, or introduce fresh strains of those kinds they have in constant cultivation, with the view of finding out what particular kind is most suitable to their conditions.

By-Products.

The object of the cultivator should be to produce brush of the best quality; consequently all other use of the plant must give way to this. In former years millet was allowded to develop a fair proportion of seed, but the diminished value of the brush was not compensated for by the value of the seed obtained. The finest green brush is usually obtained while the seed is in an immature condition, but in the production of good golden-coloured millet a fair proportion of the grain is more or less developed. This contains an amount of nutriment, and can be utilised for the feeding of stock, thus assisting in reducing the expenses of the crop. It is, however, generally more or less soft and doughy, and, if intended to be kept for any great length of time, should be thoroughly dried by spreading out in thin layers on tarpaulins. Growers who insist upon ripening their seed will secure brush of an inferior quality, which brings a low price upon the market, and if exported injures the trade.

Stalks and Leaves.

The plant cannot be recommended as a particularly useful one for feeding purposes. While young a certain amount of sugar exists in the sap, but this soon disappears, and by the time the brush is cut the stalks are more or less dry or pithy, and contain a large proportion of fibre matter which is unpalatable. For this reason very little use is made of them beyond turning stock in after the harvest to feed upon the leaves. The refuse should afterwards be cut up with a heavy disc harrow, or cornstalk cutter, and ploughed under for manure.

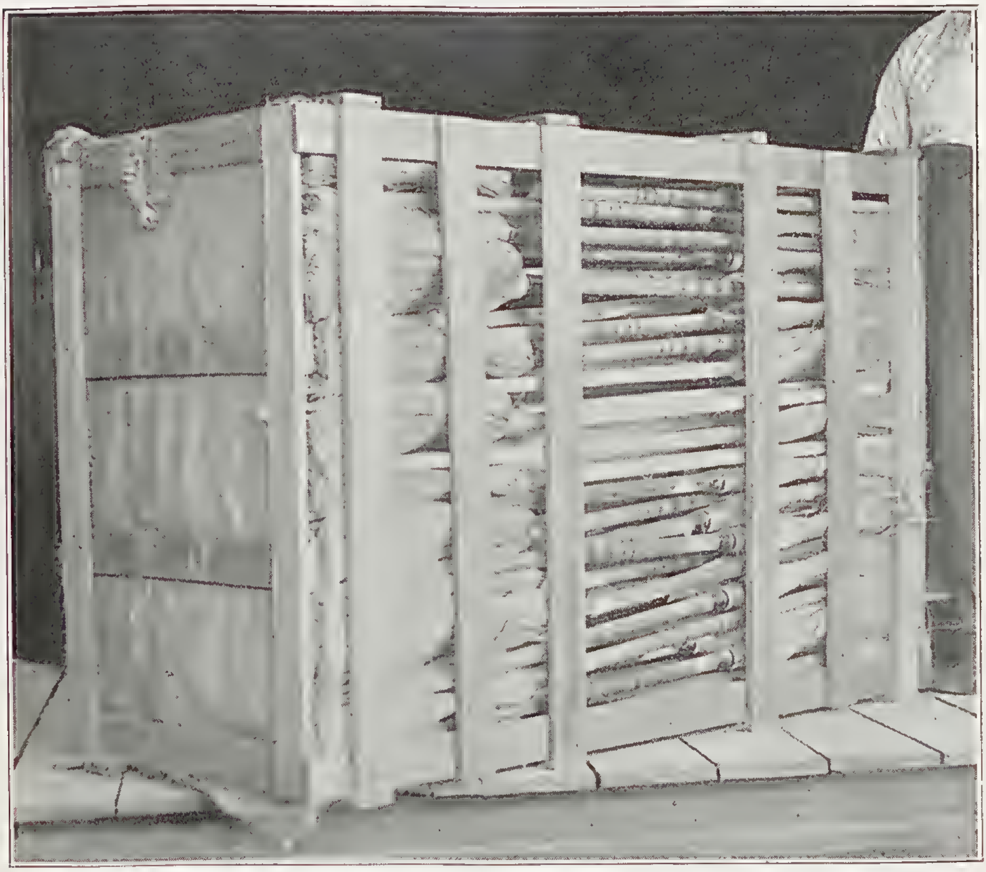

Plate 30.—Queensland Brooms Cased for Shipment.

A FINE TOMATO CROP.

The head gardener, Mr. A. Martin, has grown a very fine crop of tomatoes in the garden at Government House this season. The seed was supplied by Mr. Moore, of Bowen. The plants were put out early in August, they were grown in gravelly soil well trenched, and manured heavily. They had no special treatment, only when the fruits started to swell they were given a good mulching of horse manure. The accompanying photographs give some idea of the crop, and Mr. Martin's trellising method, though they were taken after half the crop had been harvested. Mr. Martin

Photo.: Department of Agriculture and Stock, Brisbane.

PLATE 31.—TOMATOES ("BOWEN BUCKEYE") IN THE GARDEN AT GOVERNMENT HOUSE, GROWN BY MR. A. MARTIN, HEAD GARDENER.

On the edge of the rows showing method of staking, binder twine would be more economical than wire netting.

advises: "I see by the trials at Bowen, Dennisonia came out on top; by the results here Bowen Buckeye beat it for a heavy crop. These two varieties should suit market gardeners or those with a small area of land, but I should advise them to grow them on single stems, in rows 3½ feet apart and 2 feet between plants.

"A cheap trellis to suit that style of growing—1½-inch hardwood stakes 10 feet apart, 5 feet out of ground, and use binding twine to train the plants on; pick all laterals off, and get earlier fruit and very little wastage. Grown this way one can get about the plants easily for spraying, mulching, and picking."

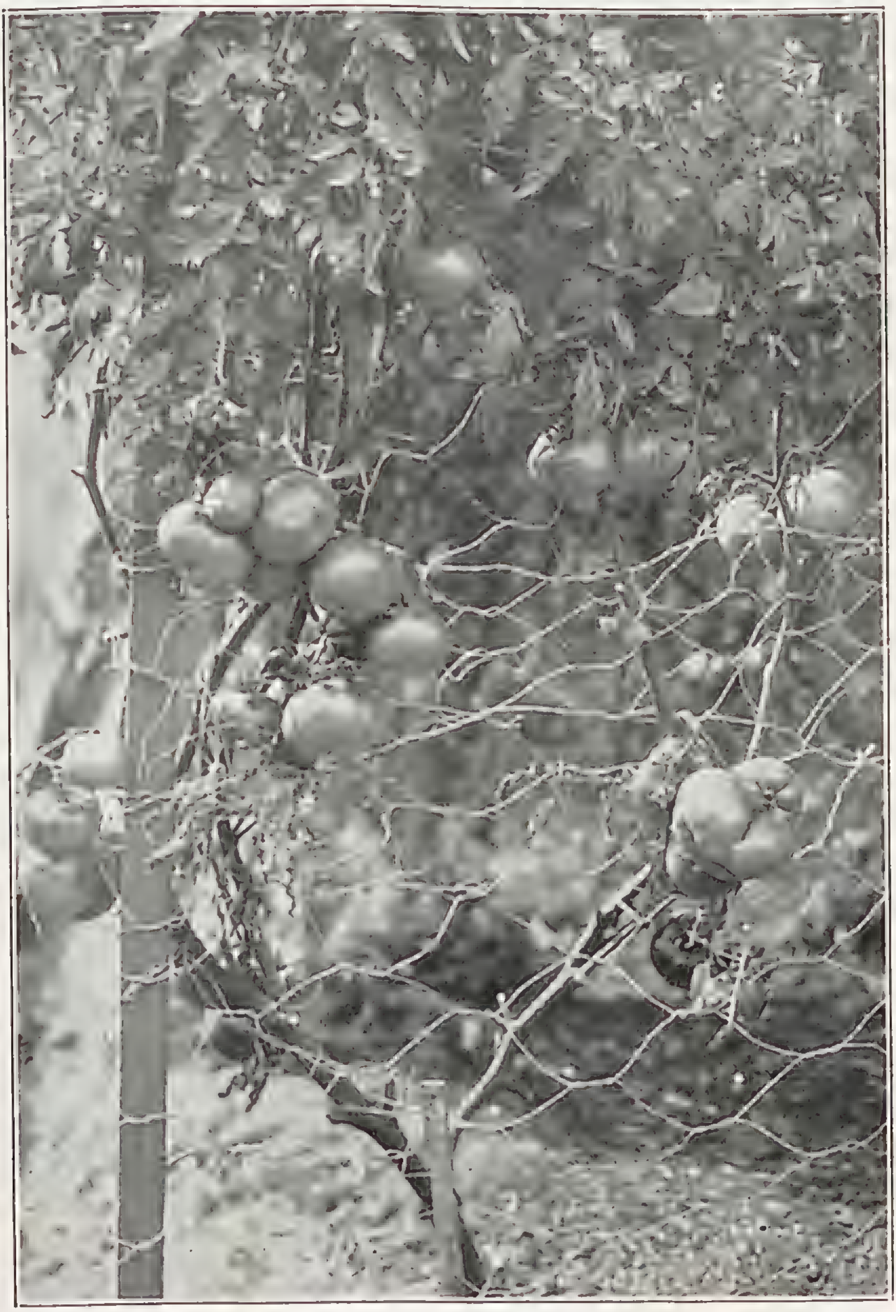

Photo: Department of Agriculture and Stock, Brisbane.]

PLATE 32.—TOMATO DENNISONIA.

A close-up view showing one plant ("Dennisonia") and method of staking. The picture was taken after the plants had been picked over. They were really more prolific bearers than the picture would suggest.

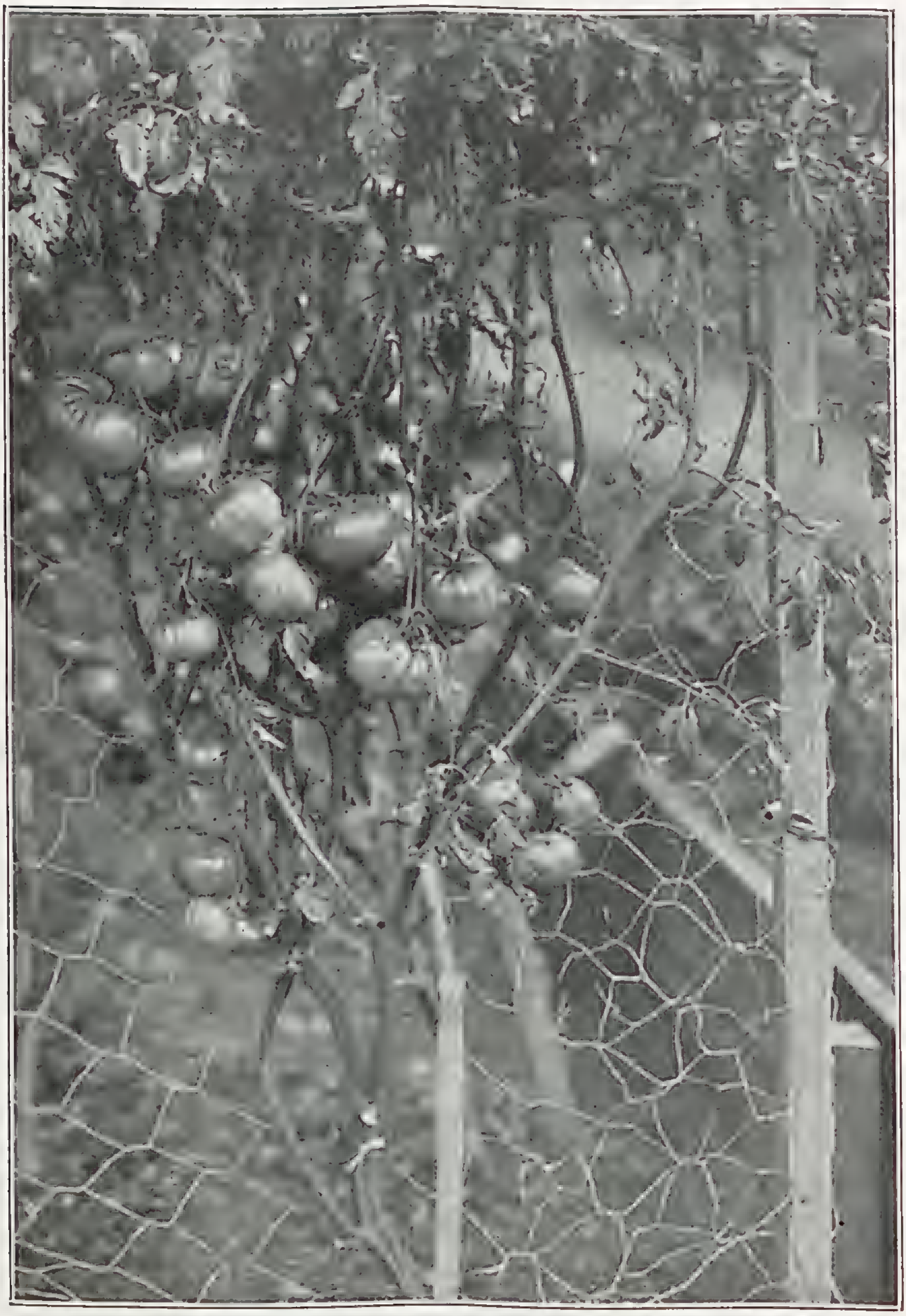

Photo.: Department of Agriculture and Stock, Brisbane.

PLATE 33.—A PLANT OF "BOWEN BUCKEYE"—PORTION OF A FINE CROP IN THE GOVERNMENT HOUSE GARDEN.

SPOTTED WILT OF TOMATOES—WHAT SCIENCE KNOWS OF THE DISEASE.

There are several wilt diseases of tomatoes which are entirely distinct from one another, in that they are caused by different parasitic organisms for which different control measures are recommended. Wilting may be due to the action of parasitic soil-dwelling fungi, or may be caused by a parasitic bacillus. The late blight fungus, as the name suggests, frequently causes blighting or wilting in affected plants.

The spotted wilt or bronzed wilt disease is distinct from all the above troubles. It is well, therefore, not to be misled by the term "wilt resistant" or "blight resistant" tomato, for it generally refers only to a variety which is resistant to the wilt disease connected with *Fusarium* fungus, and certainly does not refer to the other diseases which are at times so destructive under local conditions.

The spotted wilt disease has occasionally caused very severe losses among tomatoes. It is most noticeable in the early crops, but in some years the disease may spread throughout the season. Plants in any stage of development are subject to attack.

The First Symptoms.

The first symptoms appear on the young terminal shoots. Small, brownish discoloured areas develop on the upper surface of the young leaves, and the discolourations spread until the whole leaf is involved. On the slightly older leaflets the disease usually first appears in the form of smooth, greenish-brown spots between the veins. These spots then may extend until the discolourations amalgamate as before. As the disease develops, the affected tissues blacken and shrivel until the shoot appears as though it had been scorched by a flame. Brownish-black streaks may also appear on the surface of the stems and leaf stalks.

Vigorously growing plants seem most susceptible, and sometimes the plant may be killed within the space of a few days. On the other hand, the disease may take several weeks before reaching its full development. Apparent recoveries also have been observed. New shoots may develop from the diseased tissues, and these shoots may grow for long periods before showing the usual symptoms of the disease. The fruits on affected plants usually develop more or less sunken spots, and ripen unevenly. Very young fruits shrivel and fall.

Probably Spread by Insects.

The true nature of the disease is not yet finally established. It is infectious in character, and experiments have indicated that insects are probably the chief agencies in the spread of the disease from plant to plant. All commercial varieties of tomatoes appear susceptible to the disease. The small egg and cherry tomatoes, however, are highly resistant. The disease has also been observed on several other plants belonging to the family *Solanaceæ*.

Tests with seed from diseased tomato fruits indicate that the disease is not carried over by this means. The available evidence suggests that it is carried over from year to year in infected plants—tomatoes or closely related weeds belonging to the same family. Various specifics have been placed on the market with claims that their use results in the prevention and cure of the disease. The vendors of the preparations generally overlook the fact that apparent natural recoveries occur, and that their claims are usually not supported by the results of experimental trials. None of the claims have been substantiated in trials conducted by the Department of Agriculture. The most successful results have been obtained by the use of contact insecticide sprays, consistently applied throughout the season.

Precautionary Measures.

The following precautionary measures will prove of value in minimising losses from this disease:—

1. Remove and destroy affected plants on the first appearance of the disease.

2. Destroy weeds in the vicinity of the crop.

3. Stake and prune the plants.

4. Use insect repelling and destroying sprays, *e.g.*, home-made tobacco washes or commercial nicotine sulphate, and make frequent applications in the early part of the growing season.—A. and P. Notes, N.S.W. Dept. Ag.

CUSTARD APPLE *(ANONA CHERIMOLIA)*.

By GEORGE WILLIAMS, Instructor in Fruit Culture.

Under the heading of Anonas are included a fairly wide range of varieties of small trees and shrubs, but it is to those generally known as custard apples that very much interest is attached, and these are of wide distribution. The Cherimoya (from South America) is the most important; others known locally are the "sweet sop" (*A. squamosa*), "bullock's heart" (*A. reticulata*), and the "sour sop" (*A. muricata*). The "sweet sop" was the earliest introduction; a small tree with medium sized, deeply corrugated, many seeded fruit of pleasant flavour. Distributed throughout coastal lands it has adapted itself to local conditions, and in the Cardwell district has been noted holding its own amongst indigenous vegetation. The "bullock's heart" (sometimes applied erroneously to the cherimoya) attains more pretentious dimensions, producing fruit usually heart-shaped, and varying in colour from brownish-red to yellow. Dark brown seeds are interspersed through the pulp, which is not of high quality. The "sour sop" does not thrive under Southern conditions but luxuriates in the far North, making a very handsome symmetrical small tree with dark laurel-like foliage. Its green fruit, weighing up to 8 lb., is covered with soft green prickles, and is freely produced from the time the tree is four years old. The white pulp, which contains the rather small black seeds, has a pleasant sub-acid flavour somewhat resembling pineapple. Under congenial conditions the tree retains its attractive glossy foliage throughout the year. The previous varieties are almost entirely deciduous. On account of its rapid development this variety was suggested as a suitable stock for the cherimoyer in the warmer parts of the State, but results attendant upon its trial were entirely unsatisfactory. The seeds of the cherimoya from which the original Queensland stock was raised were imported from South America. Numerous plants were distributed, showing with development wide variations in vigour, productiveness, and quality, and it is questionable whether so many types referred to as Island varieties were not originated from this source. From a tree showing much advantage in essential features—vigour, habit, quantity, and quality of fruit—in the Brisbane district, the parentage of the most excellent type of custard apples is responsible. Several variations have been claimed but the original has not been surpassed. It is generally catalogued as Mammoth, or Pink's prolific.

A slight diversity in opinion regarding the most suitable soil for the culture of this fruit exists, but agreement is general that a deep soil of good drainage are the primary requisites. The Redlands district possesses the finest trees and is the principal producing area, though quite equal returns from trees of a given age are recorded from granite soil in the Brookfield district. Vigorous growth and reasonable production has attended planting on the Blackall Range, but for various reasons extensive planting is not there recommended. Unfortunately in the South Coast district many trees are included in shallow soils over rather impervious clay. Under these conditions early decay of the trees can be expected. Drainage, friability, and fertility, aided by humus supply, are absolutely essential to successful culture.

Propagation is affected readily by seeds of the more inferior types but in the cherimoya seeds are sparse, and of these quite 50 per cent. may be infertile. Though seedlings of other varieties do not exhibit many variations, those of the cherimoyer are most unreliable, consequently budding or grafting are resorted to. The latter is generally practised by the method known as whip grafting on nursery stock and cleft grafting on larger specimens. Under unfavourable weather conditions (the operation being performed late in winter or early spring with the start of growth) failures are rather frequent in a system which necessitates the removal of the head of the young tree, and better results attend the insertion of the graft at the ground level in the manner known as herbaceous grafting (on account of its being applicable to soft-wooded plants), the head of the stock being removed subsequent to growth of the graft. Budding is only moderately successful, but could with advantage be applied to trees which were unprofitable and which had to be headed back severely and new vigorous growth induced for bud reception. In selecting budwood the more mature parts near the bases of current year's growth is recommended, though success has followed the use of buds from dormant wood on the early stage of stock growth—the budwood being removed—as also for grafting—from the parent tree prior to the rise in sap.

In most orchards, where trees are grown under exactly similar conditions, variations are prevalent in development and production to the extent of suggesting much room for improvement in the selection of both stock and scion. As the selected cherimoya tree attains the largest dimensions it is advisable that seeds of this be planted for stock production, for disparity in growth is the inevitable result of working a stronger grower upon a weaker one. The scions should be selected from vigorous and most productive branches of the most desirable trees. The usual practice in propagation is to raise the young plants in a seed-bed. where they remain for one season, these being transplanted into nursery rows and budded during the ensuing summer or grafted the following spring. With ordinary care exercised in transplanting failures are very rare, except when trees are prematurely removed, and where this is not responsible for complete failure it is followed by indifferent growth, sometimes not extending beyond a few inches for the whole season and may after twelve months be responsible for the failure of the plant. On no account should the soil in the vicinity of young trees be fertilised at the time of or shortly preceding planting. The young roots are very sensitive and the action following contact with fertilisers has been responsible for many of the failures recorded. The distance apart at which trees should be planted varies according to local conditions—mostly of soil—and where it is improbable that upwards of 30 feet spaces would be fully occupied by developed trees planting is not recommended. Under the most favourable conditions 40 feet is not excessive.

In Messrs. Percivals' "Sunny Grove" orchard at Redland Bay a tree was measured giving a diameter of 36 feet through the branches, and about 38 feet high. It had been pruned prior to the measurements being taken, both the head and outer limbs being considerably shortened. Various trees in this orchard have given an annual return of fully 50 half-bushel cases.

The tree being of rather straggling habit, which is more pronounced in grafted than in budded specimens, systematic pruning must be applied. For the first three or four years this is fairly severe, being modified with increased age according to development. Being of a pliant nature the shoots or branches if allowed to grow unchecked adopt a pendulous or indifferent loose habit with more or less of the extremities resting upon the ground, and where attempt is made to rectify the position by the removal of the lower placed ones the next in succession usually droop and refill their spaces. At planting the young tree should be topped at not more than 30 inches (24 inches is a fair average) from the ground level, and a single fork formed by two lateral branches allowed to grow for the first season, these in turn being shortened to within about 9 inches (dependent on the vigour) of their bases. This is usually followed by two or more shoots from each "arm," two being allowed to remain, and these in turn being shortened to about 12 inches the following season. Similar treatment—the duplication of branches from short "arms"—is applied the following year. Subsequently shortening is less severe and lateral branches may be encouraged, but these should be shortened sufficiently to ensure rigidity and thinned to the extent of preventing overcrowding. Early pruning is considered detrimental, consequently pruning is not entered upon until the first rise of sap in the spring is perceptible. The habit of fruiting differs from that of most deciduous trees in that the fruit is produced on the current year's as well as previous growths.

The fruiting season is extended, but evidently insufficiently so to admit some growers to exercise the requisite care in the selection of mature fruit for market. The practice of allowing immature fruit to spoil sales when expansion is needed is poor policy and directly incentive to diverting purchasers to other lines in which they are not so easily deceived. A really green fruit will not ripen, and it is a direct loss to the purchaser and indirectly to the growers generally; unfortunately the offending grower shares, instead of the whole, but a proportion of the effect of decreased demand occasioned. It is a most simple matter to determine, by the change to paler colour in the interstices between corrugations of the fruit, whether it is sufficiently advanced to ripen, but the persistency of omission in this direction by some growers suggests more than casual oversight and should be dealt with accordingly.

The regular fertilising of fruiting trees is essential, and the following formula is recommended by the Agricultural Chemist:—1 to 3 lb. superphosphate, 2 to 4 lb. meatworks with blood, 1 to 2 lb. sulphate of potash, per tree, according to size and applied prior to spring growth.

Insect pests are seldom present to a serious extent. A small dark-brown beetle destroying the foliage is infrequent and easily combated by arsenate of lead (solution or dust application). Occasionally wax scale appears on the foliage, and soft scale in addition to attaching itself to foliage is sometimes present on the young wood, but with the fall of the leaf both disappear. Mealy bug attacking the fruit may be eliminated by spraying, with force, a nicotine sulphate or spraying oil solution. The most serious disease to which the tree is subject is a type of collar rot similar in effect to that attacking citrus and equally fatal in its result. Originating usually about the ground level, but sometimes several inches beneath it, its presence would not be noticeable until its effect had shown amongst the branches. The remedial measures are clearing away the soil from the base of the tree as deep as necessary to get well below the decaying bark—well exposing stem and root crowns—cutting clean away all dead or decaying bark and painting over the whole of exposed surfaces with crude lime-sulphur solution or Bordeaux paste, allowing the parts to remain exposed until the hole is refilled by other cultural operations. A tree showing dead ends or branches or decay in any part should be carefully examined for collar rot, in fact it is advisable, particularly in older plantations (though young ones are not immune) to include with annual pruning the examination below the ground level of main stems.

Though practically deciduous the Cherimoya is rather susceptible to frost injury. Under a generous rainfall it develops rapidly in the tropics and is productive at a comparatively early age. Not being a good shipper extensive planting for supplying Southern markets must be confined to the southern part of the State.

CHICKEN-POX OR WARTS.

By P. RUMBALL, Instructor in Poultry Raising.

This disease affects fowls, pigeons, canaries, and turkeys, and is prevalent during the period of November until April, often assuming a very virulent form during such time. The writer has, however, noticed the disease in various flocks in Queensland throughout the year, but at periods other than that stated above it is generally of a particularly mild nature. The trouble is principally confined

PLATE 34 (Fig. 1).—CHICKEN-POX ON COCKEREL.

to young growing stock and it not only, at times, causes serious loss by the mortality of stock, but when an outbreak occurs among pullets just coming into lay it generally causes a false moult, with the consequence of a very much decreased egg yield, and this, at that period of the year when egg values are high. Once stock have been affected with the trouble they appear to be in future immune, those that escape are liable to attack at a later date, but in this case it does not have such a serious effect upon the bird.

The disease is of a highly contagious nature, but different attacks vary in degree of virulence or seriousness. The form in which it will appear in is largely governed by the physical condition of the stock. Weak weedy birds are susceptible to serious attacks, while strong healthy stock have greater resisting powers. The disease with the latter class of bird does not make such progress and is easier to handle. The necessity therefore of keeping growing stock in perfect condition is well illustrated. Good conditions will follow good feeding, rearing, sanitary quarters, and correct housing. The latter question (housing) is possibly responsible for more trouble both in reference to chicken-pox and other contagious diseases, than the collective errors in any two or three phases of poultry management. The majority of breeders are desirous of increasing the numbers of their flocks beyond the capacity of their plant, with the result that as the chickens develop they are considerably overcrowded in their sleeping quarters. This overcrowding prevents a free circulation of fresh air, with the consequence that the atmosphere becomes warm, humid, and charged with carbon dioxide. Birds forced to sleep under these conditions are lacking in resisting power and fall ready victims to any form of disease.

The disease, as previously stated, varies in degree of virulence, it also varies considerably in form but there is one particular feature which is common to all forms. Fig. 1 illustrates the wart-like growth which is common to all forms, this is, however, only a mild case. The mild form of the disease in this condition was probably due to the good development and condition of the bird.

In the early stages of the disease there is generally a slight elevation of temperature, diminished appetite, and a general dulness, but these symptoms are frequently overlooked. After a time slight yellow eruptions or pimples appear,

PLATE 35 (Fig. 2).—CHICKEN-POX—BABY CHICK.

varying in size from a pinhead to that of a sorghum seed. This stage is also occasionally unnoticed, and it is not until many of these eruptions have run together and turned a dirty light-brownish colour, that the disease is noticed. From the wart-like growth of the disease in the advanced stage, the term "warts" is taken. The wart-like growths are generally confined to the bare parts of the head, such as the root of the beak, nostrils, angle of mouth, ear lobes, wattles, comb face and eyelid. Individual warts may attain the size of a pea, but there is a general tendency for them to spread from one to another until a considerable portion of the bare part of the head presents a roughened mulberry-like growth as is illustrated in Fig. 2.

When the eyelids become affected they are more or less swollen and closed, and it becomes impossible for the bird to see, with the result that they rapidly lose condition on account of lack of food.

In some forms of chicken-pox there is not infrequently a discharge of a catarrhal nature from the nostrils, mouth, throat, and eyes, canker formation (cheesey like growths) appear at the angle of the beak and diptherietic lesions may also be present. When such is the case there is that pronounced putrid smell of roup, and the disease is in its most serious form.

In mild cases the disease may run its course in a week or two with very little attention, but in the majority of cases the disease progresses, the wart-like growths increasing in size and numbers, the bird becomes emaciated, rapidly so when the eyes are affected, and death ensues from exhaustion.

Treatment.—As chicken-pox is of a highly contagious nature, isolation of sick stock should be practiced to prevent the spread of the disease and to facilitate treatment. A general disinfection of premises and clean-up should follow. A wet mash could be fed once or twice daily containing abundance of good succulent green feed. This could be moistened with milk if available, and at least two feeds a week could contain epsom salts at the rate of 1 ounce to every twenty adult birds or forty half-grown birds.

The wart-like growths could then be painted daily or every second day with any of the following:—

1. Carbolised glycerine; 1 part carbolic acid in 15 parts glycerine. Olive oil may be used in the place of glycerine.
2. 10 grains silver nitrate to the ounce of water.
3. Iodine paint, 5 per cent. solution.

After a few applications, according to the severity of the case, the warts will usually drop off. In cases where there is a discharge from the nostrils and eye they should be cleansed with equal quantities of hydrogen peroxide and water or some mild disinfectant. This is best done by means of a syringe or small oilcan. This could then be followed up by placing a few drops of tincture of iodine, with the aid of a medicine dropper in the eye and up the nostrils.

When canker formations are present in between the beak, roof of mouth, or throat they should be painted with iodine or lightly touched with the carbolised glycerine or silver nitrate solution. Douglas mixture added to the drinking water once or twice a week will also be found to be of advantage.

The Poultry Expert of New South Wales makes the following recommendation for the prevention of chicken-pox, but the period of liability to the attack in Queensland is apparently much longer here than there. Mr. Hadlington states, in connection with the prevention of chicken-pox: "The measures that may be adopted to this end are simple, but they must be commenced at the right time, and they must be faithfully carried out. To be effective, a commencement should be made about the first week in January, and a tablespoonful of flowers of sulphur for the equivalent of every fifty adult birds should be given in the morning mash every third day for a period of three weeks. This should then be stopped and for the next three weeks epsom salts should be added every third day to the drinking water at the rate of one ounce to the gallon. At the end of three weeks stop the epsom salts and return to the flowers of sulphur in the mash, and continue alternating these treatments until the period over which chicken-pox is seasonable is passed."

The protective value of the above treatment in Queensland is not definitely known, but the use of epsom salts and flowers of sulphur will be found to be very beneficial in cleaning up an outbreak of the trouble.

Plate 36.—Mr. P. Rumball, Poultry Instructor,
whose services to the industry are greatly appreciated by Queensland poultry raisers.

EDIBLE TREES AND SHRUBS.

The following note has been abstracted from a reply by Mr. C. T. White, Government Botanist, to a correspondent who sought information regarding trees and shrubs for planting on pastoral country as an insurance against drought:—"The planting of edible trees and shrubs will, in my opinion, be found one of the best methods of combating droughts in the West in the future. Unfortunately, a lot of the very best trees, such as the Mulga and Boree, are of very slow growth and seed is not stocked generally by seedsmen. The same cannot be said, however, of the Kurrajong, and for general planting in the West this is probably among the best of our indigenous trees. Seeds are nearly always procurable from reliable nurserymen, and some can supply large quantities of trees at reasonable rates. Among shrubs, the 'Old Man Salt-bush' (*Atriplexnummularia*) is worthy of cultivation. Seed is often procurable from agricultural seedsmen. Among exotic trees worthy of planting are the Phytolacca or Bella Sombra Tree (*Phytolacca dioica*) and the so-called 'Portugese Elm' (*Celtis sinensis*). Seeds of the former are obtainable from Mr. R. Dick, Peruga, via Ipswich, at, I think, 2s. a large packet. It is drought-resistant and an extraordinarily rapid grower. Seeds of the Celtis are not usually stocked by seedsmen."

WEED TAINT—WARNING TO DAIRY FARMERS.

When unusually dry conditions prevail dairy cows are given to eating plants or shrubs that possess strong odours and flavours which become absorbed in the milk and products therefrom. Recently samples of milk, cream, and butter possessing a strong disagreeable smell and flavour have been submitted to departmental officers for investigation. A sample of the plant eaten by cows producing such milk was submitted to the Government Botanist for examination and report. The analytical report showed that the butter was normal, while the bacteriological examination of the milk and cream showed evidence of clean milking methods and the use of clean utensils. The Government Botanist identified the plant submitted as *Rivina Lævis*. It would be advisable where this plant has been identified that immediate steps be taken to eradicate it.

The following full report on the plant by Mr. C. T. White, Government Botanist, is reproduced for the benefit of dairymen unacquainted with it, from the "Journal" of March last:—

RIVINA (*RIVINA LÆVIS*).

Description.—A slender, branching plant 2 to 3 feet high. Leaves on long stalks of ½ to 1½ inches. The leaf itself (blade) ovate-lanceolate in shape, variable in size, 2 to 5 inches long, ¾ to 2 inches wide, dark-green above, paler beneath, veins raised underneath. Flowers small, in slender racemes in the forks of the branches, at first only 1 inch long but lengthening in fruit to about 4 inches; the flowers themselves white tinged with pink, about 2 lines across. Fruit at first white, then pink, and finally a bright red when ripe, fleshy, about ¼ inch in diameter, filled with a red, watery juice and containing a single seed; seed black, about 1 line across, covered with short rather scattered bristles.

Distribution.—A native of Brazil. In Queensland it is found as a weed in coastal localities from Brisbane northwards to the Atherton Tableland. Generally speaking, it occurs along scrub tracks and edges, along fences, &c., where it can get partial shade.

Common Name.—In Queensland, owing to its property of tainting milk, it is sometimes known as "Stinking Weed," a name, however, applied to several strong-smelling plants.

Botanical Name.—Rivina, in honour of Dr. A. Q. Rivinus (born in 1652), for a long time Professor of Botany and Medicine at Leipzig; *lævis*, Latin, meaning smooth, in allusion to the smooth stems.

Properties.—In the "Queensland Agricultural Journal" for February, 1924, Mr. F. J. Watson, Instructor in Dairying, has a note on this weed.*

He states: "The attention of dairymen is called to a weed or shrub which is at the present time a frequent cause of a very serious defect in cream. This plant is not usually eaten by cows, but sometimes in time of drought one or more cows of a herd will take a liking to it, with the result that if their milk is mixed with that of others the whole becomes tainted. The taint is abominable, and is so penetrating that the cream from the milk of a single cow fed on the plant will taint a whole vat of cream and the butter made therefrom; and as cream so tainted is unfit for human consumption, it behoves dairymen to be on the lookout for cows addicted to the habit of eating the weed, and to exclude their milk from use for dairy purposes. . . . . Cows that eat the plant are easily distinguished from others by the fact that their milk tastes and smells of the plant, and their excreta give forth a very unpleasant odour."

The plant has several times been received for identification with the report that it gave a very unpleasant odour to the milk of cows that fed on it.

Eradication.—On account of the sheltered position in which the plants grow, hand-pulling or hoe-chipping is the only satisfactory method of eradication.

Botanical Reference.—*Rivina lævis* Linn., Mant., p. 41.

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*The weed is referred to an allied plant *Monococcus echinophorus*, but there is no doubt that from his description *Rivina lævis* is the plant referred to, a mistake having arisen in some way. *M. echinophorus* is a scrambling or semi-climbing shrub with burr-like fruits.

PLATE 37.—RIVINA (RIVINA LÆVIS).

ARE QUEENSLAND WOOLS DETERIORATING?

By W. G. BROWN, Instructor in Sheep and Wool.

For some time I have been receiving letters asking that I should say something regarding merinos, especially those of the men possessing from 2,000 to 5,000 sheep. I shall first give a short review of the merino in Queensland from the beginning, and then show how any man can improve his flock. In discussing the above it is necessary to go back into somewhat ancient history to obtain data.

In regard to the average weight of fleeces per head, it is doubtful if it has increased materially during the past 25 years. There is, however, not the least doubt that the modern sheep carry very nearly double the weight of clean scoured wool than was carried say in the 70's and 80's. It is nearly 80 years ago since the late Frederick Bracker brought a flock of sheep to Queensland. The North British Australian Investment Company stocked Rosenthal and Toolburra in the Warwick district with sheep. They were all Saxony type of sheep, superfine wool, comparatively small bodies, and a short, true clothing.

For several years (1892 to 1896) I handled descendants of these sheep at St. Ruth, Dalby, and the average weight of fleece was about 5 lb. greasy. The clean scoured yield was not more than 2¼ lb. in any estimate. The wool was heavy with yolk, with a heavy black shotty tip. No lambs were ever shorn as the wool was too short.

The late Mr. John Matheson, one of the best sheepmasters I have known, and who had been in the employment of the N.B.A. Company for over 50 years, was manager. He informed me that the St. Ruth fleeces were heavier than those on Rosenthal and Toolburra. The average weight of fleeces when the wool was washed on the sheep's back was about 2 lb. The N.B.A. Company's sheep I take as a typical example of the kind carried generally on the Darling Downs, where the first sheep were installed in Queensland.

Up till well on in the 70's the fine short wools prevailed. From that period they have been ousted from Queensland by the Rambouillet type, otherwise the Wanganella, with a good infusion of the Tasmanian merino.

The Saxony type were utterly unsuited to Western conditions. The super-fine wool of the Downs degenerated into cobweb and the animals were found to be unable to withstand hardships of any kind. There is not a single flock of the old time Steigner and Gadigast Saxony merino to be found to-day.

Introduction of Wanganella Sheep.

The introduction of the Wanganella or sheep allied to the Peppin and Webber Rambouillets altered all that. The weight of fleece was doubled, and the animals proved to be able to withstand hardships as no other has done. The Vermonts intruded for a few years, but for similar reasons as with the Saxony type they are now utterly discredited. It is perhaps a coincidence, but the advent of the wrinkled fatty-woolled Vermonts was followed by the blowfly pest. The Saxony wool, of course, brought many pence per lb. more than the Wanganella and its congeners, but this was far more than made up for by the increased weight of fleece, size, and robustness of constitution. Yet the Saxony type left its mark; it transmitted beautiful character, softness, and a certain fineness, which the ancient Rambouillet did not possess to a very great degree.

One of the questions I am asked is has merino wool deteriorated in Queensland? I am of opinion that, generally speaking, it has not. In the Departmental wool room there are many examples of Queensland-bred wool. These were collected for the Dunedin Exhibition, and were recently returned. They are all good, but several fleeces stand out on their own. Two or three of them, bred in the Central District, cannot be excelled anywhere. Mr. Millear, of Deniliquin Stud Park, a great breeder of the Wanganella strain, came up to the Departmental exhibit at the last National Show. I pulled several fleeces out for him to examine closely, and he told me that for style, weight, and quality they would be hard to beat anywhere.

As to Queensland wool deteriorating or otherwise a flat rate of 15½d. per lb. was paid by the British Government during the war for every pound of wool produced in the Commonwealth. The flat rate of 15½d. per lb. was exceeded on Queensland wools by over 1d. per lb., Tasmania by ½d., all the other States showing less than those figures. Of course, Tasmania had only comparatively small production as compared with Queensland. Queensland thus heads the Commonwealth in price per lb. At a Bradford inquiry two years ago, Queensland wools took pride of place in almost every respect.

Looking Back Forty-three Years.

I can look back to 1883 and say without hesitation that the best Queensland wools have not gone back. It remains to inquire in what way the general average can be raised, even if only reasonably near to the best. There is no reason, I think, why a man with four to five thousand sheep should not possess a first-rate flock of sheep quite as good as most stations, other than stud stations. This applies not only to quality, but weight of fleece.

Plate 38.—Mr. W. G. Brown, Instructor in Sheep and Wool, whose services to the pastoral industry are appreciated by Queensland sheep men.

Sheep Classing.

A few hints to beginners on sheep classing may be useful to the smaller holder, and are here reproduced. It may encourage a beginner to know that there is nothing to stop him from becoming the owner of a flock of first-class sheep, given that he possesses common sense. Of course there must be natural aptitude and liking for the vocation, these factors being essential to success in any business.

On the other hand, there is no royal road to success in the calling; unremitting care and observation, plus hard work, being most necessary. This article contains nothing severely technical, being for beginners. It proposes to give a method by which a selector may, by using his common sense, bring an indifferent flock up to the level of the best, even if to begin with he has little or no exact knowledge of sheep or wool.

The method is a simple application of the Darwinian theory of "evolution by selection," which is defined thus:—"Pure selection, operating on material which is not the direct result of a cross, modifies the animal or plant, and leaves it different from what it was when selection began. . ."

It was by this method that every one of the great studs of Australia was established. The sheepmen of sixty or seventy years ago, starting with little or no knowledge of the merino, and with what we would now call most unpromising material, have, with the assistance of good, natural conditions, made available to the present generation types of merinos which are the admiration of the world. They worked day in and day out among their flocks, until they knew every individual animal, its excellences and its defects. By selection and combination, often with different ideals, the historic flocks were established, and now Australian wool is a synonym for all that is excellent in that staple. The nations come to us for their fine wool; they copy Australian methods of working; and, as the South Africans are now doing, are paying very high prices for our best sheep.

Sheep-classing is another name for selection. The best ewes are selected from a given flock, and rams are selected to join them, so that the progeny shall retain the good qualities possessed by their parents, or better them.

It is not necessary that every sheep-breeder should become a stud-master in the highest sense. There are many old-established flocks wherefrom to draw good animals for flock purposes, but it is certainly desirable to make an indifferent flock a very good one, and it is within the reach of most to do so.

The Small Flocks.

Coming from the general to the particular, we shall assume that the selector possesses, say, 3,000 ewes of average quality. As, in the great majority of cases, these will consist of good, indifferent, and bad, in varying proportions, which can only be determined by inspection or classing, how shall the owner know which is good, indifferent, or bad? "Goodness," of course, is relative. One man's best may be only second-rate in another's flock, but we shall assume that in this case his best ewes shall be the biggest-framed ewes he possesses. That quality is easy to recognise by inspection. But it is possible that the biggest-framed ewes are so badly covered that it can be seen by the tyro that relatively it is badly covered. With these two factors, then, begins and ends his knowledge of sheep as they stand in the yard—*i.e.*, size and covering. He can say of this sheep, "It is big," and of that, "It is small," and of another, "It is badly covered." What shall he do next? He must wait until shearing time, and then, whatever other work may call, he must stay on the board where, say, four shearers are taking off his clip. He knows a big sheep, or at least a relatively big sheep, and he knows a small sheep. He will have an opportunity, in the ten days or so while the ewes are being shorn, of seeing each animal in detail. He will see that although his flock has been running on the same country for the past twelve months, some big, bright fleeces, weighing as much as 8½ lb., and possessed of big frame. He will see also fleeces dull, short, and dirty on big-framed sheep, and will also see undersized animals with poor fleeces, and between these average sizes with average fleeces.

Obviously his big sheep with the big, bright fleeces, are his best sheep, and the small sheep with bad fleeces are his worst. Let him take his brightest and biggest, and putting a distinguishing earmark on them, call them his No. 1 flock. His worst he shall never use again, but shall fatten them if possible and sell them as mutton, for they are an encumbrance, and a danger to the well-being of his flock. All between he shall call his No. 2 flock. He shall buy good rams, and select the best of these for his No. 1 flock.

He may make a few mistakes at first, but as he acquires confidence in his ability to judge of the weight of fleece and its brightness, he will make fewer and fewer mistakes.

In a few years he will have found that his No. 1 flock has become the apple of his eye, and that he is constantly watching his sheep to promote or degrade as he learns which are really good in either flock, and gradually his No. 1 rises in quality and numbers, and his ideal rises with it too, until at last he has a flock worth owning. Besides that, he will have acquired much comparative knowledge by watching and learning from his neighbours.

The above is not a fancy picture of what a man may do and learn. I knew a man who took up a selection twenty years ago in Western Queensland. At first he knew little or nothing of sheep, but by practising in much the same way as I have indicated he became, in a comparatively few years, a man whose opinion on sheep matters was worth having, and to-day he has a flock which anybody would be proud to own.

Be on the Board when Shearing is going on.

Observe: It pays a sheep-breeder to be on the board while shearing is going on. His harvest is being gathered, and the results of twelve months' solid work and expense are at stake. It is the only opportunity which he will have of seeing his sheep in detail, which is impossible at any other time. He will learn, what is obvious surely and yet is not generally acted upon. I have found that the sheep which does best on any particular country is the best kind of sheep for that country, and if a sheepman takes his best ewes and puts better rams to them his flock must improve, until at last he is either at or near the top. He must always dispose of his culls. He must remember that the stud-masters of old had greater difficulties than he. Yet, look at their works. He must exercise care, watchfulness, and common sense, and besides these a constant asking of questions of successful men in his district. He must remember that the man who knows all about sheep knows nothing; and, finally, he must not overstock when he learns the capacity of his country, for

Feeding and weeding
Is the secret of breeding,

which are the elements of sheep-classing, alias "selection."

AGRICULTURAL ECONOMICS.

DEPARTMENTAL COMMITTEE APPOINTED.

The need for stimulating economic thought in relation to agriculture is becoming more and more evident, particularly in view of the present position, in all its complexities, of rural industry. The economics of agriculture have not up to the present stage in our development received very much attention, the efforts of the Department of Agriculture and Stock being restricted more or less to instructional, cultural, and field experimental work.

Speaking on this subject recently, the Minister for Agriculture and Stock, Mr. W. Forgan Smith, said that in Queensland in recent years, as a consequence of a more direct system of agricultural organisation, which has been encouraged by the Government and strengthened materially by appropriate and comprehensive legislation, farmers have come to recognise more clearly the economic forces with which they have to deal both on the farm and in the market place. Within the last decade or two remarkable progress has been made in our field practice and technical processes and, though we have made an extraordinary advance on what may be called the technological side of production, on the economic side it is almost a case of "as you were." In all agricultural countries it has been discovered within recent years that closer attention must be given to the economics of agriculture. In this respect Queensland is not an exception, and we have just got to that stage in our agricultural development when further progress must be directed along lines of scientific economic inquiry.

In view of the projected extension of closer settlement in certain areas of the State, the advantage of a complete survey of the economic facts affecting farming in those particular districts is recognised. In all cases where people set out to make a living from the land it occurs, regardless of the class of farming they intend to pursue, that there must be some basic factor of acreage necessary to cultivate for any particular crop, and the volume of production required in order to ensure the settler reasonable prospects of success. A consideration of one or more basic factors may be necessary in order to give prospective settlers some indication of the lines on which they should plan and general guidance in their enterprise.

It is considered that among the officers of the Department of Agriculture and Stock there are men capable of making such an economic survey, and informing the Minister of the basic requirements in land and stock for any specific purpose in any particular district.

Accordingly a Departmental Committee has been appointed to carry out such an economic survey, consisting of Messrs. E. Graham (Under Secretary, Department of Agriculture and Stock), L. R. Macgregor (Director of Marketing), H. T. Easterby (Director of Sugar Experiment Stations), H. C. Quodling (Director of Agriculture), M. B. Salisbury (Land Commissioner) representing the Lands Department. Mr. J. F. Reid, Editor "Queensland Agricultural Journal," will act as Secretary. The Committee will have power to co-opt other departmental officer whose services may be required from time to time.

Photo.: Underwood & Underwood.

PLATE 39.

This is a photograph of the fine old Black Hamburg vine at Cumberland Lodge, Windsor Great Park, which supplies the table of King George of England. Some of the bunches weigh four and five pounds and many of the choicest clusters are sent to the hospitals and other public institutions. The vine was planted about 150 years ago, is of enormous size, and has a spread of 3,600 feet.

AN AGRICULTURAL SURVEY.

COMMITTEE OF EXPERTS APPOINTED.

A commencement of the agricultural survey of Queensland is imminent, and the committee of experts by which it will be controlled has been appointed as follows:—

Mr. E. Graham (Under Secretary for Agriculture), chairman.
Professor H. C. Richards, D.Sc. (University of Queensland).
Mr. H. C. Quodling (Director of Agriculture).
Mr. R. Veitch (Government Chief Entomologist).
Mr. J. C. Brünnich (Government Agricultural Chemist).
Mr. C. T. White (Government Botanist).
Mr. F. B. Campbell Ford (Acting Surveyor-General).

The appointment of the committee was announced by the Minister for Agriculture and Stock (Mr. W. Forgan Smith) recently, when he also said that it was intended that a meeting of the committee would be held at an early date, and that included in its early work would be the formulation of a basis of operations.

It was not considered necessary that the committee should personally engage in the field work that would be involved in the survey, and that phase of the investigation would be delegated to technical officers attached to the Department of Agriculture and Stock.

Scope of the Survey.

Amongst the matters involved in the agricultural survey would be:—

(*a*) A close study of the formation of the soil.
(*b*) The character of the soil and subsoil.
(*c*) Climatic conditions, rainfalls, temperatures, &c.
(*d*) The vegetation now in evidence.
(*e*) The insect life present.
(*f*) The class of agricultural products that can be economically grown in each zone.
(*g*) Facilities for marketing produce.

The foregoing included what might be regarded as the major matters for investigation. Of course, it might be found necessary to add to these from time to time as the work, which would extend over a considerable period of time, developed.

Mr. W. Forgan Smith added that it was proposed that the starting point would be in the coastal and hinter lands north of St. Lawrence, and the survey would ultimately encompass practically the whole of the State.

As a result of the data that would be made available from these investigations, it was expected that a large amount of fertile land, at present non-productive, would be brought under agriculture. It was obvious that a further extension of the sugar-growing areas was not practicable, but, on the other hand, there were certain agricultural products of a tropical and semi-tropical nature that were imported in large quantities into the Commonwealth, and if it was found that the soil and climatic conditions of Queensland were suitable for their production a serious attempt would be made to encourage the growth of these articles in Queensland.

The appointment of the committee has been generally well received by all interested in agricultural progress in Queensland, and the subjoined editorial, taken from the "Telegraph" (Brisbane), of the 7th January, may be regarded as typical informed comment:—

Taking Stock.

"The Minister for Agriculture has now announced the personnel of the committee which is to undertake the survey of the agricultural possibilities of Queensland. It will be seen that it is an eminently practical body of technical experts and scientists, who, between them should be capable of outlining definite developments which can only be made apparent and safe to follow in the light of a fuller understanding of many things on which the average settler is almost necessarily ignorant. Hitherto progress has been more or less haphazard and accidental. Science has now opened many doors that were formerly closely sealed, and it is possible to do systematically and with certainty what has been experimental. The essential thing now is to place the State in a position to take full advantage of that knowledge, and the agricultural survey will canvass the natural resources of the State in the matters of soil, climate, rainfall, possibilities of intensive culture, and evils to be avoided and overcome. With all that knowledge reduced to well-arranged data, the agricultural production of Queensland will be in a position to forge ahead with much greater security in the matter of successful crops, and greater variety of crops. The scheme fits in admirably with the important educational development which is to be inaugurated in March with the founding of a Faculty of Agriculture at the Queensland University. The State will be in a happy position to make use of the training which will result from the new course, and if only this concentration of attention upon land interests produces a corresponding stimulation of settlement, we shall see an end of the unfortunate dimunition of selection and production which has marked the last few years of Socialist control, though no expectations in that direction can be fully realised until freehold tenure is restored.''

UTILITY POULTRY STANDARD.

Type; Colour (plumage and lobes); *Legs and feet* (colour); *Condition*—Health, furnishing brightness and cleanliness of feather and legs; in accordance with the accepted standard of the breed.

LAYING CHARACTERISTICS, ANY BREED.

Conformation—

(*a*) Length, depth, width, proportionate to type of breed.

(*b*) Length as taken from base of the neck to base of the tail.

(*c*) Depth to be determined by the vertical space between the back and the breast-bone and the pelvic bones.

(*d*) Width as measured across the saddle and immediately behind the wings as is indicated by the distance apart of the legs.

Freedom from Coarseness—

(*a*) Shanks strong, as differentiated from either extreme coarseness or fineness of bone.

(*b*) Pelvic bones strong at base; long, fine, and straight.

(*c*) Tissue—pelvic bones to be as free as possible from gristly covering.

Head—Finely modelled; skull deep over eyes, full and round at back.

Eyes—Full, bright and expressive.

Face—Bright, lean, free from feathering, and not sunken.

Comb and Wattles—Neat, fine in texture and medium size, avoiding ''beefiness.''

Neck—Fine and fairly long.

Skin and Abdomen—Texture of skin to be of the thinnest and finest quality and pliable; abdomen to be elastic, avoiding sagging in, or fullness indicating excess of fat.

Plumage—Feathers soft and silky, close, but not hard as in game; fluff moderate.

Weights—Light breeds, ½ lb. to 1 lb. above minimum and heavy breeds 1 lb. to 1½ lb. above to score maximum points; if in excess to be cut correspondingly.

MINIMUM WEIGHTS.

LIGHT BREEDS.

Leghorns, Minorca, Andalusians, Spanish, Canpines, Buttercups, Anconas: Cockerel, 5 lb.; pullet, 4 lb. Hamburg: Cockerel, 4 lb.; pullet, 3 lb.

HEAVY BREEDS.

Orpington, Plymouth Rock, Rhode Island Red, Sussex: Cockerel, 7 lb.; pullet, 5 lb. Langshangs, Wyandottes: Cockerel, 6 lb.; pullet, 4½ lb. Any other variety: Cockerel: 7 lb.; pullet, 5 lb.

SCALE OF POINTS.

Standard points—Type, maximum points, 20; colour (plumage and lobes), 7; legs and feet (colour), 3; condition, 5.

Laying Characteristics.—Conformation (indicating stamina and capacity), maximum points, 20; freedom from coarseness, 5; head, 7; eyes, 7; face, 6; comb and wattles, 5; skin and abdomen, 5; plumage, 5; weight, 5; total, 100.

Disqualification.—Under weight, wrytail, any indications of impurity of breed, dubbing and faking.

INSECTS AND THEIR RELATIVES.

By ROBERT VEITCH, B.Sc., Chief Entomologist.

Insects belong to the extremely important group or phylum of the animal kingdom known as the Arthropoda. The great majority of described species of animals are included in that group and its members occur in salt water, in fresh water, and on dry land. The group includes insects, lobsters, crayfish, crabs, shrimps, woodlice, centipedes, millipedes, scorpions, spiders, ticks, and mites.

Many of these small animals differ from each other very considerably in structure. There are, however, a number of fundamental characters in which they all agree, and a combination of several anatomical features, common to all the animals just mentioned, justifies their formation into one large group and also serves to separate the members of that group, *i.e.*, the Arthropoda from all other animals.

Even a casual examination of a typical Arthropod reveals some of these distinctive features. Perhaps the first point observed is the fact that the body consists of a series of segments or pieces each of which very frequently bears some degree of resemblance to its neighbours. These segments are placed one behind the other, and the division between any two is generally rather clearly marked in at least some portion of the body. The Arthropod body bears a variable number of paired jointed appendages, while a further typical feature is the chitinous external skeleton protecting the soft internal tissues of the body. Chitin is a somewhat horny substance secreted by certain layers of cells in the Arthropod body, and its presence in the cuticle, or outer skin, which it permeates, results in the production of the typical hard outer skeleton. The existence of this external skeleton accounts for the peculiarity that, after death, there is apparently no decay; decomposition of the internal tissues nevertheless does take place and eventually only an empty shell is left. This empty shell is, however, invaluable to the entomologist and zoologist for purposes of classification and identification. A further characteristic feature of this group of animals is the fact that the body is bilaterally symmetrical, *i.e.*, it is evenly developed on both sides.

A bilaterally symmetrical body bearing paired jointed appendages and composed of a series of segments with a chitinous outer skeleton may therefore be regarded as the main distinctive external features of the Arthropoda.

Having drawn attention to some of the more easily observed structural characters that serve to separate the Arthropoda from the rest of the animal kingdom, consideration may now be given to a brief preliminary outline of the anatomy, habits, and economic status of certain of the more important classes of the group.

Lobsters, Shrimps, Crabs, Crayfish, Prawns, and Woodlice.

The Crustacea, the first class to which reference will be made, are represented by lobsters, shrimps, crabs (Plate 40; fig. 1), crayfish, prawns, and woodlice, and are almost entirely aquatic, being mainly marine. The woodlice (Plate 40; fig. 2) are, however, exceptions to

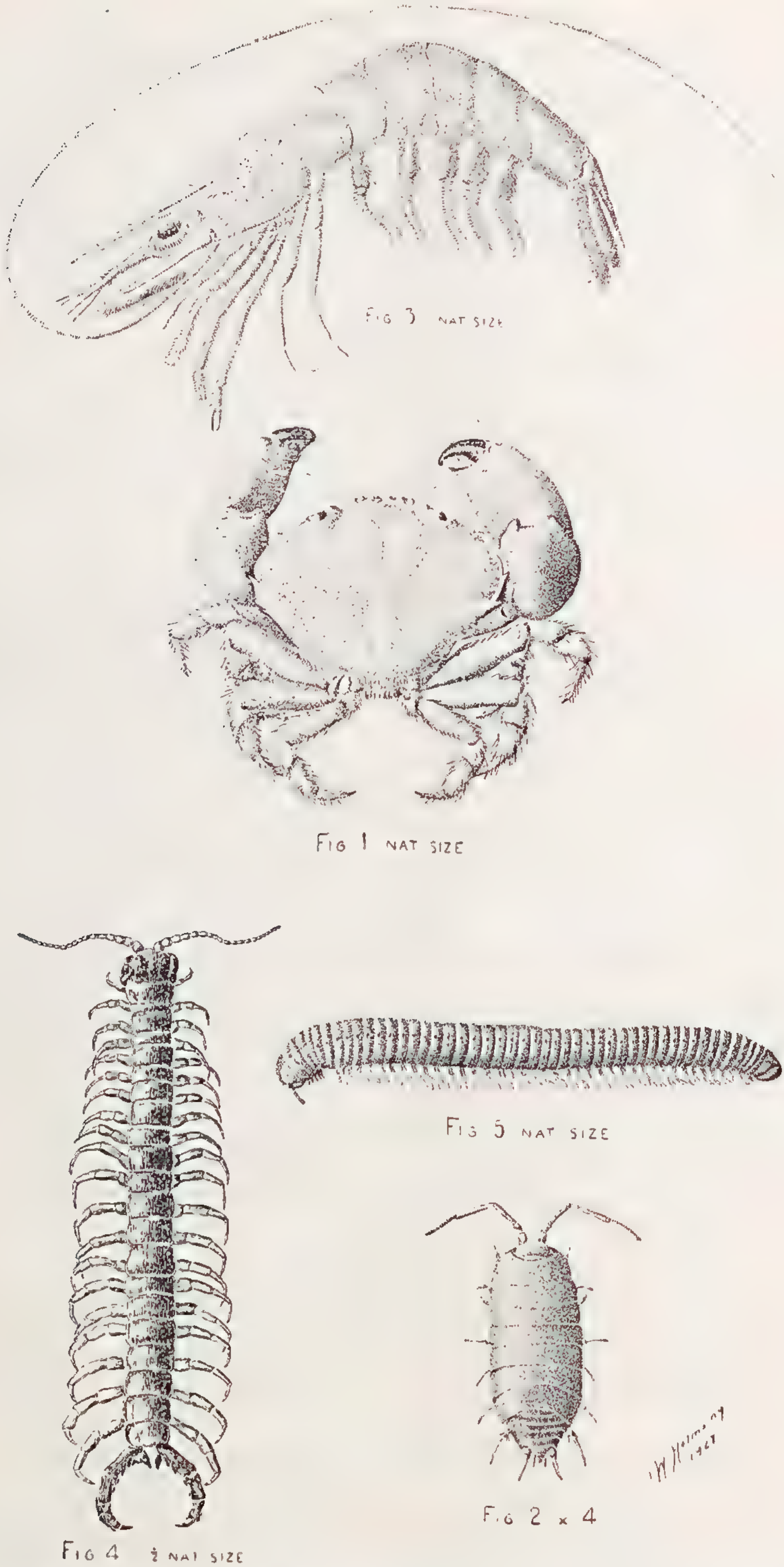


PLATE 40.—Fig. 1, Crab; Fig. 2, Woodlouse; Fig. 3, Prawn; Fig. 4, Centipede; Fig. 5, Millipede.

these aquatic habits, being land forms commonly found in damp localities where they frequent the undersides of stones and boards and the damper clumps of heavy vegetation in gardens and fields. Decaying vegetation is generally regarded as the normal food of woodlice, but numerous instances have occurred where they have fed on the roots and foliage of small plants and also on edible mushrooms; they are thus of some slight economic importance. Some of the Crustacea, *e.g.*, the crayfish and the prawn (Plate 40; fig. 3) are of value as a source of food for man.

Crustacea are generally regarded as performing, in fresh and salt water, practically the same functions as those with which insects are associated on land, *i.e.*, some are feeders on vegetable growths, some are predaceous on other animals, while many act as scavengers.

Many species of Crustacea breathe by means of gills, but respiration in the smaller species frequently takes place through the whole body surface. Two pairs of antennæ or "feelers" are present and the body is furnished with a variable number of pairs of jointed legs. The body segments in the higher Crustacea are grouped into two regions—namely, the cephalothorax or head-thorax and abdomen.

Centipedes.

The centipedes or Chilopoda, unlike the previous class, live on land, although a few abnormal species frequent the shore where they are regularly submerged by the tides. They are active fierce animals that are but little seen owing to their secretive habits; they may be frequently found, however, by turning over stones or heaps of leaves or by tearing the bark off rotting trees and stumps. They cannot be regarded as being of any very appreciable economic importance, although in some cases they may be slightly beneficial by virtue of their habit of feeding on other small animals. Unfortunately, however, they are capable of inflicting an unpleasantly poisonous bite and are therefore not unnaturally regarded with considerable feelings of aversion.

The somewhat soft centipede body (Plate 40; fig. 4) consists of two sections only, namely, the head and trunk, the latter consisting of a series of practically identical segments, which in some species number well over a hundred. The whole body has a rather flattened appearance, and although most of the species are long and slender some are short and broad. A pair of many-jointed antennæ or "feelers" is present on the head, the minimum number of antennal joints being generally regarded as fourteen. Each typical body-ring or segment bears a pair of legs, the first pair being modified to form poison claws; large poison glands are situated at the base of the claws, the poison being conducted from the gland to the wound through a canal in the claw. Centipedes breathe by means of air tubes ramifying throughout the body tissue.

Millipedes.

The third class of which mention may be made is the Diplopoda or millipedes. These small animals in some respects closely resemble the centipedes, and like them, they are inhabitants of the land and breathe by air tubes. The millipede head possesses a pair of seven-jointed antennæ and its body (Plate 40; fig. 5) consists of

Fig 1 NAT SIZE

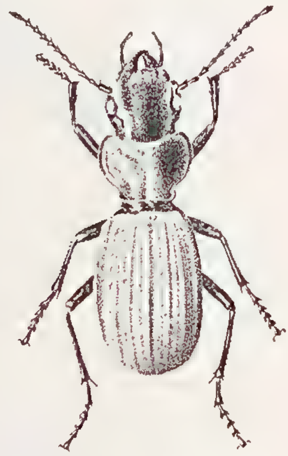


Fig 5 NAT SIZE

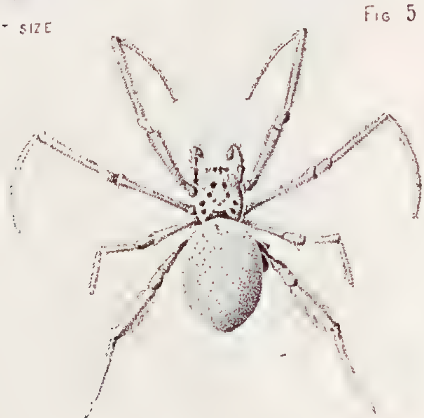


Fig 2 NAT SIZE

Fig 4 × 4

Fig 3 × 30

PLATE 41.—Fig. 1, Scorpion; Fig. 2, Spider; Fig. 3, Mite; Fig. 4, Tick; Fig. 5, Insect.

a series of segments which are all practically alike in appearance. The segments in this case are distinctly cylindrical and as a consequence the general appearance of the millipede is somewhat different from that of the broader, flattened centipede. The body segments in the millipede are somewhat imperfectly separated, and hence, with a few exceptions, each "segment" bears two pairs of legs; there is, however, still a good deal of obscurity and uncertainty with regard to this feature of millipede anatomy. There is no modification of legs to produce poison claws, but special glands exist for the production of a particularly offensive fluid. There is a high proportion of lime salts in the external skeleton of this class of Arthropod and its skeleton is much harder and tougher than is the case in the centipedes. As in the centipedes, the body is divided into two sections only, namely, head and trunk.

Millipedes are generally supposed to live on decaying vegetable matter, but some species have been recorded as attacking potato tubers and the roots of plants. They are, however, of but trifling economic importance and generally live up to their reputation as quite inoffensive creatures.

Spiders, Ticks, Mites, and Scorpions.

The fourth class to which reference must be made is of decidedly greater importance to mankind than the three just discussed in that it includes the spiders, ticks, mites, and scorpions; this class is known as the Arachnida.

The Arachnida are found almost exclusively on land, and characteristically possess four pairs of legs, but no antennæ. Generally the segments of the body are grouped into two sections—namely, the cephalothorax and abdomen. Respiration may be by air tubes, by lung books, or even through the surface of the body; the name lung book is derived from the fact that these respiratory organs are leaf-like in structure. Blood from all parts of the body is carried to the lung books, where it is purified and is then ready to be carried back to the various tissues and organs. Spiders possess the ordinary air tube system but are also supplied with lung books, while in the scorpions respiration is by means of four pairs of lung books; in the ticks and mites respiration is generally by the simple air tube system, although in some of the mites air tubes are absent. The class is a very diverse one, the differences in structure being almost as wide as in the Crustacea.

Most of the members of this class are predaceous or parasitic on other animals and some are of very great economic importance because of the part they play in transmitting serious animal diseases.

The scorpions (Plate 41; fig. 1) are nocturnal in habit and sometimes attain a length of as much as eight inches; they are predaceous on other animals, insects and spiders forming the most important source of their food supply. A poison sting is situated at the tip of the abdomen and is frequently used in paralysing the larger insects or other small animals on which the scorpions live.

The spiders (Plate 41; fig. 2) are well known predatory enemies of insects, but as they do not discriminate between destructive and beneficial species their actual value to the farmer is somewhat difficult to assess. Many spiders lead a sedentary existence, trapping their prey by means of snares of silk spun from the silk glands. Others obtain their prey by chase.

The mites (Plate 41; fig. 3) are generally very small animals that sometimes occur in enormous numbers. Some species attack plants, *e.g.*, the so-called red spider, others are animal parasites, while quite an appreciable number live in decaying organic matter. The ticks (Plate ; fig. 4) are well-known stock pests that are frequently responsible for the transmission of very serious diseases.

Insects.

The fifth and last class to which reference must be made is the most important of the five discussed and is known as the Hexapoda or insects.

The body segments in this class (Plate 41; fig. 5) are distinctly grouped into three sections—namely, head, thorax, and abdomen. The head almost invariably bears a pair of antennæ, while the thoracic or middle section of the body possesses three pairs of jointed legs and also bears two pairs of wings; the latter are very frequently closely folded on the abdomen when the insect is not in flight. Insects breathe by means of air tubes which radiate throughout the whole body.

Insects have shown wonderful powers of adaptation and they have succeeded eminently in the struggle for existence on land; so much so that, without being unduly pessimistic, it may be claimed that the future will witness a severe struggle between man and insect for the world's available food supply. The wonderful success of insect life on land has not, however, been repeated in either fresh water or in salt water; only a comparatively few species pass both the adult and larval stages of their life cycles in or on the former while the number of marine insects is extremely small.

More than half a million species of insects are already known to science and some of the most destructive of these are steadily spreading throughout the world. The toll levied by some species is enormous, and what would otherwise have been profitable branches of agriculture have, in certain countries, been reduced to a state of stagnation owing to insect attacks, and they offer little or no inducement for further development. Other species are notorious as carriers of very virulent diseases of man and beast, and the settlement of some very fertile areas has been greatly impeded by the prevalence of these insect-transmitted diseases.

It is only recently that mankind has realised just how much his physical and material wellbeing depend on his ability to successfully combat these small but tremendously powerful enemies. The realisation of the seriousness of the position has led to markedly increased activity in economic entomological research throughout the world, and the results achieved in some investigations encourage the hope that in many of the other as yet unsolved problems success will lie with man in his fight against the insect world.

MIXING OF CONCRETE—MATERIALS AND PROPORTION.

Concrete has many uses on the farm, and its popularity as a building material is steadily growing. In the course of a paper on this subject read recently before members of March Branch of the New South Wales Agricultural Bureau, Mr. N. Griffith submitted a paper of which the following is a digest:—

The materials, such as sand, gravel, broken stone, and cinders, which are bound together to form concrete, are termed aggregates. Fine aggregates are sand and stone screenings; coarse aggregates are gravel and broken stone, and it is a general rule to use two parts of coarse material to one part of fine. It is necessary that the sand be coarse and clean. Fine sand may require several times as much cement as coarse sand to produce concrete of the same strength. Sand containing a large proportion of fine particles will make a concrete of low strength, and be easily penetrated by water, unless a large amount of cement is used. A sand containing a small amount of clay (say, not more than 4 per cent.) may be used, but a clean sand is preferable, although sometimes a small amount of clay may strengthen a weak concrete.

To test a sand put about 4 inches of it in a glass vessel, fill with water to within an inch of the top, cover, shake for five minutes, and allow to settle. The sand will sink to the bottom, the loam will remain on top. If there is more than a quarter of inch of loam the sand should not be used without being washed. Vegetable or organic impurities in the sand are extremely injurious, even in small quantities. Stone screenings instead of sand may be used, provided they are free from dust and impurities and reasonably hard. They should pass through a quarter-inch mesh.

The Best Type of Stone.

Broken stone should be clean, hard, and of a size suitable to the character of the work in which it is used. A stone which breaks into angular shapes is much to be preferred to one that gives thin flat pieces. soft limestone, soft sandstone, slate, &c., should not be used. For thin walls or a network of reinforced concrete, the largest portion of stone should not be more than 1 inch square; for heavier work it may be increased to 2 or 2½ inches. As a rule the diameter of the largest piece of stone should not be greater than quarter to one-sixth the thickness of the concrete. A mixture of coarse and fine stone will give the best results.

Gravel can often be obtained from the banks or beds of creeks. If it is clean and well graded it is just as suitable as stone; but it should be screened over a ¼-inch screen, the parts passing through being used as sand. As a rule the gravel and sand run into pockets or seams, making some parts deficient in fine aggregate, while others have too much—thus the necessity for screening. Sandstone or gravel may be washed by placing it on a sloping platform or screen and turning a hose on it, or by throwing buckets of water on it. Cinders are sometimes used for concrete where little strength is required. They are entirely unsuitable for general concrete work. When used they should be free from dust, ashes, and unburned coal.

Correct Proportions Important.

The correct proportion of stone, sand, and cement to use is of the utmost importance. The problem in proportioning concrete is to determine the correct amounts which must be used in order to obtain the best results at the lowest expense for labour and materials. The voids or open spaces between the materials must be filled. If the broken stone is of a uniform size there will be about 50 per cent. of void, and in the case of screened gravel about 40 per cent. In sand, the voids form about 30 per cent., and in cement about 50 per cent. When these materials are mixed together with water most of the sand goes into the voids of the stone, and the cement paste remaining after the particles of sand and stone are coated goes into the voids of the sand.

The voids in broken stone or gravel may be found by filling a measure level full with the material to be tested; weigh it, and pour in water till the measure will hold no more; weigh the measure again and take the difference in the two weights, this being the weight of water required to fill the voids. Now fill the vessel with water, weigh again and divide the weight of water required to fill the voids by this weight, and the quotient multiplied by 100 will be the percentage of voids in the material tested. To find the voids in fine aggregates pour the sand into the water, otherwise there will be a considerable number of air pockets.

Percentage of Sand.

The percentage of sand to be used for concrete must be a little greater than the voids to be filled, as the sand gets between the stones and holds them apart. Experiments show that with the same percentage of cement the concrete will be strongest and most impermeable when the fine and coarse aggregates are so proportioned to give the greatest density. If the amount of sand used is either more or less than enough to fill the stone voids with mortar, the concrete will be less dense and more cement will be required to give the same strength. It is approximately correct to use a volume of sand equal to one-half the amount of gravel or stone. If the concrete is well tamped, and more mortar flushes to the top than is required to cover all the stones, then less sand may be used, but if it is difficult to get any mortar to flush the top then more sand should be used.

A rich mixture of 1 part cement, $1\frac{1}{2}$ parts sand, and 3 parts stone or gravel is generally used for columns or reinforced buildings and thin walls that must be water-tight, and wherever a strong, dense concrete is required. A good mixture of 1-2-4 is generally used for reinforced concrete work of all kinds, and is best adapted for general concrete work. A medium mixture of 1-$2\frac{1}{2}$-5 parts is used for plain (not reinforced) concrete work of all kinds—i.e., foundations, walls, floors, and all purposes for which a good concrete is required. A lean mixture of 1-3-6 is used in heavy masses where the loads are wholly compressive, and where the principal requirements are weight and stability, as in heavy walls, foundations, and bridge piers. Leaner mixtures than these are not recommended.

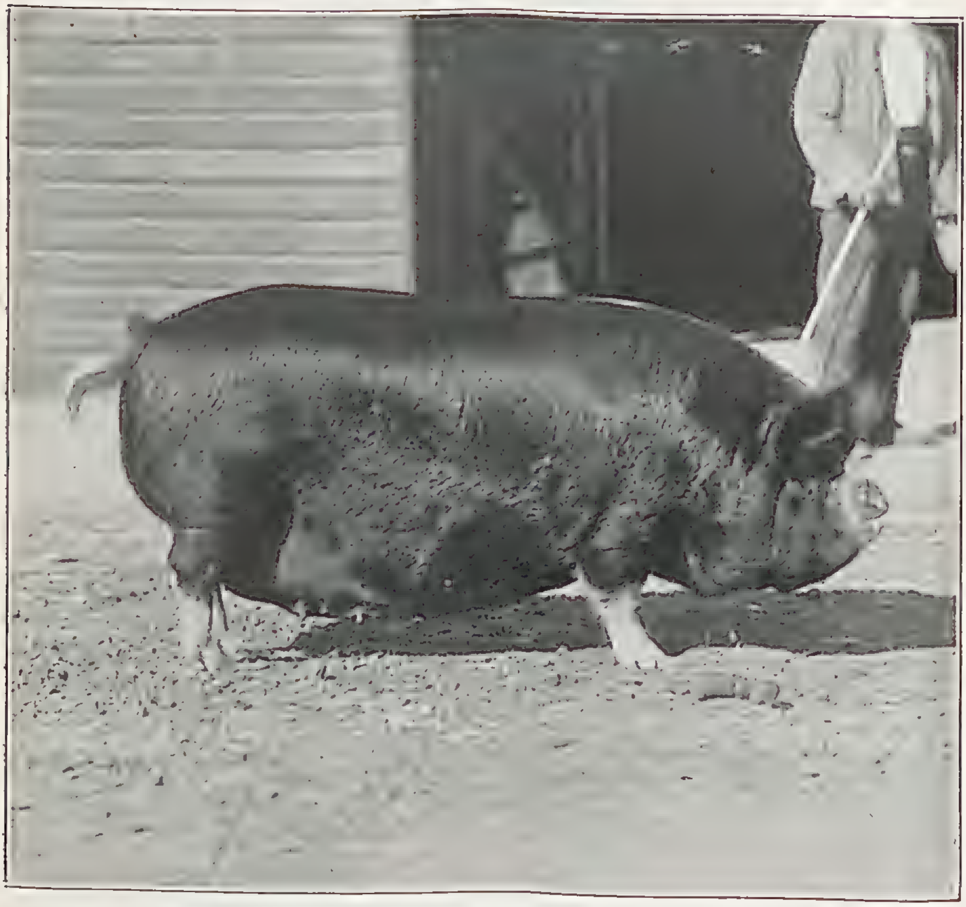


PLATE 42.—THE CHAMPION BERKSHIRE SOW AT THE MELBOURNE SHOW, 1926. E. P. WORNER'S "BRENTWOOD IRENE," 6890, BRED BY G. A. BEDWELL, OF NEWMARKET, VICTORIA.

Note the typical markings, the characteristic development, and the well-built-up body of this famous brood sow.

Berkshires are the most popular breed of pig in Australia. They are reliable and productive, and have a place to fill on every farm where it is desired to show a profit. A pamphlet descriptive of the Berkshire breed is available gratis with other pig-raising literature on application to the Department of Agriculture and Stock, Brisbane.

Answers to Correspondents.

BOTANY.

In the course of the month the Government Botanist, Mr. C. T. White, F.L.S., addressed the following replies to correspondents, and which are of general interest:—

"White Cedar"—Brigalow.

R.B.H. (Lautoka, Fiji)—

The specimen seems to represent *Melia Azedarach*, a tree widely spread over the Asiatic and Eastern Australian regions. It varies a good deal according to geographical distribution and has been divided into several species and varieties. The Australian variety is well known to you as the "White Cedar." "Pride of India" and "Persian Lilac" are names given to it in garden cultivation. The botanical name of the Brigalow is *Acacia harpophylla.*

"Jacobean Lily."

R.A. (Atherton)—

The specimen proved to be *Sprekelia formosissima,* commonly known as the "Jacobean Lily." It is a native of Mexico and Guatemala and was introduced into European gardens as early as 1593. It is only occasionally seen in Queensland gardens, but bulbs are listed by most of the leading nurserymen.

Tree Poisoning.

W.S. (Murgon)—

Your inquiry regarding a poison for trees was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—Arsenic made in solution with caustic soda may be used for killing trees, but the boring of a hole, or holes, into the stem and filling with the poisons is only in some cases successful. Boring right into the centre would be no advantage as the poison must circulate in the growing tissue just between bark and wood. Therefore, ringbarking or ringing the tree and pouring poison in the cuts is much more successful."

A Native Legume—"Tick Trefoil."

R.C.F. (Clump Point, N.Q.)—

Specimen No. 1 is *Pycnospora hedysarioides,* a small native legume for which a common name is not known.

Specimen No. 2 is *Desmodium polycarpum,* a species of "Tick Trefoil"; so called on account of pieces of the seed-pod often adhering to clothing and other fabrics. Both of these plants, so far as we know, are quite wholesome. They would benefit the soil in the same way as other legumes. Their propagation in the pasture is advisable. We have commonly seen No. 2 growing in rather wet, swampy places.

Specimen No. 3—*Desmodium* sp.—Another species of "Tick Trefoil," but the specimen sent is scarcely sufficient for specific determination. We do not think subterranean clover would do well at Clump Point.

Sedum Praealtum.

W.B. (Brisbane)—

The species of Sedum or Stonecrop, which you brought to Mr. White for determination some time ago, and which could not be placed satisfactorily, was sent to the Royal Botanic Gardens, Kew. We have now been advised by the Kew authorities that the species is *Sedum praealtum,* a native of Mexico.

Tapeinocheilos queenslandiae.

W.T.C. (Cooktown)—

Your specimen proved to be *Tapeinocheilos queenslandiæ,* a native of the scrubs of various parts of North Queensland. It is not uncommon in the scrubs at the foot of the Bellenden-Ker Range and similar species are fairly common in New Guinea. The plant belongs to the ginger family (Zingiberaceæ), but we have not heard a local name applied to it. We were very pleased to get the specimen, and will always be glad to report on any specimens you care to send from your interesting locality.

"Native Quinine"—Whitewood—Moreton Bay Ash—*Xerotes Leucocephala.*

R. McG. (Roma)—

(1) Plant mistaken for Poison-peach or Peach-leaf Poison Bush (*Trema aspera*). This proved to be *Alstonia constricta* var. *mollis*, a native of Queensland and New South Wales, stretching from the coast to a considerable distance inland. It is known by various local names such as "Native Cinchona," "Native Quinine," "Bitter Bark," &c., all due to the very bitter nature of the bark. It suckers freely from the roots and on this account is in some places regarded as a bad pest in cultivation.

(2) Whitewood, *Atalaya hemiglauca.*—A very common tree throughout Western Queensland, also found in New South Wales.

(3) Carbeen, leaves only, but I should say *Eucalyptus tessellaris*. On the coast this tree is almost universally known as Moreton Bay Ash. Inland and in New South Wales it goes under the name of "Carbeen."

(4) Grass-like plant with the base covered with a cottony substance, *Xerotes leucocephala*, rather an anomalous member of the Liliaceæ or Lily family.

Lantana Sellowiana.

J.L. (Brisbane)—

Your specimen is a small species of Lantana (*Lantana Sellowiana*), a native of South America, commonly cultivated in Queensland gardens as an ornamental plant, climbing over rockeries, fences, &c., and has here and there run out, and become to some extent a pest. Other Lantanas, including the common one, cause a trouble in cattle known as "pink-nose." We have no definite information regarding the species you send, but have no doubt its properties are similar to the common species, and if eaten in quantity would cause trouble.

Onion Couch.

A.N.W. (Maleny)—

It is almost impossible to name grasses in the absence of seed-heads, but the one you send apparently represents the "Onion Couch" (*Arrhenatherum avenaceum* var. bulbosum), a very bad weed on European farms. It has been previously recorded for the Southern States, but so far as known has not previously been met with in Queensland. Eradication is extremely difficult owing to each little "knot" or "bulb" forming a new plant when cut free by cultivation implements. If only in a small patch, hand forking and careful burning are the most satisfactory methods of eradication, and this would have to be done periodically as fresh pieces grow. If you could send a fresh specimen we would feel much indebted. Probably our summers will prove too hot for the grass to set good seed. Have you noticed seed-heads on it? We would be especially glad of one if you have.

"Blue Top."

F.H.T. (Townsville, N.Q.).—

There are three or four plants or more in North Queensland that go under the local name of "Blue Top." One of the most common is *Ageratum conyzoides*, but to make sure send a small specimen.

"Native Lucerne" or "Herb-Vine."

T.W. (Longreach)—

The specimen proved to be *Psoralea cinerea*, a plant commonly known in Australia as Native Lucerne, a name, however, also applied to other species of the genus, of which we have about a dozen in Queensland. The particular one you send is not uncommon in Western Queensland and the Northern Territory, and is also found in Western New South Wales. On Brunette Downs it is known as "Ervine" or "Herb-vine," and is looked upon as one of the best fattening fodders in the country. Most of the genus here and also abroad are regarded as good fodders. For travelling sheep or other stock they would of course bloat, particularly on an empty stomach, but any succulent feed such as pig weed, lucerne, and other herbage would act in the same way. On the other hand, the plant you send has been suspected of poisoning cattle on the Flinders River, but in view of the generally good reputation of the plant, it is not likely that it is poisonous to stock.

"Sassafras"—(Cinnamomum Laubatii).

"Inquirer" (Brisbane)—

Most of the leaves belong to *Cinnamomum Laubatii.* This species was named by Ferd. von Mueller but was synosagmised by Bentham with an Indian species—*C. Tamala* Mees. Recent researches would tend to show, however, that the Indian and Australian trees are distinct, and that Mueller was right in giving it a specific name. The tree is known in North Queensland as "Sassafras."

Gidyea Poisoning of Stock.

T.M.T. (Brisbane)—

Gidyea poisoning reports are rather conflicting. In the annual report of the Department of Agriculture and Stock, Brisbane, for 1918, the Chief Inspector of Stock (Major A. H. Cory, M.R.C.V.S.) printed a letter from Mr. G. R. Beauchamp, of Westward Ho, Boulia, dated 25th November, 1918:—"I had a good chance here the other day of proving beyond doubt that the gidyea, while in pod, will poison cattle. Being short of grass near the homestead, I broke down some gidyea limbs for the goats. Just then the milking cows were let out of the yard, and two of them ate some of the gidyea I had broken down for the goats. These two cows were poisoned. When I found this out, I had a look at the gidyea and noticed that the limbs were heavily laden with pods. It is this bean that, in my opinion, causes all the trouble."

This letter would seem fairly conclusive, but we also hear reports of cattle eating gidyea without any ill effects following. There are two kinds of gidyea in Queensland, and both are species of wattles, belonging to the genus Acacia. In regard to wattles on the coast as feed in times of drought conflicting reports are heard, the majority of stockowners looking upon them as a good forage and a standby in times of drought, others reporting losses of stock through them. My own belief is that the trouble mostly occurs when the wattles are full of green unripe pods. The pods or beans of many wattles contain a saponin, a glucoside, some forms of which are known to be poisonous. At other times the gidyea and other wattles, I believe, may be eaten with impunity. It is a question, however, on which we have little definite information, and, in my opinion, is one worthy of research by means of feeding experiments and chemical analysis. A specimen of Whitewood was handed over to me at the same time. It is *Atalaya hemiglauca*, known universally throughout Western Queensland as "Whitewood." It is a good fodder, but the young shoots are said to give horses the staggers. This, however. is a question on which we have no very definite information.

Trees in Pear Country.

W.S. (Westbrook)—

Regarding timber locked up in pear, none is, so far as I can call to mind, of any special value. The three commonest are, of course, the ordinary Box or Bimbil Box (*Eucalyptus populifolia*), the Brigalow (*Acacia harpophylla*), and the Beelah (*Casuarina lepidophloia*). The first is one of the poorest of the Eucalypts and rarely found sound in large sizes, therefore only used for fence posts, &c. I have seen beautiful furniture from Brigalow, but very heavy. The Beelah is only used for rough bush work and it decays in contact with the ground. It could be used for cabinet work, and Mr. R. T. Baker, late Curator of the Technological Museum, says that it is the most suitable of all Australian timbers for shaft bearings, being the nearest substitute for Lignum-vitæ so extensively used for this purpose. The Bastard Sandalwood (*Eremophila Mitchellii*) is used to a limited extent for small fancy articles.

"Cape Cotton" or "Wild Cotton."

N.G. (Mullett Creek)—

The weed with balloon-like pods is the Cape Cotton or Wild Cotton (*Gomphocarpus fruticosus*). We would advise you if possible to get rid of this before it sets seeds, as it can become a very bad pest. It has been suspected of poisoning stock in Queensland, though nothing definite has been proved against it. It belongs, however, to a dangerous family—the Asclepiadaceæ. The seeds when ripe have a fine tuft of silk-cotton on the ends; this, however, has no value for spinning but only as a kapok, and its collection for this purpose would not pay. The stems contain a strong fibre.

Tree Propagation.

T.B. (Warwick)—

Cupressus torulosus and other species are best struck from the young tips a few inches long, placed, if possible, in rather sandy soil and kept moist, and protected from the hot sun. Cupressus can be more easily raised from seed, but some of the horticultural forms do not come true to type.

Planes can be struck from the last year's wood when the leaves have fallen. Pieces eight to ten inches long with a heel of old wood at the base are best.

Poplars strike more easily than Planes; pieces of the leafless branchlets, 8 to 12 inches long, placed about half in the soil strike readily.

Prune and Myrobalan Plums.—We do not know any special treatment. Sown fresh from the fruits they should germinate freely enough.

Plants Identified.

W.R. (Kawl Kawl)—

The specimens are very small but seem to represent the following plants:—

1. *Chenopodium murale.* "Goosefoot." A common weed on the Downs and similar localities. Not harmful in any way, but does not seem to be eaten much by stock. Sometimes called "Fat Hen," a vernacular applied to several weeds in Queensland.

2. *Tetragonia expansa.* New Zealand Spinach. Sometimes used as a substitute for ordinary spinach.

3. *Malvastrum tricuspidatum.* A common weed sometimes mistaken for the common *Sida retusa.* It is not harmful in any way but is rather aggressive. We have not heard a common name applied to it.

4. *Ipomœa plebeia.* "Bell Vine." Becomes a pest by climbing up the stalks of cane and other crops.

5. *Helipterum polyphyllum.* A native plant for which we have not heard a local name. It is not harmful in any way and is not an aggressive weed.

6. *Chenopodium sp.*, probably *Chenopodium album.* A "Goosefoot" or "Fat Hen." Remarks similar to No. 1 apply.

PIG RAISING.

Following are selected replies to correspondents by the Instructor in Pig Raising, Mr. E. J. Shelton, in the course of the month, and which are of general interest:—

Excessive Salt in Pig Food.

Case: An inquirer asked for advice concerning the sudden death of five pigs which had been given water in which mangel wurzels had been boiled as part of their food. The pigs were severely distressed and suffered great pain and their owner was puzzled as to the cause of the trouble. The pigs had on a previous occasion (no record of when) been given similar liquid without any apparent ill-effect.

Reply: A sample of the water was analysed by the Agricultural Chemist who found no common poison in the liquid, which, however, contained about 175 grains of salt to the gallon. It is apparent that the high percentage of salt in the water was partly the cause of the trouble. The mangel wurzels being somewhat tough and fibrous in the green state before being cooked, and lacking nutriment, would probably be a contributory cause. Constipation and disorders of bowels are responsible for many apparently sudden deaths in pigs, and on many occasions death has been suggested as being due to poisoning, &c., when in reality it is due to stoppage of the bowels, the result of the continued use of dry fibrous foods. Quite recently we investigated the cause of death of a brood sow that had shown signs of severe pain, and swelling up to an abnormal size both prior to and immediately after death. The stomach on examination was practically full of dry fibrous shreds of wattle bark and similar fibrous matter which the sow had evidently eaten in an endeavour to satisfy her craving for some "green" or protein (flesh forming) food.

We investigated a case recently also in the Central Burnett district in which a number of pigs fed on buttermilk had suddenly died, the analysis of this buttermilk showed that it contained an excess of salt which, acting as an irritant to the stomach and bowels, led to fatal results.

Under ordinary conditions salt may be placed before pigs as a condiment—it really is a necessity in all foods—or as a food and they would not partake of it to excess, but where pigs have suffered from a deficiency of salt and mineral matters in their food they are inclined to eat too freely, this especially so where the salt is mixed in with the food or fluids given to the pigs. Cases are not uncommon in which pigs have died as a result of brine poisoning, this especially so where corned beef water or the water in which a ham has been cooked is mixed with the milk or kitchen waste. Soap powders, soda water and the like cause similar trouble.

It takes but a few minutes after eating or drinking an excess of salt for symptoms of poisoning to develop. However, in the case under review it would appear that unless salt was accidentally added to the water in which the mangels were cooked the trouble was caused by excess of fibrous matter and lack of nutriment together with constipation or some other disorder of the bowels.

Mortality Among Pigs.

F. J. P. (Dallarnil)—

It is noted that the pigs were fed on a mixture consisting of boiled bottle-tree (chaffed), molasses, milk, and pollard. We presume, on account of the very severe spell of dry weather recently experienced and the high prices of concentrated foods, that there has been a shortage of milk and pollard, and that the bulk of the food consisted of boiled bottle-tree (chaffed) and molasses. There is little or no nutriment in either of these foods, the bottle-tree portion consisting practically entirely of water and fibre, and the molasses containing no protein or flesh-forming elements, it being at best a heat and energy producer and a condiment but of little actual food value.

Without actual analysis and postmortem examination it is of course somewhat difficult to definitely diagnose the cause of death, but on the surface it would appear that digestive disorders and stoppage of the bowels with possible extensive inflammation of the bowels has been the cause.

Pigs require liberal supplies of green food, clean drinking water, and mineral matters in addition to their ordinary food, milk, grain, &c., in order to be able to develop properly and to reproduce themselves to advantage. An excess of sugar, as in cases where too much molasses has been added to the food, is just as likely to result in disaster as where an excess of salt is present, and perhaps in this case some of the stronger pigs fighting their way to the front of the trough received all the milk leaving the balance of the pigs to consume all the dry fibrous food and to have practically no moisture or drinking water at all.

Diseases in Pigs.

C.E.L. (Bajool)—

Disease is often due to disorders of the digestive system, to severe indigestion, and to inflammation of the stomach and bowels. It is often induced by neglected breeding, by weaning too early, and by lack of mineral matters in the food. Pneumonia and affections of the lungs are also a prolific cause of complaints affecting the nervous system and of interference with the normal development of the animal. Pamphlets on the "Administration of Medicine to Pigs" and "Profitably Feeding Iodine to Pigs" forwarded.

Foods for Young Pigs.

K.O.H. (Westbrook)—

Just as to what feeds are the most efficient and economical for young pigs in the absence of milk and green stuff, and during periods of excessively high prices for all classes of concentrated food, is a difficult question to answer. You should be able to gain a good deal of information locally by visiting the Farm Homes for Boys, Westbrook, and discussing this matter with Mr. Jones, the Superintendent. If there is no skim milk or other dairy product and no green stuff, then there is nothing for it but water and concentrated foods, with the addition possibly of a small proportion of molasses as a condiment and an aid to digestion, and, perhaps, in extreme cases, the use of prickly-pear boiled after the prickles have been removed by singeing.

Of concentrated foods the commonest form in use in wheat-growing districts is pollard or wheatmeal with grain sorghum meal (Milo and Feterita seed ground to a meal form), and in some cases Barley Meal. Pollard is, however, scarce and high-priced. It, however, is a very useful food, and many farmers have found that it can be used to advantage where prickly-pear is boiled, cooled down, and fed as a mash; in some instances meat foods are used, as in cases where cattle or horses and calves are slaughtered and boiled down for use as pig food.

Barley meal, rice meal, pea meal, and grain sorghum meal are all useful, but they, too, are high-priced and in short supply. All clases of root crops, English potatoes (of which a proportion usually find their way to the pig bucket), sweet potatoes, artichokes, swede turnips, cassava, arrowroot, &c., are also in short supply, while pumpkins and the like have been so high-priced that they have been absolutely prohibitive as pig foods.

There are certainly no cheap pig foods of sufficiently good quality readily available at the present time, but if you wrote to the Wheat Board they would be able to advise as to whether they had any wheat available suitable for pig-feeding or any grain sorghum meal. Produce merchants would willingly quote for any grain or meals available.

PLATE 43.—THREE CHARACTERISTICS OF THE MODERN BERKSHIRE—CONTENTMENT, CONSTITUTIONAL VIGOUR, AND COURAGE.

This well known winner, "Britannia Brigadier," and his owner, Mr. Charles Dawson, of Belmore street, Dundas, N.S.W., takes a pride in facing the photographer. Charlie is satisfied he has a remarkably good pig, while Brigadier is content to wear his ribbons and pose.

Three characteristics of the successful pig raiser—(1) knowledge of the job; (2) love of the animals; and (3) judicious handling both of the food supplies and of the breeding stock and progeny. Britannia Brigadier is a well known prize-winner at Sydney Show. His stock also have won many prizes.

Plate 44—The Champion Tamworth Sow at the Melbourne Show, 1926. E. V. Harley's "Hawkesbury Rosie," 504, bred at the Hawkesbury Agricultural College, Richmond, N.S.W.

The Tamworth breed stands in the forefront for purposes of crossbreeding for the production of early maturing fleshy bacon pigs. Note this sow's wonderful body development, her compact, thick-set frame, and the capacity for development as she grows older. The fine quality skin and hair, and the development of teats and udder are worthy of note. A pamphlet descriptive of the Tamworth breed is now available, with other pig-raising pamphlets, on application to the Department of Agriculture and Stock, Brisbane.

GREEN PEAS—HARVESTING AND MARKETING POINTS.

Pods should be picked as soon as the pea kernels are full and give the pod a tight feel, but before any loss of colour occurs, such as is the case when on the turn to maturity. Twenty-eight pounds of green peas is the usual trade recognition of a bushel weight. Growers sending their peas long distances must always allow for loss by shrinkage in transit, and in some cases it is usual to reckon on a 2 lb. loss per bushel.

If the peas have to be stored on the farm overnight or for any time before despatch it is advisable that they be spread out on the floor of a shed rather than left in bags. Sweating in heaps in the shed will not be harmful to the same extent as would be the case in bags, particularly when done up in full chaff bags. The usual method of marketing is in small bags—about 2 bushels in size—which are made by the grower or supplied by the agent who is to dispose of them.

For local markets it is often an advantage to do up in small lots of 7 lb., more or less, in order to cater for family supplies.

Picking costs vary with the crop. The usual price is somewhere about 1s. 6d. per bushel, but with high yields it may be possible to secure pickers at a lower price. When the yield is low the price increases proportionately, and under these conditions it is only possible for the grower to bear such an expense when market prices are high.

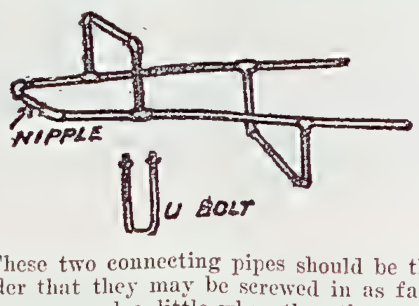
A careful watch should be kept on the pickers to see that only the full pods are harvested. Immature and discoloured pods should be eliminated from any consignments marketed.

PLATE 45.—"FABRIC'S PRIDE," AGE 10 MONTHS.

"Fabric's Pride."—A well-developed foal by "Fabric's Heir," one of the State Stallions, from a Stud Book mare, at 10 months—the property of Mr. E. L. Reinke, of Murra Murra, Crow's Nest.

WHEELBARROW FRAME.

A substantial gear for a wheelbarrow can be made of 1-inch pipe and fittings as shown in the illustration from "Country Gentleman." The extreme length of the frame is 4 feet 6 inches. The two sides are joined at the front by means of two elbows and a nipple, the nipple answering for a shaft upon which the wheel can turn. If, instead of an open wheel, one with a spindle on each side is used, the nipple can be left out and suitable wooden boxings bored and driven into the elbows. The front standards of the barrow as well as the legs are joined together by means of elbows



and a piece of pipe. These two connecting pipes should be threaded for 2 inches or more on one end in order that they may be screwed in as far as they will go, since they will necessarily be unscrewed a little when the other end is being screwed into the elbow. The box, which is of wood, should be attached to the frame by means of flat clips or U bolts that encircle the pipe and are screwed to the wood.

When the box is in place there will be no tendency for the frame to give or spring apart at any point. Such a barrow will last for a generation. It is simple in construction and neat in appearance. When the boxings or shaft wear they can be quickly removed and new ones put in.

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 next 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.

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.

Parrots are frequently very troublesome in the orchards at this time of the year, especially if there is a shortage of their natural food. So far, there is no very satisfactory method of combating them, as they are very difficult to scare, and, though shooting reduces their numbers considerably, they are so numerous that it is only a subsidiary means.

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 state, 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.

SHOW DATES FOR 1927.

Stanthorpe: 2nd to 4th February.
Warwick: 8th to 11th February.
Allora: 16th and 17th February.
Clifton: 24th and 25th February.
Goombungee: 3rd March.
Killarney: 9th March.
Milmerran-Pittsworth, 22nd March.
Inglewood: 22nd and 23rd March.
Toowoomba: 28th to 31st March.
Dalby: 7th and 8th April.
Chinchilla: 12th and 13th April.
Sydney Royal: 11th to 20th April.
Herberton: 18th and 19th April.
Nanango: 21st and 22nd April.
Beaudesert: 27th and 28th April.
Oakey: 29th April.
Kingaroy: 28th and 29th April.
Taroom: 2nd to 4th May.
Charleville: 4th and 5th May.
Wondai: 5th and 6th May.
Toogoolawah: 6th and 7th May.
Mitchell: 11th and 12th May.
Murgon: 12th and 13th May.
Blackall: 10th to 12th May.
Roma: 17th and 18th May.
Ipswich: 18th to 20th May.
Kilkivan: 18th and 19th May.
Wallumbilla: 24th to 26th May.
Maryborough: 24th to 26th May.
Childers: 28th to 31st May.
Marburg: 2nd and 3rd June.
Gin Gin: 2nd to 4th June.
Bundaberg: 8th to 10th June.
Wowan: 8th and 9th June.
Maleny: 23rd and 24th June.
Kilcoy: 29th and 30th June.
Esk: 15th and 16th July.
Ithaca: 23rd July.
Laidley: 27th and 28th July.
Royal National: 8th to 13th August.
Crow's Nest: 24th and 25th August.
Imbil: 7th and 8th September.
Beenleigh: 15th and 16th September.
Stephens: 17th September.
Nundah: 30th September and 1st Oct.
Kenilworth: 6th October.

This list may be added to.

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, 1926 AND 1925, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1926.	Nov., 1925.
North Coast.	In.		In.	In.
Atherton	2·97	25	0·68	0·60
Cairns	3·99	44	1·86	2·16
Cardwell	4·01	52	1·27	3·18
Cooktown	2·68	50	0·53	1·39
Herberton	2·47	39	2·17	1·61
Ingham	3·50	34	3·08	0·43
Innisfail	6·12	45	3·09	2·02
Mossman	3·61	13	2·21	2·90
Townsville	1·84	55	0·60	0·82
Central Coast.				
Ayr	1·70	39	0·15	0·27
Bowen	1·30	55	0·10	0·39
Charters Towers ...	1·47	44	0·23	0
Mackay	2·89	55	1·09	0·86
Proserpine	2·85	23	0·81	1·35
St. Lawrence ...	2·27	55	0	1·75
South Coast.				
Biggenden	2·68	27	1·48	2·66
Bundaberg	2·52	43	0·13	1·29
Brisbane	3·73	75	1·73	8·53
Childers	2·73	31	0	1·39
Crohamhurst ...	4·39	30	0·25	7·47
Esk	3·19	39	1·29	5·45
Gayndah	2·80	55	0·75	2·75
Gympie	3·18	56	0·29	5·46
Caboolture	3·32	39	0·60	8·59
Kilkivan	2·57	47	0·67	2·41
Maryborough ...	3·14	54	0·12	6·41
South Coast—continued:	In.		In.	In.
Nambour	3·90	30	0·22	5·52
Nanango	2·65	44	0·71	4·73
Rockhampton ...	2·20	39	0·03	1·50
Woodford ...	3·24	39	0·45	6·94
Darling Downs.				
Dalby	2·66	56	0·77	3·85
Emu Vale ...	2·73	30	0·76	5·17
Jimbour	2·33	38	0·44	3·01
Miles	2·41	41	0·51	2·17
Stanthorpe ...	2·76	53	0	4·23
Toowoomba ...	3·27	54	2·15	4·38
Warwick	2·59	61	1·14	5·51
Maranoa.				
Roma	2·10	52	0·04	3·78
State Farms, &c.				
Bungeworgorai ...	2·27	12	0·02	2·57
Gatton College ...	2·75	27	2·13	5·94
Gindie	2·11	27	0·06	2·15
Hermitage ...	2·76	20	1·07	5·08
Kairi	2·02	12	1·25	0·56
Sugar Experiment Station, Mackay	2·56	29	1·13	0·53
Warren	3·31	12	0	5·30

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November, 1926, and for the same period of 1925, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

FALLOWS DEFINED.

At a recent conference of Agricultural Instructors of the Department of Agriculture of New South Wales, it was recommended that fallows of different periods should be defined as follows:—

Long Summer Fallow.—Land fallowed for at least twelve months, the initial ploughing or cultivation to be not later than May in the year previous to sowing.

Winter or Ordinary Fallow.—Land fallowed for at least six months, the initial ploughing or cultivation to be not later than October in the year previous to sowing.

Short Summer Fallow.—Land fallowed for at least two months, the initial ploughing or cultivation to be not later than February in the year of sowing.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1926 AND 1925, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1926.	Dec., 1925.
North Coast.	In.		In.	In.
Atherton	7·69	25	9·98	7·55
Cairns	8·95	44	6·97	1·71
Cardwell	8·45	52	8·73	1·35
Cooktown	6·97	50	5·11	0·60
Herberton	5·59	39	10·30	5·54
Ingham	7·01	34	6·08	1·99
Innisfail	11·89	45	8·21	1·49
Mossman	12·55	13	7·02	5·96
Townsville	5·52	55	7·42	5·03
Central Coast.				
Ayr	3·85	39	3·52	1·22
Bowen	4·39	53	6·44	2·13
Charters Towers ...	3·53	44	3·77	0·87
Mackay	6·83	55	7·74	8·33
Proserpine	8·26	23	5·89	2·02
St. Lawrence ...	4·50	55	6·43	2·21
South Coast.				
Biggenden	4·50	27	13·61	5·51
Bundaberg	4·73	43	16·96	6·45
Brisbane	4·96	75	9·48	6·17
Childers	5·53	31	16·34	7·02
Crohamhurst ...	7·40	35	26·19	5·48
Esk	4·39	39	8·75	4·19
Gayndah	4·04	55	9·64	4·43
Gympie	5·78	56	23·01	10·39
Caboolture	5·05	39	12·19	5·98
Kilkivan	4·43	47	12·37	6·95
Maryborough ...	4·78	51	21·71	6·43

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1926.	Dec., 1925.
South Coast—continued:	In.		In.	In.
Nambour	6·20	30	23·99	4·56
Nanango	3·76	44	7·13	3·21
Rockhampton ...	4·64	39	7·74	3·90
Woodford	5·36	39	16·68	4·01
Darling Downs.				
Dalby	3·19	56	5·58	4·57
Emu Vale... ...	3·53	30	3·91	1·64
Jimbour	3·14	38	4·65	3·21
Miles	2·83	41	6·60	4·86
Stanthorpe ...	3·48	53	6·57	2·38
Toowoomba ...	4·26	54	7·24	3·51
Warwick	3·46	61	3·60	1·40
Maranoa.				
Roma	2·44	52	5·45	3·08
State Farms, &c.				
Bungeworgorai ...	2·74	12	6·49	2·11
Gatton College ...	3·38	27	7·25	2·97
Gindie	2·88	27	3·01	5·78
Hermitage ...	2·98	20	3·73	1·41
Kairi	6·71	12	12·97	5·19
Sugar Experiment Station, Mackay	8·04	29	7·04	12·77
Warren	3·49	12	5·68	3·52

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December, 1926, and for the same period of 1925, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

ILLEGAL BIRD TRAPPING.

It has come under the notice of the Department of Agriculture and Stock that a certain amount of illegal trapping of parrots and other birds was going on in the outskirts of Brisbane. The offenders in the majority of cases are boys, and it was for this reason that so far the department had refrained from instituting proceedings against them. It now desires, however, to draw attention to the fact that the present is the close season for all finches and for such parrots as kings, redwings, budgerigahs, quarrions, "blueys," and "greenies," and all persons are warned against either trapping or dealing in these birds. The open season for the abovementioned parrots does not commence until the 1st April next and the season for finches until the 1st July next.

General Notes.

Acknowledgments—Appreciation of the "Journal."

We desire to acknowledge many New Year greetings from our readers and appreciative references to the "Journal" from numerous farmers in correspondence with the Department. One farmer writes, and his remarks are typical of many:—"I enclose herewith postal note for one shilling, being the nominal fee for twelve months for the excellent periodical—the "Queensland Agricultural Journal"—the matter, paper, printing, and illustrations of which reflect credit on all concerned in its make-up."

Staff Changes and Appointments.

The Officers in Charge of Police at the following towns have been appointed Acting Inspectors of Stock as from the 1st January, 1927:—Clermont, Blair Athol, Capella, Finch Hatton, Mackay, Rolleston, Westwood, Maryborough, Bundaberg, Gayndah, Howard, Imbil, Pialba, Rosedale, Millaa Millaa, Collinsville, Jackson, Thallon, Mount Garnet, and Yaraka. Mr. F. J. Webber, of Burketown, has been appointed Government Representative on the Burke Dingo Board, Mr. H. C. S. Griffin, of Clermont, has been appointed Government Representative on the Clermont Dingo Board, and the Inspectors of Stock at Clermont and Winton have been appointed Government Representatives on the Belyando and Gregory Dingo Boards, respectively.

Messrs. H. E. Jenyns, J. B. Stephens, E. R. Geissmann, and W. Wilson, of Tambourine Mountain, Mr. L. Cain, of the Department of Agriculture and Stock, and Messrs. P. H. McLean and A. Pitts, of the Mackay district, have been appointed officers under and for the purposes of the Animals and Birds Acts.

Messrs. R. T. Croker (Malanda), F. H. Hyde (Peeramon), R. Campbell (Peeramon), D. Johnston (Malanda), A. Beattie (East Barron), and L. R. Macgregor (Director of Marketing) have been appointed Members of the Northern Pig Board as from 1st January, 1927, to the 31st December, 1927.

Messrs. R. B. Corbett (Woombye), M. H. Campbell (Albany Creek), S. Luxford (Wynnum), H. H. Stevens (Lanefield), J. Hutton (Kingsthorpe), and L. R. Macgregor (Director of Marketing) have been appointed Members of the Egg Board as from the 1st January, 1927, to the 31st December, 1927.

Mr. W. H. Thrupp, of Lauriston, Roma, has been appointed Government Representative on the Bungil Dingo Board.

"Organisation and Marketing Act of 1926"—Additional Regulations.

Regulation 37, as appearing in the "Government Gazette" of the 16th December, 1926, has been amended to provide that the maximum fees, allowances, and travelling expenses payable to Members of the Council of Agriculture shall be £2 2s. per sitting day, £1 11s. 6d. per travelling day, first class rail fares, sleepers and coach fares, or, in lieu of coach fares, sixpence per mile each way from their residence to their nearest railway station.

A further regulation has been approved providing for the filling of vacancies on any Commodity Board or the Council of Agriculture, caused by the death, retirement, or resignation of any member thereof. In the case of a vacancy on a board, the Minister may either appoint someone to fill the vacancy or order an election, the member so appointed or elected to hold office only until the next general election for members of the board. In the case of a vacancy arising, caused by the death, retirement, or resignation of a Commodity Board's representative on the Council, the board concerned shall elect one of its elected members to fill the vacancy, and the member so elected shall hold office only for the balance of the period of the tenure of office of the commodity board electing him.

Hambledon Sugar Levy.

Regulations have been approved empowering the Hambledon Mill Suppliers' Committee to make a levy on all sugar-cane growers whose lands are assigned to the Hambledon Mill at the rate of one-eighth of a penny per ton of all cane delivered from those lands to the Hambledon Mill during the period commencing 1st May, 1926, to the 28th February, 1927. Provision is made for a poll to be taken on the question of the levy, if such poll is petitioned for by at least eighty cane-growers in the abovenamed locality. The amount of the levy, if made, will be deducted by the manager of the Hambledon Mill from final cane payments due to the growers concerned, and shall be paid by the manager to the Hambledon Sugar Mill Suppliers' Committee for the purpose of administering the business of such committee.

Organisation and Marketing Act—Regulations.

Regulations have been approved under the abovementioned Act, providing as follows:—By Regulations dated the 21st January, 1926, a levy was imposed by the Council of Agriculture on canegrowers in the Homebush area, and as all the proceeds of this levy have not been disposed of, it has been approved that the balance shall be distributed by a Liquidator (Mr. F. J. Stevens, of Mackay, has been appointed Liquidator) amongst the primary producers on whom the levy was first imposed, in proportion to the amounts collected from them.

Sugar Mill Suppliers' Committees.

Regulations have also been passed providing for the election of members of the Mill Suppliers' Committees and District Cane Growers' Executives connected with the Queensland Cane Growers' Council. Forms are prescribed for the ballot-papers, nomination forms, returning officer's returns and declarations. It is provided also that at the election held in March, 1927, each Mill Suppliers' Committee, District Executive, and the Queensland Cane Growers' Council shall be elected for a period of three years for the period to the 31st March, 1930. Colonel Hooper, care of the Council of Agriculture, Brisbane, has been appointed Returning Officer in connection with these elections, and nominations must reach him not later than 6 p.m. on Monday, the 14th February, 1927.

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.

Egg Board Election.

Following is the result of the Egg Board election, conducted by the Department of Agriculture and Stock, for two growers' representatives for Districts Nos. 1 and 2 which took place at that office on the 31st December:—

District No. 1 (Caboolture to Bundaberg).	
Ronald Benjamin Corbett (Woombye)	60 votes
Alfred Moody (Palmwoods)	39 votes
Informal	1 vote
Total	100 votes
District No. 2 (Brisbane North and Redcliffe).	
Matthew Hale Campbell (Albany Creek)	49 votes
Robert Auburn Chapman (The Gap)	48 votes
Total	97 votes

One representative is required for each of these districts.

Homebush Sugar Levy.

The Homebush Sugar Mill Suppliers' Committee have been empowered to make a levy on sugar-cane growers in the locality constituted by the lands formerly assigned to the Homebush Mill but now assigned to the Farleigh Mill, and whose cane is diverted from the Farleigh Mill to North Eton, Marian, Pleystowe, Racecourse, or delivered to Farleigh, at the rate of one penny per ton on all cane delivered from the said locality to any of the abovementioned mills during the period 1st May, 1926, to 28th February, 1927. Provided, of course, that if at least seventy sugar producers in the abovenamed locality ask on or before the 22nd January, 1927, for a poll to be taken as to whether the levy shall be made, a poll shall be held, and if, upon the result of the poll, the majority of the votes is against the making of such levy, the levy shall not be made. The amount of the levy will be deducted by the managers of the mills concerned, from the final cane payments due by such mills to growers in the locality concerned, and the managers shall pay the amount deducted to the Homebush Sugar Mill Suppliers' Committee. which shall utilise same for the purpose of providing funds for the Homebush Mill Suppliers' Committee.

The American County Agent—An Australian's Impressions.

Much has been written about the American county agent, and the part he plays in "better farming" propaganda. In the course of a recent visit to the United States, Mr. D. Kelly, of Parkes district, New South Wales, collected some information and impressions which he has made available to the Advisory Council of the New South Wales Agricultural Bureau. Mr. Kelly's observations covered also the operations of the American Farm Bureau, and as the Bureau and the agent work together and are interdependent, they were made the subject of a conjoint report.

The method of organising the Farm Bureau of America, it is stated, is distinctly different from the New South Wales Agricultural Bureau system. The membership of a Farm Bureau would consist of subscribers scattered all over a county, who would contribute to the salary of the county agent, and would elect from their members an executive committee, or "county commissioners," as they are sometimes called. These executive bodies have very wide powers, including the right to levy direct taxes upon the farmers of the county to provide all necessary finance for the support of the county agent, &c. In this way a strong central body is created, which functions in a general way in all matters of interest to the agriculturists of the county; but in the opinion of Mr. Kelly is appears to lack the interest that centres in small local branches, which is so valuable a feature in the New South Wales system. An American State county would generally include an area of about 30 miles square. These are divided into square-mile sections or townships (as they are called), and with the Bureau indiscriminately spread over the whole area, the vital local interests, as stimulated by our own system, seemed to be lacking.

The visitor also found that there was in some localities a strong feeling of antagonism among certain sections of the farmers, who considered they were not getting any direct benefits from the organisation, and very bitterly resented having to contribute in direct taxes towards its upkeep. This feeling existed principally among the members of the Farmers' Union, a trading concern, running on co-operative lines.

The same remarks are stated to apply also to the county agent and his work:

"I came into personal contact with several county agents, and the general impression was that they were not very happy in their work. They appeared to attempt too many things in a general way, giving a great deal of time to the commercial problems of individual farmers, and marketing problems generally.

"While I was in one agent's office several men called in, inquiring for work on farms, and the agent told me that his time was mostly taken up with that kind of work during harvest time. The responsibility of collecting from the farmers subscriptions towards his salary rests upon the agent, and this circumstance very seriously depreciates both his status and his popularity in the community in which he has to work. In one State the county agent was vested with powers to take action in respect of the Noxious Weeds Act against landholders who disobeyed the law, and in this regard he was expected to perform police duties.

"Generally speaking, the county agent was looked upon as a kind of handy man —at the beck and call of everybody. If a farmer had a sick cow, or his fowls had refused to lay, he sent for the county agent; and woe betide him if things were not promptly rectified."

The conclusion arrived at was that development of the Agricultural Bureau and the district instructor system on existing lines seemed likely to prove most satisfactory to the agricultural interests of New South Wales.

American Fresh Fruits on the British Market.

That America is not free from the charge of sending damaged fruit to the British market so frequently levelled against Australia is shown by a report recently made by Mr. Edward Smith, Specialist in Foreign Marketing, employed by the United States Government. Writing on 23rd October, Mr. Smith said:—

"The week of September 30th witnessed the first appreciable arrivals of Washington Jonathans on the British market. Splendid prices resulted for Jonathans in good condition, but, strange to say, even at this early date, at least three cars of Washington Jonathans arrived showing internal breakdown and decay, with a general condition of over-ripeness. A portion of these were in this condition as a result of ordinary stowage on board ship, but two carloads, however, came under refrigeration, so that their over-ripe condition must have occurred prior to leaving New York. Most of these deteriorated Jonathans when sold showed a loss of at least 2s. per box, due to faulty handling practices.

"For several weeks Bartlett pears packed in barrels have been arriving in a deplorable condition—as only Bartlett pears can get in when over-ripe and decayed—selling for any price obtainable, if, in fact, the barrels did not have to be dumped."

Commodity Boards—Regulations.

Regulations to be known as "The Primary Producers' Commodity Boards Regulations of 1926-27" have been approved. These provide for the constitution of Commodity Boards, ballots in connection with Commodity Boards, election of members, meetings of Boards, &c.

The Cotton Board Constitution—An Alteration.

The constitution of the Cotton Board has been altered to provide for five representatives of growers instead of seven as originally provided. The members will now be elected biennially instead of annually, and it is provided that the present members shall hold office only until the election of new members, which will take place shortly. Nominations are being called for members, the date of closing being the 22nd January, 1927.

Broom Millet Levy.

The Broom Millet Board is empowered to make, on growers engaged in the broom millet industry, a levy at the rate of 2s. 6d. per cwt. (or part thereof if such part exceeds half cwt.) on all broom millet produced and sold during the period 1st December, 1926, to 30th November, 1927, such levy to provide for the administrative expenses of the Board. The amount of the levy shall be deducted from the proceeds of sales of broom millet by every agent, person, firm, &c., who purchases broom millet from a grower, or sells broom millet on behalf of a grower, and shall be forwarded to the Secretary, Broom Millet Board, by such agent, &c., not later than the seventh day of the month next succeeding such purchase or sale.

Novel Milk Can for Railway Transport.

A feature of the Annual Dairy Show, organised by the British Dairy Farmers' Association, and held in London in October, was the many new and improved dairying appliances. According to the "Farmer and Stockbreeder," one of the exhibits comprised "the special railway churn, built on Thermos flask lines, having double walls throughout, filled with insulating material." It was claimed that milk can be left in one of these churns all day in a hot sun, without more than 5 per cent. temperature rise. The name of the manufacturer is given as Mr. A. J. Clare, Wells, Somerset.

Present Position of World's Sugar Industry.

The world's production of sugar has increased by about 9,000,000 tons during the last seven years, and it is interesting to note that of this figure Europe accounted for nearly 5,000,000 tons, and Cuba for 1,150,000 tons. The consumption of sugar, however, throughout the world has not been able to overtake supplies, and at the end of the sugar year 1924-25 there was a carry-over of 2,890,000 tons. A large carry-over is also expected at the end of the year 1925-26. The question naturally arises as to whether production be restricted or the situation be left as it is, in the hope of arriving at some satisfactory basis with consumption overtaking production under the impetus of lower prices.

Discussing the matter in a recent supplement to the "Indian Trade Journal" (Calcutta), Mr. Kasanji D. Naik, M.A., and Mr. Dhirajlal M. Desai, B.Sc., of the Indian Sugar Bureau, point out that there is no doubt that India, Japan, and China are capable of absorbing much larger quantities of sugar, provided they are offered at a price which they can afford to pay. Assuming, however, that the normal increase in world absorption of 750,000 tons per annum will continue, it would mean that there are prospects of an increase in consumption at the end of ten years of 7,500,000 tons. Such an increase would only be possible provided large sums of money are invested in the industry. It must not be forgotten that Germany is still far short of its pre-war level of production, and that Russia can produce nearly a quarter million tons more than her output of the last campaign. The latest estimates place the area planted with beet in Europe at 2,182,000 hectares or 5,394,700 acres—an increase of 48,560 hectares or 120,000 acres over last year.

The problem is how and in what way production may be reduced and the consumption increased. The price generally paid for the commodity is the determining factor. Any appreciable rise in prices would act as a check on consumption; on the other hand, if the prices were to go lower than the present level it would not pay the factory to manufacture sugar, the cost of production having increased considerably since the war. This brings about unsettled conditions in the market with consequent fluctuations which benefit only the speculators, but are in reality detrimental to the trade as a whole.—"Chamber of Commerce Journal," London.

Activities of the New Zealand Honey Control Board.

According to a report issued by the New Zealand Honey Control Board the system of organised marketing of honey which has voluntarily been followed has achieved considerable success. This has been brought about in the specialising of New Zealand honey, first by packing only a definite standard of quality, second by retaining its identity in its retail distribution, third by keeping below-standard from table consumption, and fourth by extensive advertisng and publicity work. This system of marketing, according to the report, has resulted in New Zealand honeys being sold at a considerable premium over competitive honeys, a portion of such premium, in the ordinary course of events, being absorbed in the payment of advertising and distribution costs. The Control Board was set up to have this system of marketing protected, the disorganisation of which could otherwise be brought about by shippers selling outside the organisation.

The Honey Control Board first assumed control in February, 1925, this control requiring that all honey exported to the United Kingdom and Europe should be shipped to and distributed by one agent only. The Control Board does not handle accounts, the shipper dealing direct with the agent. The costs of maintaining and extending the market are distributed over all consignments to the extent that advertising charges are spread equally over all sales, the expenditure of one year being spread over the sales in that period, and also the costs of distribution, and control of distribution in the 5 per cent. commission allowed to the agents. Exporters are financed as required by advances made by the agents' New Zealand representative against documents.

Limited control has operated over the 1925 and 1926 export seasons. The producers who were exporting through their own association were in no wise affected when control came into operation, they having borne the costs of organised marketing throughout. The number of shippers, therefore, affected by control is very few. In 1925 they represented 2.8 per cent. of the producers exporting, their honey representing 4.6 per cent. of the whole. In 1926 the figures were 1.89 per cent. and 2.19 per cent. respectively.

Previous to organised marketing, New Zealand honey did not realise equal to Californian or Jamaican, but, in August last, sales of New Zealand honey were made at from 60s. to 80s. per cwt. Quotations for the same month for Canadian honey were at 40s. to 56s. per cwt., Californian at 47s. to 58s., and Jamaican 42s. to 49s. The report points out, however, that while a considerable portion of the premium obtained has been absorbed by advertising charges, the balance represents a considerable margin on the returns of New Zealand's competitors. The total exports for 1925 amounted to 785 tons, some 265 tons more than for 1924. The export for 1926 was 550 tons, the reduction being due to an adverse season.

Business with Germany is developing satisfactorily. During the period July to November, 54 tons were sold to that country, all in retail packages. This progress in the introduction of New Zealand honey into Europe has been made despite the fact that it pays a duty of roughly 20s. per cwt.

It is now proposed that the board investigate the marketing conditions with a view to ascertaining whether costs of marketing can be reduced while at the same time retaining a proportionate amount of the advantages gained and also provide for the disposal of the increasing production.

Cheap Rugs for Dairy Cows.

To farmers who favour the rugging of their dairy cows, but who cannot afford the ordinary bought article, the following suggestion of a dairy instructor of the New South Wales Department of Agriculture will be of interest:—

"The farmer can make his own cow rugs for little more than the cost of the bags, a ball of twine, and a sewing needle, plus his own ingenuity. Two bags (cornsacks or any heavy bags will do), or three for larger cows, will make a nice rug. Split them down the seams and join together, place on the cow, and sew together in front of the cow's brisket; next join the back with a 4-inch strip of bag about 12 or 18 inches below the rump-level, and the rug is complete.

"This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has soaked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs."

It is stated that it is fairly common on the North Coast of New South Wales to see a herd rugged during portion of the winter in the manner described. The practice helps greatly in the maintenance of the milk flow, and the idea is one that should appeal to all thrifty dairymen.

Arrowroot Levy.

The Arrowroot Board has been empowered to make, on all growers delivering arrowroot bulbs to mills during the 1926-27 season a levy at the rate of 1d. per ton of bulbs so delivered. The amount of such levy shall be deducted by the managers of mills concerned from payments due by such mills to growers, and shall be paid by the managers to the secretary of the Arrowroot Board at the end of 1926-27 season. The proceeds of the levy shall be utilised for the administrative expenses of the Arrowroot Board.

The Marketing of Poultry in England and Wales.

At an approximate estimate, about 75 per cent. of the total poultry marketed in England and Wales is produced there, but there is reason to believe that the overseas producer has not yet delivered his main offensive, states the Report on the Marketing of Poultry in England and Wales just issued by the British Ministry of Agriculture, which, though prepared primarily for the information of the home producer, will nevertheless be of great interest to Australian producers. The report shows that there are many directions in which reform is desirable; there is little or no specialisation in the production of a particular type of bird to meet specific market demand as there is in France, Holland, and Belgium; there is no uniform system for the classification and grading of home produce. This last is a pressing need. A scheme of classification and grading applicable to both live and dressed poultry is, therefore, put forward in the report for consideration. The scheme has met with the approval of leading distributors in the trade who realise that "the present lack of uniform terminology, of a standard system of price quotation and of well-defined quality distinctions that are accepted and understood generally, leads too frequently to a state of affairs on the wholesale markets that is little short of chaotic."

In other respects, the preparation of home-produced poultry for market is poor, and there is a general lack of knowledge of market requirements. An important section of the report is, therefore, devoted to describing the best practices at home and abroad. These include the processes of conditioning, fattening, killing, plucking, cooling, shaping, and trussing. Stress is laid in the report on the importance of the systematic conditioning of birds for varying periods before slaughter. At present this is not carried out to any great extent in England except at one or two centres, and complaints are general in the wholesale markets of the high proportion of lean and unfinished birds received. Conditioning should play an increasingly important part in the future course of the industry. For various reasons, individual producers, particularly general farmers, are rarely in a position to carry out the process conveniently or economically, and the report states that it can usually be best left to country wholesalers or to conditioning and packing establishments run by producers on co-operative lines.

With the aid of the grant recently made to the British Ministry of Agriculture by the Empire Marketing Board, the report is being issued at a very low price. It can be obtained from His Majesty's Stationery Office, London, for 9d., post free.

Regularity in Cow Feeding.

Experiments by the United States Department of Agriculture at the experimental farm of the Bureau of Dairying show that with cows that are average to good, milking may take place at irregular hours without any marked effect upon production. Whether very high producers would show similar results has not been determined.

It was found, however, that when irregular milking was accompanied by irregular feeding the production was lessened about 5 per cent. Apparently cows are more sensitive to changes in the feeding routine than to variations in the hours of milking. The conclusion is not to be drawn from these experiments that regularity in doing the dairy work is a matter of little importance, observes the Department, but rather that cows can occasionally be milked earlier or later than usual if there is something else to which the dairyman desires to give his time.

Though it is generally believed that a cow will produce more when milked always by the same person, the practice in many large dairies in the United States, where there are several milkers, is to milk the cows as they come, rather than to reserve certain cows for each man. At the Bureau's experimental farm, twelve cows were divided into three groups of four cows each, and each group was milked regularly by the same man for forty days. The twelve cows were then milked by the same three men in such a way that no cow was milked twice in succession by the same man. After forty days the cows were changed to regular milking again for forty days. The results show an increase of only about 0.05 per cent. in the milk and butter-fat through steady milking by the same man. This, says the Department, is so little as to be almost negligible.

Farm for First Offenders.

The Government of South Australia is considering a proposal of the Salvation Army to establish a farm for absorbing first offenders, following a suggestion of the Justices' Association. The suggestion is that the Salvation Army should manage the farm and that the Government should finance it. When an arrested man is unemployed and destitute, it is proposed that the magistrate should have a discretion to order a period on the farm instead of imprisonment.

The Value of Crop Rotation and Fertilisation in Increasing Soil Productivity.

According to the Bureau of Soils of the United States Department of Agriculture, the United States will have to depend upon the cultivation of the soil for about one-third of its combined wheat, maize, and oats produced; upon crop rotation for another third; and upon the use of manures and commercial fertilisers for the other third. It is logical, states the Bureau, that cultivation aids both rotation and fertilisation, that rotation aids in rendering fertilisers more effective, and that fertilisers increase the value of rotation. Recent experiments, however, bring out the fact that rotation and the use of fertilisers, when practised together, may interact to the extent that their conjoint effects, as measured in terms of crop increases, may be not only equal to but greater than the sum of their separate effects.

The average yield of maize obtained without fertilisers and rotation in these particular experiments was 23.4 bushels per acre. The gain due to using fertilisers and lime was 9.2 bushels per acre, and the gain due to rotation alone was 27.8 bushels, or practically three times that obtained from the fertilisers and lime. The total increase effected by conjoining rotation and the use of fertilisers was 44.2 bushels per acre, or 7.2 bushels greater than the sum of their separate increases.

Other experiments conducted by the Bureau have corroborated these results, which emphasise the importance of recognising all three factors in striving for permanent soil productivity.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Buds and Grafts—Directions for their After Care.

Shoots that were budded the previous growing period should have been cut back to start the inserted buds into growth when the natural buds of the stock showed signs of activity in the spring. It is generally far better that this cut should be made between 2 and 3 in. above the inserted bud, leaving a stub to which the tender shoot from the inserted bud can be tied as it extends, thus lessening the chances of breakage from wind. Apart from tying, the projecting stub often offers protection to the tender shoots from birds resting or the brushing of persons or horses when passing.

The buds on the stub above the inserted bud will start into growth, and if not attended to will probably sap the growth from the inserted bud. The way of dealing with these buds which entails the least work is to destroy them by picking them out with the thumbnail or secateurs when cutting back the shoots in the spring, and if one cannot depend on finding time to pay attention to the buds later probably this is the best plan. However, the inserted buds appear to come away with a healthier growth if the buds in the stub above are allowed to start. When this is done it is necessary to pinch the growth from them later to prevent the growth from the inserted bud being sapped. The healthier growth from the inserted bud is probably due to the buds above drawing the sap and later providing foliage which assists in elaborating the raw sap. After the growth from the inserted bud has grown out a few inches and has an established appearance, the growths from the stub above can be brushed off to avoid further attention.

GROWTHS BELOW THE INSERTED BUDS.

Besides the growth from the buds on the stubs, many growths will start from the stock below the inserted buds, or from below grafts that have been inserted earlier in the spring of the current season. On nursery stocks these growths are generally better rubbed off on sight, but on established trees that have been worked over with another variety it is far better to allow some of the growths from below the inserted buds or grafts to remain. However, attention is required, or these growths may sap the growths from the buds or grafts.

Some of the shoots from below the buds or grafts will at once show great vigour, and are better rubbed off at once, as they will be a constant menace; the weaker shoots are better allowed to remain, but should be inspected occasionally, and, if any shoot strongly, should be pinched or slashed back to prevent them sapping the growth from the inserted buds or grafts.

The advantages of leaving some growth on the stumps of worked-over trees below the buds or grafts is threefold. In the first place these growths provide some foliage to assist in the elaboration of the raw sap. It must be remembered that by cutting back the main limbs for grafting or budding the major part of the foliage is lost, and the roots thereby suffer partial starvation till sufficient growth is made to restore the balance between root and top. Secondly, the growth on the stumps shades the bark from the sun and promotes sap circulation, which prevents the sun from scalding the bark. Thirdly, the extra growth assists in protecting the tender new shoots from the inserted buds or grafts from breakages by wind.

Sometimes when working over established trees some limbs are left unworked; where this has been done it is often necessary to check their growth during the following growing season, or they will sap the growth from the buds or grafts too much.

The shoots from the inserted bud or graft should be interfered with as little as possible during the growing season, but when they make rapid growth it is necessary to pinch them back to prevent them being blown out by winds. For a year or two after they start they must also be cut back rather severely when pruning in the winter to prevent too rapid extension till they are fairly established.

SUPERFLUOUS INSERTED BUDS.

Superfluous inserted buds should not be removed for the first two or three years till those selected for framing the tree are well established, and there is reasonable certainty that they will not be blown out or lost by other mishaps. Likewise the superfluous scions on a stump should be retained till the callous has spread well over, and all round the cut edge of the stump. If only one scion is left on a thick stump the sap will not be drawn on the opposite side, and the bark will often die away on that side. The extra scions round the stump keep the sap moving on all sides and hasten the callousing over of the wound.

Though the delay in cutting them out often creates a fairly big wound when the time comes for the operation to be performed, such wounds are surrounded by the new callous, and the liberal flow of sap causes them to heal over rapidly. As the growth from buds or grafts on reworked established trees often develops very rapidly, there is danger during the first few years, until the callous has crept round, of their being broken out. For this reason it is wise to brace the new limbs with lashing or wires.—A. and P. Notes, N.S.W. Department of Agriculture.

Agriculture in Germany.

According to an American official report, unbalanced economic conditions in South-west Germany have led to an agricultural situation under which farmers, in many instances, are unable to make a living. The result has been a large emigration of farmers limited only by the immigration restrictions of various countries. In 1871 the rural population of Germany was 64 per cent. of the whole population, while the present percentage is said to be only 35.

Laying Out a Poultry Farm.

The shape of the block, the area available, the aspect and the general direction of the fall, all require close attention, both before purchase and subsequently when deciding on the location of poultry farm buildings and yard.

The best site for a poultry farm, other things being equal, is a slope with a north-eastern aspect, free from broken ground or rocky declivities, and having a clear opening for the morning sun to reach the yards. Flats and hollows are not suitable positions, especially when the ground is of a clayey nature; high positions give decidedly the best results in winter egg production. It is a truism that poor land keeps the farmer poor, and this, together with position, is in a great measure applicable to the site for a poultry farm; it will take some very substantial advantages in other directions to balance the handicap of a bad site. According to its size, too, every poultry farm should have its cultivation area, for the purpose of growing at least all necessary green feed.

Following are some points in the selection of a site:—

A northern or north-eastern aspect is best.

Give preference to high ground with a gentle slope, not too much exposed to south-west winds.

Secure good surface drainage, and avoid seepage at the foot of hills.

Give preference to sandy soils as against those of clay formation.

Avoid flats and gullies.

Rocky positions will be found troublesome in the matter of erecting fences and laying out the farm generally.

Give preference to land in its virgin state over that which has been cultivated.

Remember that adequate provision of water is a very important factor.

It is highly desirable that the land should have sufficient fall to allow of good surface drainage; without this, adequate sanitation is impossible. Where there is a good fall in the land the yards will get washed during heavy rains, which is very desirable, particularly on clay or loamy soils, but it is a mistake to have too steep a gradient. On sandy soils of good depth perhaps this is not so important, because sand is such a good filtering agent; but the great bulk of poultry farming is conducted on the soils of the class first mentioned.

The buildings, too, will have to be arranged so that they will not too materially obstruct the natural course of the water; it is also most important that the yards or enclosures fall away from the houses, not towards them. If placed otherwise, trouble will certainly be experienced with water running into the houses during rainstorms.

The area of land required will, of course, be in proportion to the anticipated extent of the operations. Of late there have been systems claiming to be able to run so many thousands of poultry to the acre, but an ultimate breakdown is almost a certainty with such intensive methods. It may be set down that if one is to make a living on the average country taken up for poultry farming, 5 acres is the minimum that can be advised. On this area it is possible to run 800 to 1,000 layers, to raise the necessary stock to maintain that number, and to have a small area on which to grow green feed.

The poultry industry can only become fully profitable when established on sound lines, and when each stage, from the selection of the breeding stock to the final marketing of either egg or live bird, receives the closest consideration.—"A. and P. Notes," N.S.W. Dept. Ag. and Stock.

Burn—or Plough in?—A Point in Preparing Land for Wheat.

One of the questions most frequently asked in relation to the preparation of land for wheat is: "Would it not be advisable to occasionally plough in the straw left after harvesting, instead of burning it?" It can be definitely stated that it is always advisable to burn the stubble. A good stubble burn is one of the best means of destroying fungus spores, and is therefore of great assistance in combating such diseases as flag smut, take-all, wheat blight, and wheat mildew.

The ploughing in of stubble, in addition to encouraging fungus diseases, also has a most objectionable effect on the physical condition of the soil, rendering it extremely difficult, if not impossible, to bring about a good consolidation of the subsurface soil. The moisture-holding capacity of the soil is also affected temporarily.

The results of experiments carried out in wheat districts throughout New South Wales indicate that wheat yields are reduced when the straw is ploughed in. This reduction in yield has in the past been chiefly attributed to the detrimental effect of the straw on the physical condition of the soil, but in view of the results of recent investigations in the United States of America it now seems that there is also a detrimental effect on the nitrogen content of the soil. The investigations referred to showed that—

(1) The ration of nitrogen to carbon in soils, irrespective of their origin, is practically constant, and tends to remain so. Taking the carbon content as an index of the organic matter present in the soil, this indicates that the soil organic matter cannot be increased unless additional nitrogen has also been provided.

(2) The nitrogen-carbon ratio in material returned to the soil has a marked influence on the kind and rate of decomposition. Organic matter, such as wheaten straw, having a wide nitrogen-carbon ratio (1 part nitrogen to 75 parts carbon) has a depressing effect on the development of nitrates when applied to the soil, and such effect is noticeable until there has been sufficient decomposition to cause the ratio to approach that of the organic matter of the soil. Green manure of a leguminous nature would have a narrow nitrogen-carbon ratio (1-10). If this were ploughed in there would be an immediate and rapid nitrate development. There would also be less loss of carbon-dioxide, and an indication of greater maintenance of organic content.

The application of straw to the soil stimulates the activities of bacteria, which use the straw as a source of carbon and the nitrates of the soil as a source of nitrogen. The nitrates are transformed into organic nitrogenous material, and for the time being are lost to the soil, as far as their availability is concerned. The more straw ploughed in, the greater the loss of nitrates. Nearly all the carbon is lost as carbon-dioxide, and as this is the case non-leguminous crop residues, such as wheaten straw, cannot bring about any satisfactory increase in the amount of humus in the soil.

In the light of these results it now appears that, although straw is ploughed in with the idea of increasing the humus content of the soil, actually it would be no better in this respect than if the straw had been burnt, and would even result in a temporary loss of available nitrogen. From every point of view, therefore, the burning of wheaten or oaten straw is preferable to ploughing it in.

In view of these investigations it would also appear advisable to eat off such green stuff as wild oats, self-grown wheat, &c., rather than to plough it in, as the sheep would return most of the green stuff to the soil in a handier form. Much nitrogen also would be returned in the excretion. To increase the humus content of the soil to any extent we must also increase the nitrogen content. This can best be done by ploughing in or feeding off a leguminous crop.

There is great difficulty in finding a leguminous crop that can be economically fitted into the present system of wheat-growing. Although field peas grow well throughout most of the Southern wheat belt, they have not up to the present been widely grown. The reasons for this are: (1) Sheep do not eat them as readily as could be desired; (2) the expense of seeding; and (3) the difficulty of each year economically feeding off a large area of field peas. In the future, as sheep become more closely associated with the growing of wheat, and as the areas become smaller, this problem of utilising green crops will tend to solve itself, but at present it is a serious drawback to the growing of leguminous crops.

Rotation experiments are being conducted at the experiment farms on this important matter, and the result should eventually be most valuable.—"Agricultural and Pastoral Notes," New South Wales.

When Buying a Cream Separator.

Although the proper handling and care of the cream separator is becoming more generally known, writes Mr. E. O. Challis, Superintendent of Dairying, South African Department of Agriculture, a large number of cream suppliers have still much to learn in this respect. Its proper understanding is important, especially in view of the fact that the variations in cream tests depend almost entirely on whether the separator is being worked correctly or not. There are many excellent makes of separators on the market, as well as numerous bad ones. In selecting a machine one that is simple and solidly constructed should be chosen, which is easy to clean and turn, has a minimum of spare parts to be replaced, and, above all, skims clean.

A cheap separator is dear at any price. It wears out quickly, frequently requires new parts, and, after a comparatively short time, will cause no end of trouble between the creamery management and the supplier owing to the variations from day to day in the consistency of the cream.

To ensure good work being performed by any separator, it is essential to have it firmly set up on a solid foundation, care being taken to ensure that the latter is perfectly level. These points are too frequently neglected, with the result that the machine quickly gets out of order, and clean skimming becomes almost impossible. In selecting a foundation for a machine, it should be borne in mind that the types which have a suspended bowl can be placed directly on a cement floor, a cement block, or solid stone foundation. Machines not having the suspended type of bowl can be similarly fixed, but must have a wooden cushion inserted between the base of the machine and the solid block foundation. This latter precaution is very necessary, as good types of machines frequently go wrong owing to having been bolted down direct on either a stone or concrete base.

Growing Green Peas—Climatic and Soil Requirements.

It is not many years since green peas were looked upon as a luxury, but now this vegetable is classed with those of almost everyday use, as it is possible to secure supplies practically throughout the year at prices within the reach of all.

The pea crop requires for its best development a temperate climate. In the cooler portions of the State the season of growth is during the summer months, a period when the cultivation of the crop is limited in other districts owing to the heat. While the plant itself is seldom injured by frost, the flowers and pods are not so hardy. Young pods that have been frosted and that are unlikely to develop may be distinguished by a characteristic white, mottled appearance on the outside skin. During autumn and spring, when frosts are sufficiently severe to cause damage to the crop in cool, elevated districts, the conditions are suitable for its growth in warmer districts, while in the frost-free regions bordering on the sea the crop can be harvested in midwinter.

Experience of local conditions and luck in missing damaging frosts at flowering time are the factors which largely regulate the range in planting dates from the early to the late sown crop.

The damage from frost may be only partial, and a later crop of bloom on plants previously ''nipped'' may form up without further trouble in this respect.

There has been a considerable increase in the area planted of late years, so much so that gluts are not infrequent. This is due largely to the high monetary returns which are at times secured during crop shortages inducing greater interest in the crop in following years. It is always impossible to foretell what the season will be, and as the crop is one largely grown without irrigation fluctuations will always occur.

During periods of glut many consignments realise less than the picking and forwarding costs, and are then a direct loss to the growers. Under these circumstances it would be advisable for growers to consider the question of maturing the crop for seed. If this were done a good deal of expense of future crops would be saved, and, apart from supplying one's own requirements, there should be little difficulty in disposing of further supplies should the quality be satisfactory.

As the supply of pea seed is now almost wholly imported, it is in the interests of the State and producers generally that greater attention be given to this aspect of the pea-growing industry. The possibilities in this direction should certainly not be lost sight of during periods of glut.

A sandy loam is most suitable for the crop, but almost any soil of fair average quality will yield good results. As with all legumes, the supply of nitrogen in the soil is a matter of less moment than that of phosphoric acid, potash, and lime, and hence it is that in some localities dressings of fertilisers that contain the last three have a material effect upon the yield. The crop has the strong recommendation that in addition to yielding profitably it contributes to the fertility of the soil for the purpose of subsequent crops by increasing the store of nitrogen, and by enabling the gardener or farmer to add to the soil a considerable quantity of top-growth of a kind that humifies readily when turned under.

It does well on newly-broken land, and can be used as a preparation crop.—''Agricultural and Pastoral Notes,'' New South Wales.

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.

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Please address all requests for copies of these publications to the Under Secretary, Department of Agriculture and Stock, Brisbane.—John Reid, Editor of Publications.

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.

1927.	JANUARY.		FEBRUARY.		MOONRISE. Jan.	MOONRISE. Feb.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5.1	6.49	5.26	6.46	2.33	3.44
2	5.2	6.49	5.26	6.45	3.17	4.48
3	5.3	6.49	5.27	6.45	4.6	5.57
4	5.3	6.50	5.28	6.44	5.2	7.5
5	5.4	6.50	5.28	6.44	6.4	8.13
6	5.5	6.50	5.29	6.43	7.9	9.17
7	5.6	6.51	5.30	6.42	8 16	10.22
8	5.6	6.51	5·31	6.42	9.21	11.24
						p.m.
9	5.7	6.51	5.31	6.41	10.25	12 25
10	5.8	6.51	5.32	6.40	11.27	1.27
					p.m.	
11	5.9	6.51	5.33	6.40	12.29	2.27
12	5.9	6.51	5.34	6.39	1.31	3.25
13	5.10	6 51	5.34	6.38	2.31	4.19
14	5.11	6.51	5.35	6.37	3.34	5.1
15	5.12	6.51	5.36	6 37	4.34	5.54
16	5.13	6.51	5.36	6.36	5.30	6.34
17	5 13	6 51	5.37	6.35	6.22	7.11
18	5.14	6.51	5.38	6.34	7.0	7.45
19	5.15	6.51	5.38	6 34	7.58	8.10
20	5.16	6.50	5.39	6.33	8.35	8.46
21	5.16	6.50	5.40	6.32	9.11	9.15
22	5.17	6.50	5.40	6 31	9.45	9.49
23	5.18	6.49	5.41	6.30	10.15	10.22
24	5.19	6.49	5.42	6.29	10.46	11.1
25	5.19	6.49	5.42	6.28	11.16	11.42
26	5.20	6.48	5.43	6.27	11.50	nil
						a.m.
27	5.21	6.48	5.44	6.26	nil	12.31
					a.m.	
28	5 22	6.48	5.44	6.25	12.25	1.25
29	5.23	6.47	...	...	1.0	...
30	5.24	6.47	...	...	1.53	...
31	5.25	6.47	...	...	2.45	...

Phases of the Moon, Eclipse, Occultations, &c.

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

4	January	●	New Moon	6 27 a.m.
11	,,	☾	First Quarter	12 43 a.m.
18	,,	○	Full Moon	8 26 a.m.
26	,,	☽	Last Quarter	12 5 p.m.

Perigee, 7th January, 1 6 p.m.
Apogee, 23rd January, 1 18 p.m.

When the Sun rises on 4th January it will be under circumstances quite unusual. Instead of the full-orbed Sun the greater part of its face will be darkened by the intervening Moon and only about one-fifth of the usual brilliant orb will bring modified daylight at Warwick and Toowoomba. Right across the Pacific Ocean and part of South America the magnificent phenomenon of an annular or ring-shaped eclipse of the Sun will occur.

The fact that the Earth and Moon will be in Perihelion at the time of the Eclipse is the principal reason why an annular instead of a total eclipse will result.

An occultation of Epsilon Tauri, a small star of magnitude 3·6, will take place about 40 minutes after midnight. The star will disappear before the bright edge of the Moon reaches it, the cause being the dark or unlit portion of the Moon preceding the brightened surface.

Mercury will be in superior conjunction with the Sun on the 28th, that is on the path of its orbit beyond the Sun and farthest from the Earth. Mercury will not be directly behind the Sun but two degrees, or four times the diameter of the Moon above it.

2	February	●	New Moon	6 54 p.m.
9	,,	☾	First Quarter	9 53 a.m.
17	,,	○	Full Moon	2 18 a.m.
25	,,	☽	Last Quarter	6 42 a.m.

Perigee, 4th February, 10 6 a.m.
Apogee, 20th February, 4 6 a.m.

By the middle of February Jupiter and Mercury will set so soon after the Sun as to be unobservable. Venus also will be low down near the western horizon.

Jupiter and Mercury will be in conjunction on the 13th, at 10 p.m., about three hours after they have set.

The most distant planet, Neptune, will be opposite the Sun on the 15th. Owing to its great distance from the Earth, it is only a small telescopic object. On the 16th it will be in conjunction with the Moon at 9 p.m., when it will be eight times the diameter of the Moon above it and, apparently, in the constellation Leo.

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.

ERRATA.

On the first page of this issue, line 13, for "experts" read exports.

On page 174, line 3, for "reorganised" read recognised.

On same page, line 2, of paragraph "Forestry and Farms" for "exception" read question.

On page 251, last word of paragraph side head "Borer in Citrus Trees—Tomato Plant Test," for "test" read pest.

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.

Science and Dairying.

The value of Commonwealth dairy production totals many millions of pounds annually. Our dairying industry has reached its present important position largely through the well-directed co-operative effort of dairy farmers and factory managers who turn out the high-grade product that has established for us a very worthy reputation in overseas markets. That we have reached a high standard in dairy production is due to the staff ability which the industry has always been able to command in the fields of production, manufacture, and distribution. The time has arrived, however, when we can no longer rest satisfied with our present achievements. Competition in the world's markets is becoming keener every year. Denmark and our other rivals are continually improving the quality of their butter; new countries are becoming increasingly important factors in the supply of dairy products, and to maintain and improve her position Australia must give constant attention to improvement in the quality of her experts, and to do that we must look to the scientist for assistance.

Dairying in Australia to-day is faced with problems which only the scientist can solve. At present the need of men and facilities in the scientific field is urgent, and to meet this need the Australia Dairy Council advocates the establishment of an Australian Dairy College and Research Institute.

A federal insitution, staffed by highly qualified dairy scientists to whom the problems of the industry could be referred for investigation, is the aim of the Council. With those problems solved, the task of quality improvement would be simplified, and the industry would be placed in a position nearer to equality with that of dairy farmers in other countries where the value of scientific research has long been reorganised. Such an institute, in addition to its research activities, would be of great value as an educational centre for the training of young Australians in dairy science and efficient factory management. Uniformity in methods, and particularly uniformity in quality, one of the most important factors in marketing, would be a natural outcome of such a training. The institute would also serve as a centre at which new methods and new appliances could be tested thoroughly. In this way alone heavy expense in costly individual experiments could be saved. The economics of the industry would also be a subject of constant study, to the general advantage of those engaged in one of the most profitable, nationally speaking, of our primary enterprises.

Forestry and Farms.

Downs in South Australia, where much of the agricultural country consists of open, wind-swept plains and treeless uplands, the exception of providing shelter for stock, both in summer and winter, is a live one. In the course of recent travels we met with one farmer who was very emphatic about it. Arboriculture, he remarked, is not practised in this country to the extent that it should be. Many farms in open, shelterless regions could be beautified, the live stock benefited, and an air of comfort and prosperity imparted to them if a well-planned system of hedge and tree culture were introduced. The general practice when occupying native scrub country was, he continued, to clear as much of the growing timber as possible in the quickest time, no thought being given to leaving shelter belts. Where dairying is the chief source of revenue he emphasised the benefit of hedges as a shelter in comparison with rugging. The latter, in his opinion, is expensive and, on account of weather vagaries, not particularly healthful. When given natural shelter of which they could avail themselves at any time and good feeding, cows would find themselves in much more comfortable conditions, and the results altogether would be very satisfactory.

Mixed Farming.

Another South Australian farmer had some very interesting ideas on mixed farming, and in view of the contemplated opening of some of our nearer western lands for wheat and sheep, his comments are more than ordinarily useful. He took as an example a farm of about 800 to 1,000 acres in a district in which wheat would be the main source of income. Careful and efficient cultivation, selection of suitable seed, and a liberal use of super. were essential. In his opinion, a rotation of wheat and fallow is not the best system, for the land became ultimately wheat-sick, followed by a reduction in average returns. He preferred the practice of sowing stubble land with oats early in the season. The crop could be either grazed or cut for hay, or, if the season were very favourable, a good yield of oats might be obtained. By grazing animal manure was returned to the soil, thus building up and restoring its fertility. The second line of effort should undoubtedly be the keeping of a suitable flock of sheep, merino for choice. The flock would supply the house with fresh mutton, keep down weeds, and, through the sale of wool and lambs, add a very acceptable sum to the general farm revenue. Sheep on a mixed farm, he added, repaid amply for the care bestowed on them. Water in every paddock would be advisable. A few good cows would also be very useful and profitable. A little care in breeding and judgment in buying would enable one to add considerably to returns from that side-line. A few pigs, if labour were available, would be another source of appreciable profit. Poultry could also be made to show a handsome return, and here again convenience in the farmyard layout and cleanliness would be well repaid. To make mixed farming quite a success there should be the closest co-operation between the farmer and his family. The young people should be encouraged by being given an interest in the farm, its stock, and profits. The finest asset the farmer and country could have, he added earnestly, was a contented and industrious family.

Herd Testing in Australia and Denmark.

An interesting comparison of results from herd-testing in Australia and Denmark is given in Hansen's Dairy Bulletin. The article follows:—"The production of the fourteen herds on the Bodalla Estate, situated about 200 miles south of Sydney, New South Wales, are carefully tabulated each year for the purpose of comparison. The figures for the financial year ending 31st March, 1922, compiled by the manager, Mr. D. Hutchison, afford a valuable illustration of how a high standard can be maintained under systematic and experienced management. Mr. Hutchison, however, points out in his report that the figures are not altogether a fair comparison of the breeds mentioned, as the farms are not uniform in character, and the breed or strain to some extent had to be selected to meet the particular class of country. In view of the fact that the established average yield per cow in New South Wales is 120 lb. per annum, the yield of the Friesian herd on the home farm, namely, 314 lb. per annum, is noteworthy. To convert the butter-fat in the table into commercial, 17 per cent. should be added. The figures as supplied may be summarised as follows:—

Breed of Cows.	Total Cows.	Total milk, gallons.	Gallons, per Cow.	Test, Per cent.	Butter-fat.
Culls from all farms	90	25,402	282	3.7	105
Friesian	86	65,339	759	3.5	269
Red Shorthorn	62	37,616	606	3.7	222
Friesian-Ayrshire	84	50,207	597	3.8	224
Guernsey Grade	63	37,565	594	3.9	236
Shorthorn Grade	81	48,134	594	3.9	229
Friesian Grade	104	61,634	592	3.6	213
Jersey-Friesian Grade	45	24,996	554	4.1	225
Ayrshires	86	46,778	543	3.8	229
Shorthorn (roan)	88	47,337	537	3.7	201
Ayrshire Grade	84	44,275	527	3.9	205
Friesian-Jersey	64	30,355	474	4.1	200
Ayrshire Grade	90	41,039	456	3.8	172
Ayrshire Grade	44	19,280	438	3.8	168
	1,071	579,922	569	3.8	200

"Although it is not strictly fair to draw parallels between the average yield per cow of one country with that of another, especially when it is a question of two entirely different countries like Australia and Denmark, still it is always interesting to make such comparisons. As the pre-eminence of the Red Danish milk cow is not generally known, we have compiled, for the purpose of interested readers, some official figures showing the yield of some Danish herds of this type of cattle, which we reprint below. We quote those of (1) a large estate, (2) of three medium-sized farms, and (3) of a small holding; also under (4) the average yield of all red cattle (R.D.M.) of the Islands of Denmark, not including Jutland. Under (5) the average yield of registered Red Danish cattle of merit for the whole country, and, as no average figures are available for the total number of Red Danish milk cows (about 600,000 head), we quote instead under (6) the average figures of all milk cattle in Denmark, including "reds," "Jutlanders," and other breeds.

Herd.	Total Cows.	Gallons Milk Per Cow.	Fat. Per cent.	Butter Fat. Lb.
1. Brattingsborg	196	860	3.98	344
Farringlose	34	1,090	4.31	469
2. Hjarup	21	1,177	4.12	485
Thorshoj	17	1,195	4.32	516
3. Bogo	6	1,308	4.15	543
4. Average all R.D.M. of the islands	188,586	783	3.73	278
5. R.D.M. of merit of entire country (about)	2,000	1,173	4.12	542
6. Average all Danish milk cattle	1,391,999	660	3.65	240

"The figures above represent the average yields per cow (dry or milking) of herd or area, and present, therefore, an excellent base for comparison. The table shows clearly the indisputable high standard of the Red Danish milk cow, which compares most favourably with any other breed."

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received from Mr. R. W. Mungomery, Assistant Entomologist, the following report (18th January, 1927):—

Throughout the various reports that have originated from entomological investigators in this Bureau, allusion has frequently been made to the fact of there being several Scarabaeid beetles or cockchafers, whose larvæ attack cane to a greater or lesser extent. While the presence or absence of certain grubs in canefields in sufficient numbers to cause damage is dependent to a certain degree on climatological conditions, which are important in the development and spread of fungus and bacterial diseases, as well as limiting the areas in which it is possible for certain species of these beetles to live, other factors such as soil conditions often play an important role. Thus it is well known that grubs favour loose, friable, well-drained soils for their development, whilst packed clayey soils are shunned by the female beetles as unsuitable places for oviposition. Clayey soils during periods of drought become stiff and hard, and in periods of excessive rainfall they become of the consistency of putty, and impermiable to water, in which former case it would be impossible for the grubs to progress through the soil, and in the latter case the exclusion of the air ordinary circulating around the fine soil particles, would cause death of the grub through asphyxiation. Types of soils are so important that, provided grubs are present, it is sometimes possible to predict within limits the species of grub responsible for the damage in that locality, this soil partiality being so well developed in the case of certain species.

Therefore in sugar districts such as Bundaberg where the soils are derived from the disintegration of various rocks of different geological periods, we meet with different species of grubs whose effects are serious in certain classes of soils only, whereas in other soils they are totally absent or their effects are negligible. These soils vary considerably and those planted with cane range from the red volcanics of the Woongarra, the black alluvials along the banks of the Burnett, to the red and white forest soils in the outer lying parts of the district. The beetles associated with these soils include *P. furfuracea* Burm., *L. frenchi* Blkb., and another undetermined melolonthid, all of which warrant thorough investigation. *P. furfuracea* apparently is the worst beetle in the Southern areas, so that investigation work was commenced on this beetle during the recent flighting season, and Childers was selected as being the best locality in which to carry out these investigations. The Isis district is well known as being a compact one, with soils for the most part of an even red volcanic nature, so that *P. furfuracea* predominates there to the almost total exclusion of the above-mentioned species, a few grubs of very minor importance being its associates in those cane lands. Now *L. frenchi* has been carefully studied in the Northern districts and its life-cycle and metamorphosis well described and illustrated by Mr. E. Jarvis, in Bulletin No. 5, of this Bureau, and farmers who are troubled with this pest should become familiar with its habits. Further work on this beetle can therefore, for the present, be postponed until the habits of its confederates are elucidated. Owing, however, to the non-occurrence of the other Melolonthid at Childers, observations on this beetle had to be abandoned, until next flighting season, when this important phase of the work will again be continued.

Flight and Habits of *P. furfuracea* Burm.

Light rain commenced to fall in Childers on the 13th December, but it was not before the 15th that good soaking rains had fallen. A few beetles were then on the wing at night, but rain continued to fall about the time when beetles ordinarily take to wing, and it was not until the night of the 17th when the greater part of the day was fine, that the really big emergence of the beetles took place, and from that date onwards their numerical strength gradually lessened. By the 23rd only a few stragglers remained. At about 7 p.m. a flight of small quick flying beetles took place, and this happened regularly each night and seemed to be the fore-runner of the "furfuracea" flight, for when these beetles had settled on various shrubs at about 7.30 p.m. "furfuracea" beetles began to make their appearance. From then on, there was a continual hum of beetles on the wing, and on the night of the 17th this lasted until well after 9 p.m., but on subsequent nights a lull occurred at 8 p.m. and all noise had practically ceased by about 8.30 p.m. Mating evidently occurs soon after the flight commences, and the males probably seek out their mates as soon as the females emerge from the ground, for pairs were often found near exit holes in grubby fields. Copulation was found to have occurred usually previous to 7.45 p.m., and this act takes place mostly on the ground, the male after having secured connection falling backwards from the superimposed position, and the pair remaining motionless in this position for periods sometimes as long as three-quarters of an hour. It is during this time and when in this position that many species of small ants attack the beetles, and they usually have swarmed over them before the beetles seem to be aware of their presence. Sometimes with such a horde attacking them, they become powerless and are eventually destroyed by the ants, but at other times they make a gallant effort, and righting themselves, burrow back into the soil, thus brushing off and ridding themselves of their would-be captors. In such cases copulation ceases very quickly—in fact it may not last for more than five minutes—and from the numerous instances in which ants overpowered their victims, it was recognised that they must exercise some appreciable check on the natural increase of this pest.

Although some beetles (chiefly males) may be seen after the flight resting on corn leaves, &c., most of them burrow back into the soil or under old burnt pieces of cane sticks, and they remain there just covered, probably going further into the soil as the heat of the sun increases on the following day.

Several female beetles that were caged produced a few eggs on the 22nd, and thereafter eggs were taken from the soil in large numbers. Beetles deposit their eggs over a number of days, and each egg is laid singly in the soil, being enclosed by a small pellet of earth, and after laying the original supply of eggs, the females perish, thus further sets are not produced, which is possible in the case of the Greyback cane beetle. From dissections made on several beetles, the average number of eggs produced per female was found to be 30, whilst in very large females as many as 45 were obtained, and in small undersized specimens the total amounted to only 12. The eggs are elongate oval in shape, and in general appearance do not differ noticeably from the eggs of other beetles except in their size. When the egg is first deposited it measures 3.4 mms. in length and 2.4 mms. in greatest width, and it then increases gradually in size until just before hatching it measures 4.6 mms. by 3.6 mms. Hatching took place on the nineteenth day after the act of oviposition, the mean shade temperature registered being 77 F.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (12th January, 1927) from Mr. N. L. Kelly, Pathological Student:—

Gumming Disease.

This disease is a considerable factor tending to retard the prosperity of the growers in the Nambour district. Last season was so dry that the disease was not very troublesome at harvesting, but the farmers must beware of any false sense of security. In many fields of twelve months' old D. 1135 that was standing over until next season, a large proportion—about 50 per cent.—of the stools had one or more sticks with dead tops due to this disease. Should the coming season be a wet one there will certainly be much heavier losses on harvesting. In fact there is always a big risk in allowing an infected field to stand over, as the bacteria have every opportunity to gain the ascendency within the two years. D. 1135 and N.G. 15 are both, unfortunately, very heavily infected in this district. Now the majority of the cane lands are admirably suited to one or other of these two varieties, but until farmers have been assured by an inspector that their plants have not even the germs of gumming in them, it is very unwise to plant either D. 1135 or N.G. 15. This also applies to N.G. 16 where it is grown, as all the stock inspected was diseased. It is suggested that clean D. 1135 be introduced, quarantined for about twelve months, and finally distributed.

Leaf Scald.

This disease was located in Mahona early in 1926. In December two fields of N.G. 15 and N.G. 16 nearby were found to be at least 2 per cent. infected, and there may be other lightly infected fields. This being an isolated outbreak the control should be drastic—plough out the fields after harvesting. If this cannot be done, the spread may be minimised by the digging out of the diseased stools. This stock of plants must not, of course, be used for seed purposes.

Mosaic.

This is still very prevalent in the district, but a larger number of farmers are exercising caution in seed selection, and a correspondingly cleaner plant crop has resulted. In those cases where a few infected sets have inadvertently been planted, it would be advisable to dig these out when planting "supplies."

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received from the Assistant to Pathologist, Mr. E. J. F. Wood, the following report (20th January, 1927) on disease conditions at Beenleigh:—

The two most serious diseases in the Beenleigh district are Fiji Disease and Gumming. Mosaic, while bad in some varieties, does not occasion heavy monetary losses.

Fiji Disease.

This disease is widespread, and no farm could be said definitely to be free from it, except for two isolated farms, one growing Q. 813 and varieties not including D. 1135 and the other growing Green Baruma, which is mosaic infested.

I have been co-operating with Mr. Dormer, who is investigating Fiji Disease in this area for the Bureau, and I shall leave further discussion of the disease to him.

Farmers have been advised to get rid of D. 1135 (frost proof) in this area as soon as possible, and to substitute Q. 813 and smaller patches of H.Q. 285 and H.Q. 5.

Gumming.

This is widespread at Steiglitz, and also occurs at Alberton, while its distribution is improperly known. Only in one field and in the variety N.G. 64 (Purple Top) have the typical gum streaks been seen in the leaves, while the typical red vascular bundles in the stem and the exudation of gum from cut ends of the cane have been seen on many farms in the Steiglitz area and on several at Alberton.

Thus it can only be definitely stated to occur in those two districts, but as plant cane has been freely interchanged throughout the district I have urged farmers to be on their guard, and, as far as possible, to keep a stock of resistant varieties for use as seed cane in case of an epidemic.

In an area of mixed farming such as this, it is useless to suggest drainage, for most of the farms are cleared portions of the surrounding ti-tree swamp. Drainage of such lands on a big scale is impossible without the active co-operation of millers and farmers, and would entail a large capital outlay.

Mosaic.

This disease, with its conspicuous leaf symptoms and insidious effect on the cane, is very prevalent. The cane locally known as Green Goru—which is probably Green Baruma—is often 100 per cent. infested, and the disease spreads to D. 1135, Q 813, and Rappoe.

General.

Varieties and Disease.—In some rather isolated areas the old varieties Rappoe (Rose Bamboo) and Striped Singapore are grown, but in most parts they have succumbed to a rather mysterious malady from the accounts of the growers, but which was probably gum.

A cane which is reputed to be a cross between Striped Singapore and Kikarea is much grown, but is susceptible to gum and does not seem a desirable variety. Kikareo itself is susceptible to gum and has also been found (though infrequently) with Fiji Disease.

Green Goru (New Guinea Green), or Green Baruma as I believe it to be, *should not be planted* in this area, as it is usually from 60 to 100 per cent. infected with Mosaic, which makes the sticks spindly. The disease spreads from this to other cane.

Purple Top should be *avoided* owing to its susceptibility to gum, and to infestation by rats. It also takes Fiji Disease rather badly. Luckily it is dying out in this district. D. 1135 (frost proof) is susceptible to Gum, Mosaic, and Fiji Disease, and its planting should not be attempted. The district would be far better without it if farmers are to continue growing cane.

H.Q. 5 is a good cane which is slow in sprouting, but which makes up and gives a good one-year or two-year crop of high density in this district. It is resistant to gum and probably to Fiji Disease, but until this latter is actually proved by time, it is suggested that its planting be confined to areas of 2 acres or less, in case of a failure. It is possible that it may prove a better variety in this district than Q. 813.

The disadvantage of being hard to cut is somewhat compensated by resistance to rat injury.

H.Q. 285 seems very resistant to Fiji Disease, but its resistance to gum is doubted. It is a soft cane and is much favoured. Farmers should subject it to more drastic trials before planting large acreages.

Q. 813, so far, seems the best cane for the district, and is rapidly replacing D. 1135. It is a heavy one-year or two-year cropper of high density, and ratoons well. The trash has a tendency to stick, but the cane is not as objectionable to cut as D. 1135. It is rather subject to Root Rot and Set Rot and also to the Noctuid Moth Borer (*Phragmatiphila truncata*), but it is highly resistant to Gum, Fiji Disease, and Mosaic. It is not, however, immune to these diseases, and many farmers are disappointed at this; but no cane has yet been found which is immune to any of them. In about seventy farms which I have examined in this district I have only seen four stools showing Fiji Disease, even though D. 1135, badly infested, is growing alongside. On one farm a patch about 30 feet square of D. 1135 was dead or dying from Fiji, while Q. 813 of the same age (first ratoon) growing alongside was healthy and normal.

Red Rot is said to be prevalent, but just now only a few cases were found, and those in Purple Top, D. 1135, and ''Singapore Cross.'' The soil here has been growing cane for years—three ratoon crops mean eight years' continuous growth of cane, and often no fertiliser or lime has been used. It is moreover often of a salty nature, and is conducive to such a soil disease as Red Rot. One farmer who used lime has had no trouble, while his neighbours have. Attending to the soil will tend to eradicate this disease.

A disease has been described as occurring in Kikarea plant, which seems to tally closely with Top Rot as defined by Mr. Dormer. None is showing now. The leaves, it is said, are red striped (W. Cottrell-Dormer on Top Rot), and the tops soon die and rot. If, before the rotting has proceeded too far, the cane is ratooned the ratoons are healthy and produce normal crops.

Summary.—Fiji Disease, Mosaic, and Gumming are the diseases needing attention in the Beenleigh area. All three may be combated by seed selection, rogueing, and the use of resistant varieties. Farmers are advised—

(1) Plant seed, from plants, and if possible from *fields* or *farms* free of these diseases. Use no diseased seed, nor seed adjacent to diseased plants.

(2) Dig out and burn stools infested with Mosaic or Fiji, unless the percentage of disease is too great. This depends on the judgment of the farmer.

(3) Plant Q. 813, or, in small quantities at present, H.Q. 5 and H.Q. 285. No other varieties can be recommended.

NOTE.—H.Q. 285 is sometimes known as ''Milton.''

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (22nd January, 1927) from Mr. E. Jarvis, the Entomologist at Meringa near Cairns:—

Since reporting last month the cane-beetles have made their appearance as usual; the first emergence of this pest having taken place between the 15th to 23rd of December; during which period 3.14 inches of rain were recorded at this Experiment Station. Judging by the number of beetles observed and collected from feeding-trees at Meringa, grub-infestation in the Cairns area during the coming season will probably not exceed that experienced last year. Growers may, therefore, congratulate themselves upon the likelihood of their obtaining good crops this year, seeing that the prolonged drought seems to have broken at last.

According to mill statistics, only about 1 per cent. or less of the cane received from Highleigh last season was lost from grub attack. Infestation during the coming year will most probably be of very local occurrence, and confined—as appears to have been the case last season—mostly to high lands of volcanic origin having soil of a light or friable nature, and situated close to, or within half a mile of feeding-trees of this beetle. Since emergence of these cockchafers several heavy showers have kept the soil moist, maintaining ideal conditions for egg-laying operations, which commenced during the first week in January, and will continue until about the middle of that month.

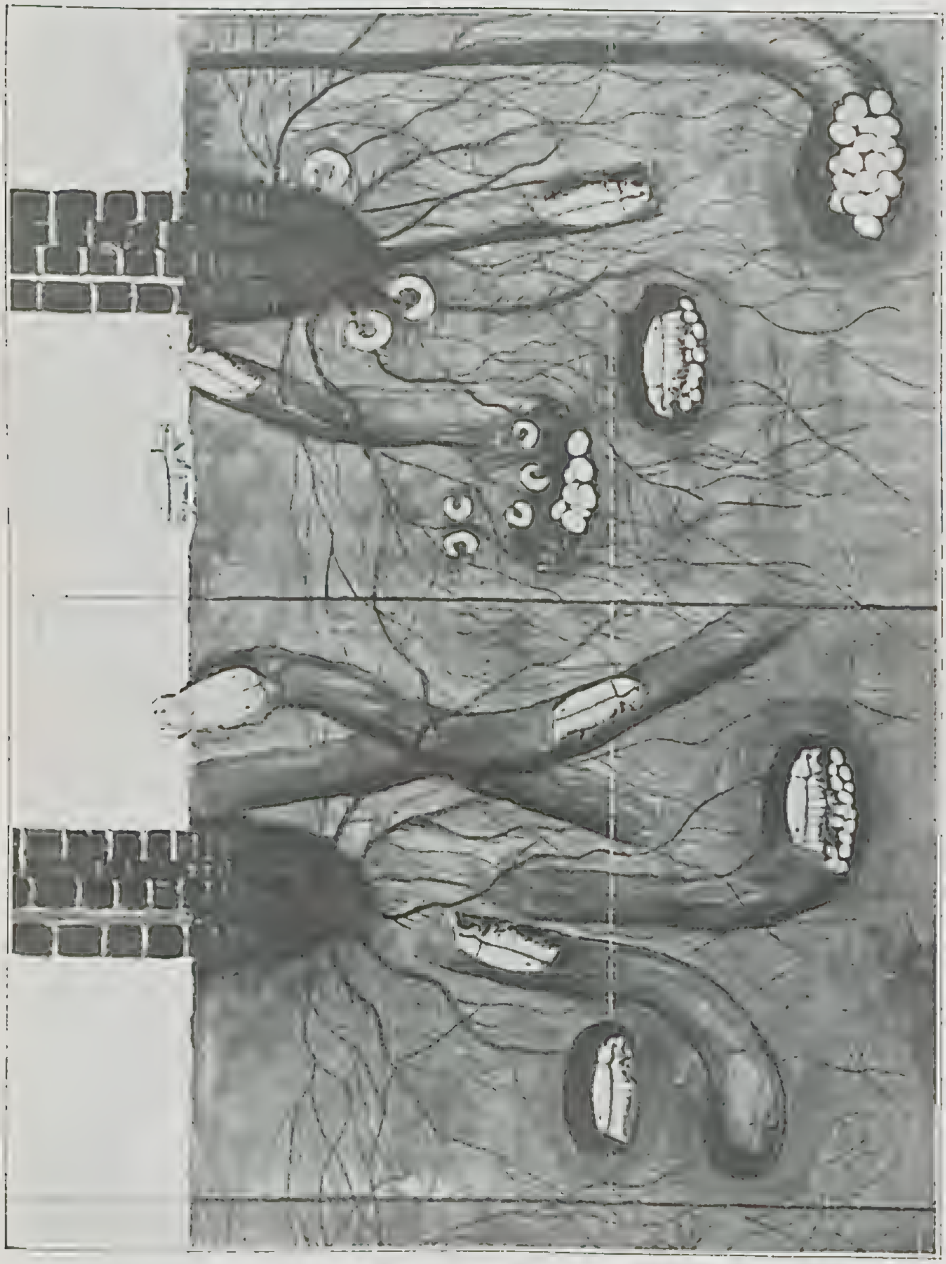

PLATE 46.—DIAGRAMMATIC DRAWING OF MODE OF EGG-LAYING OF GREYBACK CANE-BEETLE,
Showing Eggs in Egg-chamber, Eggs being Laid, and others Swelling prior to Hatching; also First and Second Instars of Grub. (About third natural size.)

During this period (19th December to 4th January) 3.56 inches of rain were registered here, whereas throughout a period of similar duration following immediately upon the first appearance of the beetles in 1925 the total rainfall did not exceed 0.48 inches.

It is generally recognised amongst canegrowers that the occurrence of brief intervals of wet weather during the month occupied by growth of the ovary of the female beetle, and subsequent development and hatching of her eggs usually signifies plenty of grubs later on.

Poisoning Food-plants of Beetles.

Additional data was obtained this month in connection with this interesting phase of control work against the adult form of our "Greyback" cane-beetle, *Lepidoderma albohirtum* Waterh.

Initial experiments in this direction made by the writer during 1915 demonstrated that lead arsenate (2 lb. in 50 gallons of water) when sprayed upon the leaves of its favourite food-plants proved fatal after nine days; during which time sixty caged beetles devoured 32 square inches of the poisoned foliage ("Australian Sugar Journal," vol. vii., p. 62). Six years later, in 1921, further experiments along these lines showed that Paris green (1-lb. P.G., 1½ lb. lime, in 8 gallons water) would kill these beetles in from four to seven days after feeding on the poisoned leaves. During December, 1923, the insecticidal value of dust sprays was tested, these being applied more easily in field practice than liquid solutions.

This invstigation took the form of ten separate experiments in which 290 beetles were used, including 104 control specimens. Ten per cent. of the beetles eating leaves poisoned with lead arsenate died half a day after feeding; while 50 per cent. of those poisoned with Paris green succumbed in about 24 hours.

During the present season, final laboratory tests were carried out with lead arsenate—this being a cheap form of arsenical and practically harmless to vegetation. With a view to obtaining a more rapid mortality, the spray used was made very much stronger than any previously employed—viz., 2 lb. in ten gallons of water.

This was applied to the leaves of native figs, which were then placed in cages of moist earth, each containing a single greyback beetle. The results obtained may be summarised as follows:—

Eleven out of the twenty-six beetles which individually devoured from ½ to ¾ square inches of poisoned foliage died within 24 hours after feeding; two died after 48 hours; four after 2½ days; one after 3 days; three after four days; two after 7 days; and one after 10 days. On the other hand, out of twenty-five beetles in control cages only four fed on the untreated leaves supplied, consuming individually from ¾ to 10 square inches. One of these beetles lived for fourteen days after feeding, while the remaining three were still alive at the conclusion of the experiment.

The above results are sufficiently conclusive to warrant experimentation next season in canefields with suitable trap-trees. These should be sprayed as soon as possible after emergence of the beetles, seeing that food is partaken of mostly during the first five or six days of their aerial existence. The importance of this point was again amply demonstrated during the present season; when, out of one hundred caged beetles captured from three to sixteen days after the primary emergence, only thirty specimens (including controls) fed on the leaves supplied to them.

As pointed out in an earlier Monthly Report ("Queensland Agricultural Journal," vol. XVI, p. 388), amongst the numerous native food-plants of *albohirtum* there are two species which invariably attract great numbers of beetles—*Ficus pilosa* and *F. nesophila.*

Growers inclined to collect beetles invading their canefields could not do better than plant these trees either singly or in clumps of two or three on headlands or if convenient among their cane at distances of a few hundred yards apart.

Such trap-trees might be pruned occasionally to keep the heads low and spreading, and could either be collected from during the fighting season or sprayed with lead arsenate as described above. Migrating cane-beetles chancing to visit such a plantation or quantities emerging from any badly grub-infested land close at hand would be attracted to such favourite feeding-trees.

In order to induce them to congregate in this manner it would be advisable to destroy undesirable food-plants found growing in the immediate vicinity, such as large Moreton Bay Ash trees (*Eucalyptus tessalaris*) having heads too high to easily collect from.

Having kept this phase of control in view during the past few years we are in a position to supply any interested canegrowers with robust healthy plants of *Ficus pilosa* from 1 to 2 feet in height, which have been raised at Meringa Laboratory from seed. A limited number of these young fig trees is available at the present time (15th January) for free distribution.

Giant Termite of the Burdekin.

During the last month (December) an Assistant was sent to the Ayr district to make further inquiries regarding primary cane pests and study the habits of *Mastotermes darwiniensis* Frogg. etc.

While visiting Jarvisfield, Mr. J. H. Buzacott inspected some experiment plots laid down by him last August on cane land affected by the Giant Termite. Results obtained from these field tests, however, proved disappointing. Dipping the ends of sets in dehydrated tar before planting gave negative results, as these termites were found to enter the treated ends and also to bore through the rind between the nodes. Fumigation of termite infested soil with paradichlor gave little control; but the results of this experiment were renderd inconclusive owing to attack being unequally distributed on the treated and control areas. A single winged specimen of this insect was procured, and about three thousand of the worker form were collected and brought back to Meringa for experimental purposes, but efforts to locate the queen termite again proved fruitless. Examples of three species of predatory ants (Formicidæ) were observed—viz., *Camponotus nigriceps* (var. *dimidiatus*), *Iridomyrmex detectus*, and an ant not yet identified. A day was spent at Rita Island, where growers are troubled at times by the large moth-borer of cane, *Phragmatiphila truncata* Walk., which, however, appears to be under efficient control at the present time.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Controlling Grubs of Cane-Beetles.

During the beginning of February, larvæ of our greyback cockchafer will be in the first instar, and too small to seriously injure cane roots. At this stage of development the head is never more than one-eighth of an inch wide, since this part of a grub, unlike the abdominal and thoracic portions, does not increase in size during the course of the various instars, altering only when a grub moults or casts its skin. The length of the body during this first instar may, therefore, vary from ¼ to ½ an inch in doubled-up position. Towards the end of February most of these grubs will be found to be in the second stage, and can at once be distinguished by an increased width of head, which then measures three-eights of an inch.

Advantage should be taken of the first opportunity afforded for moving the surface soil between rows of young shoots of ratoon or plant cane considered likely to be grub infested. In well-drained soils this can usually be safely done two or three days after cessation of heavy rain. At such times, while the lower portion still retains excess of moisture, these small grubs have a habit of coming to within an inch or two of the surface—attracted probably by warmer and a little drier conditions in the upper layer of soil—where they may be found lying at a distance of from 6 to 8 inches from the centre of the stools, feeding on the fibrous roots. By disturbing the soil as close against the cane-rows as can be effected without injury to the plants some of these grubs are brought to the surface, while the remainder being dislodged from their tunnels and mixed with loose particles of earth are liable to fall an easy prey to such soil-frequenting ants as *Pheidole megacephala* or other predaceous species.

Controlling Plant-Eating Beetle-Borer.

Small chrysomelid beetles belonging to the genus *Rhyparida* may prove destructive this month to young cane shoots. The small white or creamy-yellow grubs of this pest occur in the soil against the basal portion of the stalks, or in the central core of affected shoots, where by devouring the succulent internal tissue they cause death of the heart-leaves. The beetles—which in the case of two of our species known to attack cane are small hemispherical insects scarcely exceeding a quarter of an inch in length—are of sluggish habit, and often found upon the leaves of blady grass. When touched, they usually fall at once to the ground and remain motionless for a time.

Cutting out all "dead hearts," collecting the beetles when very numerous, keeping headlands free from blady grass, and fumigating badly-infested soil with bisulphide of carbon are all suitable remedial measures. Growers are asked to advise the Entomologist at Meringa Experiment Station of any material injury to cane thought to be due to this insect.

How to Combat the Weevil-Borer.

Watch the growth of cane on river-flats or lowlying ground, which are situations eminently favourable to the occurence of this beetle-borer. If discovering evidence of its having commenced attack on the basal portion of cane sticks, communicate with the Entomologist at Meringa. Tachinid flies will be released by the Sugar Bureau free of cost on areas affected by this insect, on condition that the grower concerned will agree to leave at least a quarter of an acre of borer-infested cane uncut for these Tachinid parasites to breed in. This area should be allowed to stand for three months or longer, and the cane on it must on no account be burnt.

SUGAR WORK IN JAVA AND AUSTRALIA.

With reference to the interview with Professor A. E. V. Richardson which was published in the Queensland Press last week, the Director of Sugar Experiment Stations points out that in studying this a number of points should be taken into consideration. The fine work done by the Sugar Experiment Stations in Java is generally recognised, but Java possesses many advantages that Queensland does not, such as extraordinary cheap labour, irrigated land, and no ratoons. As pointed out in the "Agricultural News and Sugar Planters' Gazette," "Java is fortunate in having wonderful facilities for irrigation. The water carries a slimy silt which is manure in itself. The system of irrigation is conducted by the Government, which only charges the planter 2s. 6d. per acre per annum . . . Irrigation is really the outstanding feature of the sugar-cane cultivation in Java, and it is thoroughly well organised."

Prinsen Geerligs, a well-known authority on Java, says—

> "Planting is done exclusively on irrigated land, and a triennial rotation of crops is practised. Manuring is done either simultaneously with the planting, or later on, and sometimes at both times to an average amount of £2 6s. 8d. per acre and almost exclusively with nitrogenous compounds, potash and phosphoric acid being rarely applied. The reason for this is that the silt yearly deposited by the rivers contains so much potash and phosphoric acid in combination with other elements, but which are set free by disintegration processes, that the cane, as a rule, does not want any more, and experiments have shown that any increase in the quantity of potash and phosphoric acid in most cases does not lead to any better cane and sugar production. Ratoons as known in other cane sugar producing countries, where in most cases they are most profitable, *are not grown in Java* . . . and owing to the heavy rent and the small amount of disposable land it becomes an absolute necessity to obtain as much cane sugar as possible from the little area of land, while labour in Java is so *abundant and cheap* that it pays pretty well in the end to spend more money in labour connected with yearly planting."

Thousands of natives are used to turn up the land with spades in preparation for cane planting, so that the cultivation is most intensive.

The seedling work in Java is very thorough, but judging by the published mill results, their varieties are of a lower sugar content than those of Queensland.

Speaking of the variety "No. 2748," referred to by Professor Richardson, no trace of this number can be found in any of our Java Bulletins or in any other sugar journal in the Bureau's possession. The travelling scholars, Messrs. Kerr and Bennett, spent some time in Java, but they make no mention of this particular cane. It may, however, be a variety known as "247 B," which has already been tested in Queensland, where it has given no particular results.

Mr. Bennett mentions the three following canes as being principally grown in Java, giving the percentages they form of the total crop:—

E.K. 28	40 per cent.
D.I. 52	21.5 „
247 B.	15.5 „

All these varieties are upon the Experiment Stations now.

The amount subscribed to the Experiment Stations in Java is amazing, being 12s. 6d. for every 1¼ acres. Their work covers all sections of the industry. Professor Richardson puts the revenue of the Pasoroean Sugar Experiment Station at £114,000, and says they employ 45 Europeans and 135 natives.

In his lengthy report upon mill work the travelling scholar, Mr. Bennett, remarks that one of the first things which attracted his attention in the mills was the employment of women to work the centrifugals, on the grounds that they were more reliable than men. The average wage paid during 1923 to all classes of labour was a little over one shilling a day, whilst the average for unskilled labour was about 9½d. a day.

The low cost of labour has its natural effect on the methods and machinery in use. In some cases it is cheaper to do the work by native labour than to use machines.

The use of this cheap native labour is in all probability the reason why the mills have not installed more modern types of machinery.

Exact figures for the number of people employed in the cultivation of cane were impossible, but one administrator estimated that during May and June—the best months for planting—he employs between 5,000 and 10,000 people—men, women, and children—to plant the cane and look after the young plants.

The locomotives for cane haulage make increasing use of baled or compressed megass. Where the megass is more than sufficient for the needs of the mill boilers the surplus is pressed into bales and then stored. This baled megass is used for the locomotives during the following campaign. The economy effected in wood and coal is thus considerable, while the cost of the latter is further reduced by burning cane trash in the boiler furnaces, the cost of the trash being exceedingly low.

The Sugar Experiment work of Queensland now includes the raising of seedling varieties, and some canes of Badila parentage are highly promising.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports 17th January, 1927:—

MOUNT BAUPLE.

An average of something like 24 inches of rain occurred in the districts under review, changing the appearance of the country like magic. During the drought there was a spectacle of dry watercourses and bare fields. The forests and scrubs were wilting. Now, the country is a picture of brilliant green, herds are rapidly fattening, and the staple commodities such as cane, maize, and lucerne are growing vigorously.

In the Bauple areas the cane was just beginning to feel the effect of the rain. Serious damage had been done to young plant cane by flood waters on some farms. Work was practically at a standstill, although at present some of the farmers are working hard to combat the weed growth. Varieties making a good showing include Q. 813, M. 1900, and H.Q. 285. As there appears to be some confusion in the identity of Q. 813 and Q. 855, a cane that is coming into favour in the southern districts, the following description of Q. 855 may be of use:—

Manner of growth—Erect;
Foliage—Dark green, erect;
Internodes—Lightly waxed, straight;
Nodes—Slightly raised, heavily waxed;
Eyes—Small, well defined;
Trash—Non-adhesive, plentiful;
Colour—Reddish purple;
Root system—Light, lateral;
C.C.S.—14 to 15.
Fairly resistant to disease.

The seriousness of allowing Mosaic to get a hold is pointed out to the growers. As far as is known this disease is not in the soil nor transmitted by cutters' knives. It is only transmitted, as far as knowledge extends at present, by the corn aphis. Therefore, if corn is not growing near the cane it may be assumed that the grower is spreading the disease himself by affected plants. An important matter that the writer would like to bring before growers relates to the harvesting of fields affected with Leaf Scald and Gumming Disease. If a farmer observes that either of these diseases is beginning to show in his cane, he should take a day before cutting commences, and with a special knife cut what he considers affected stools. That knife should then be disinfected before using again. This method would not serve to eradicate the disease in any particular block, principally owing to the incomplete knowledge of the farmers, in diagnosis, but it would serve to some extent to lessen the incidence of these maladies.

Canegrowers in the Bauple district are optimistic regarding the mill, which they have just taken over. The writer can see nothing to prevent success. The district is a good one with a well-organised system of haulage. Good milling, high density cane can be grown on almost all the farms. A greater interest is being taken in fallowing and green manuring. Some time ago the writer recommended a 25 per cent. basis of fallowing and green manuring. The farmers are urged to try to make a system of this in the future, not only in Bauple, but in the sugar areas of the whole State. This applies just as forcibly to the tropics as to the cane country south of Capricorn. The Main Roads Board are to be congratulated on a fine strip of road on the route from Tiaro to Bauple. The work carried out by the Board is becoming a boon to settlers who are back from the railway. This, combined with the cheap, efficient motor-car, is making life on the land pleasanter and more desirable.

BUNDABERG.

As if by a magic wand the country side has been transformed. Roads now lead through pleasant grassy lanes bordered with trees of brilliant green and lakes of water fed by springs and streams meet the eye with pleasing frequency. The dairy and farm animals are fattening rapidly with a consequent increase in the supplies of butter, cream, and eggs.

Naturally the weeds are growing vigorously, as well as the cane, and not for a long time have the farmers been out in such numbers in their campaign of cultivation. Taking the sub-areas in detail, the following are the conditions in brief:—

Barolin.

Autumn plant—Rapid growth.
Spring plant—Rapid growth.
Ratoons—Rapid growth.
Standover—Rapid growth.
Weed growth—Heavy, particularly "white-eye" weed; paspalum and summer grasses also giving work.
Saturation of soil—Plentiful but not excessive.
Cultivation—Growers actively engaged, clods breaking up well.
Fertilisation—Growers considering stimulating ratoons.
Varieties doing well—M. 1900, Q. 813, H.Q. 285, Black Innis. Badila ratoons are growing well, although a great deal of Gumming Disease appeared in this cane last season.
Diseases—There is no fresh phase to comment upon in this respect.
Leguminous crops—A gratifying increase is to be observed in the farmers using green manures. There is still a scarcity of cowpea for seed.
Industrial—It is pleasing to note that the rains have, to a certain extent, increased agricultural employment.

Gooburrum.

Included in this area are those farms which extend along the North Coast road to within 5 miles of the beach. The farmers on these lately-developed areas are all young men and deserve the greatest credit for the fine showing they have made. The heavy forest has been cleared away and good crops of cane and neat little bungalows are to be observed. One farm in this area is run entirely by an enterprising woman with a family of very small children. She ploughs, plants, cultivates, and does domestic duties as well—and makes good work of it.

The following are essential details of this district:—

Soil.—Red forest loam of good depth.
Cultivation.—About 10 inches deep; some land cane-holed at present.
Varieties.—Q. 813, M. 1900 Seedling, Black Innis, H.Q. 285, D. 1135, and Uba.
Diseases.—Mosaic; slight incidence.
Growth of cane.—Strong and healthy. A good area to obtain plants from.
Mill supplied.—Fairymead.

Bingera South.

This area extends along the southern bank of the Burnett about 12 miles from Bundaberg. The farms present a pleasing aspect at present, the cane growing strongly. There is a wonderful growth of fodder grass. Mosaic Disease is serious in places but can be readily eradicated if the farmers select carefully.

Cane varieties doing well are—N.G. 22 (Mahona), H.Q. 285, Q. 855, N.G. 16, and D. 1135. Farmers are recommended to plant Q. 813 but avoid if possible cutting it too early. Growers of cane are advised to keep maize at least 2 chains away from their cane, owing to the risk of Mosaic infection from the corn and from stool to stool by Aphis Maidis of corn. If farmers plant Shahjahanpur No. 10 they are recommended to keep the block by itself, well away from other canes. The writer, however, recommends the farmers to discontinue growing this variety.

THE BANANA THRIPS.*

(Anaphothrips signipennis Bagnall.*)*

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

Banana "rust," or "colour" as it was previously called in North Queensland, has been known in the Innisfail-Cairns area for nearly thirty years, and has been more recently recorded from other Northern and certain Central and Southern banana-growing areas of the State.

Although the occurrence of "rust" on the fruit occasioned considerable losses to the industry in the Northern areas in the past, the seriousness of this menace to the industry was not generally realised until recent years. The association of a species of thrips with this damage to the banana fruit was first mentioned by H. Tryon in 1910.

Nature of Injury.

The minute insects known as the banana thrips feed on the surface skin of the fruit, causing injuries which develop into roughened reddish-brown areas, generally more or less superficial in nature, the colour of these attacked areas having given rise to the application of the popular designation of "rust" to this unsightly condition of the fruit (Plate 47). The first marking of the fruit occurs in between the fingers at any spot where two or more touch one another, and especially in the base of the hand. Where infestation is severe the damage may be extended more or less over the whole surface of the fruit; in such cases the skin is rendered "leathery," and the pulp is rather dry. In some instances where the fruit has been very badly affected, more especially in the early stages of development, the skin may crack as the fruit fills out, the pulp then becoming exposed. In either of these cases the fruit is unmarketable. Except in the two instances cited, however, banana "rust" has no effect whatever on the edibility and normal flavour of the fruit, although it materially affects its market value due to marring its appearance, especially when ripened.

Life Cycle Stages.

There are four stages in the life cycle of this insect—(1) egg, (2) larva, (3) pupa or chrysalis, (4) imago or adult.

The egg is an extremely minute object very closely resembling the plant tissue in which it is embedded, and hence almost impossible to detect except by special dissection.

The larva (Plate 48, fig. 1) is white, and when fullfed is about one twenty-fifth of an inch in length.

The pupa also is white and is approximately the same size as the larva.

The imago (Plate 48, fig. 2) is yellow in colour and is slightly larger than the pupa; it is equipped with two pairs of very fine delicate wings fringed with long hairs (Plate 48, fig. 2*b*). The female has, towards the tip of the body on the under-surface, a saw-toothed ovipositor by means of which the plant tissue is punctured and the eggs deposited in the opening thus made.

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* For fuller details of the life history and habits, see Bulletin No. 2, Division of Entomology and Plant Pathology, Department of Agriculture and Stock, Queensland, "The Banana Thrips Rust," by A. A. Girault, B.Sc.

Life History and Habits.

The eggs are deposited in the soft tissue of the leaf sheaths on the stem and in the skin of the fruit, generally within or near the colonies; about fourteen days are passed in this stage. The young larva, after emergence, makes a minute puncture in the covering tissue through which it crawls on to the surface; it develops by a series of moults until full grown, the period required for this development being about eight days. Larvæ and adults congregate in colonies on the pseudostems under the leaf sheaths and on the fruit, more particularly towards the base of the hands or where two or more fruit are touching or are com-

PLATE 47.

(For description of Plate, see page 190.)

pressed together. They feed more or less within the boundaries of the colonies, and when exposed scatter rapidly in all directions; larvæ in all stages of development may be met with in the one colony. When fullfed the larval thrips may leave the plant and enter the soil to pupate or may pupate on the plant. The duration of the pupal period is about seven days. When pupation takes place in the soil, the adult, after emergence, remains below ground for a short time before coming to the surface preparatory to making its way on to a banana plant. The full life-cycle occupies about thirty-three days. Mating takes place within a week after emergence from the soil, and very shortly afterwards the

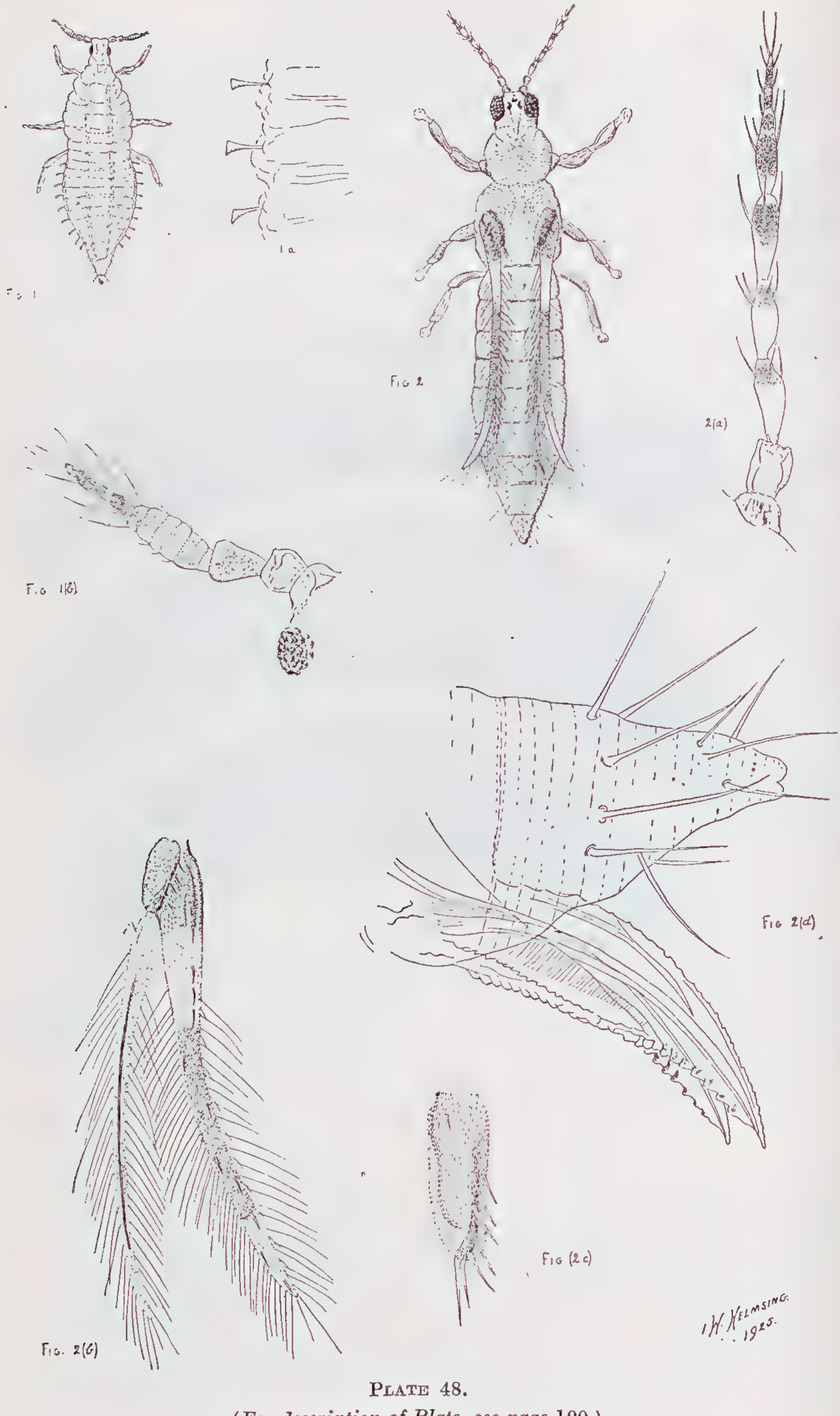


PLATE 48.
(*For description of Plate, see page* 190.)

female begins to deposit eggs; mating pairs may be observed at any time during the day when a colony is exposed.

Without food the adults die within twenty-four hours, but have lived for four weeks in captivity when fed continuously. If exposed to the heat of the sun they succumb very rapidly.

Thrips are present on the plants at all stages of growth, from the very young suckers to the mature plants, and remain on "stems" left standing in the stools or lying on the ground after the bunches have been cut as long as the tissues remain at any degree fresh. They enter a bunch as soon as the flower bracts lift off the hands, and it is in this stage of the development of the fruit that the worst "rust" damage is generally done. The fruit on any bunch that has been "choked" is practically always very badly affected.

Thrips are present on the plants all the year round, but show a steady increase in numerical occurrence from early in September, although in some seasons this may begin slightly later, reaching a maximum in January and February, after which a decline sets in, the numbers reaching a minimum in the winter months. The maximum damage occurs during the summer period, while during the winter months the injury is generally very slight.

All varieties of bananas grown in this State are subject to damage by thrips, but the injury is most extensive in those varieties in which the fruit is gathered closely together in the bunch.

Dispersion of the pest is brought about in one of two ways—namely, by prevailing winds carrying the adults to other centres, or by the transfer of suckers from a thrips infested plantation to areas previously free from infestation.

Preventive Measures.

Whenever possible suckers for planting should be obtained from a plantation in which the banana thrips is not present. Where this is not possible the bulbs when dug should be thoroughly cleansed from adhering soil or be lightly pared or heavily scraped; the tops should be cut off well down and any trash around the crown of the corm removed.

When a plant has had the bunch cut from it, the "stem" should be cut off as close on to the ground as possible and then be cut into three or four pieces crossways, each portion being split in half; this material should then be left exposed to the sun to dry out. The dry material can afterwards be chipped in or burnt. By this means all such plant material is rendered unsuitable either as sites for the shelter or breeding of the pest. All tip fruits and bud ends should be cut off and destroyed, as these also constitute shelter and breeding sites for the thrips.

By turning over the soil as much as possible thrips present therein will be exposed and killed. Good cultivation, therefore, combined with the continuous exercise of general plantation hygiene, are two most important factors in the scheme of control of the pest.

Remedial Measures.

A marked measure of control of this pest is obtained by dusting the stems and bunches with calcium cyanide "A" dust, but a greater degree of control can be obtained by combining treatment of the soil with the dusting of the stems and bunches. This soil treatment comprises burying half an ounce of calcium cyanide flakes 3 or 4 inches below the ground level, and about 6 inches out from the base of the plant; the soil dosage should in each case be divided into two or three parts and distributed at the required depth around the stool. Both dusting and soil treatment can be carried out at any time of the day, but with the bunches it is advisable not to dust while the fruit are wet either from rain or heavy dew.

In dusting, only a fine dust cloud should be projected on to the plant, and more especially on to the bunch, for if the fruit is coated with a layer of the powder scalding will be liable to ensue, due to the formation of quicklime as a result of the chemical decomposition of the calcium cyanide. It must always be borne in mind that it is the prussic acid gas given off from the powder and not the powder itself that kills the insects. Therefore a light cloud of the dust driven well down under the leaf sheaths, or into the base of the hands and amongst the fingers is all that is required. This gas, although highly poisonous, is given off at a comparatively slow rate, thus allowing a margin of safety to the operator, but the powder, on account of its poisonous properties, must not at any time be handled carelessly. In arranging the work in the plantation, it is advisable to keep moving away from the plants treated as far as it is possible to do so, and the operator should adopt every practicable precaution to avoid inhaling even small quantities of the gas. The dust can readily be applied by means of a hand bulb-blower, consisting of a rubber bulb into the neck of which is fitted a stopper carrying a short length of copper tubing.

In the field application of these remedial measures, treatments should be made at intervals of not more than three weeks. It is advisable to start dusting from when the flower bracts first lift on the bunch, or even dust the stem a little before the bunch is thrown, as an early treatment will reduce the number of thrips that may migrate on to the bunch as soon as it is thrown. Particular attention must be paid to control measures from October to March, when the thrips are steadily increasing in numbers and doing an ever-increasing amount of damage.

DESCRIPTION OF PLATES.

PLATE 47.—FRUIT SHOWING "RUST," THE INJURY CAUSED BY THE BANANA THRIPS.

Note the characteristically roughened surface of the affected areas and the gradation of severity of damage in the three fruit. The confines of a colony are well marked in the top fruit near the base.

PLATE 48.—THE BANANA THRIPS.

Fig. 1. Larva, second stage; x 45. Fig. 1*a*. Portion of side of abdomen of same, showing funnel-form hairs, one to each segment; x 210. Fig. 1*b*. Antenna of same; x 210. Fig. 2. Adult female, wings slightly extended; x 45. Fig. 2*a*. Antenna of same; x 210. Fig 2*b*. Wings of same; x 90. Fig 2*c*. Scale over base of wings; x 180. Fig. 2*d*. Apex of abdomen of female, showing saw-toothed ovipositor; x 295.

MARANOA WHEAT.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, informed the Press recently that advices from the State Wheat Board show that, notwithstanding that the season was one of the worst ever experienced on the Downs and other sections of the wheat belt, crops were produced in the Maranoa district which were, in many instances, records, both as regards quantity and quality of grain, and establishes the fact that there is a large area of country between the Main Western and Main South-western lines eminently suitable for grain-growing. In the Maranoa, "Florence," "Canberra," as well as other varieties, proved very successful croppers, some of them, from around about Mount Abundance, scaling as high as 67 lb. per bushel straight off the field.

CALLIDE COTTON RESEARCH STATION, BILOELA.

ANNUAL REPORT FOR THE YEAR ENDING 30th JUNE, 1926.

INTRODUCTION.

It was realised early in the formation of the Cotton Section of the Queensland Department of Agriculture and Stock that a properly equipped Experiment Station was absolutely necessary for the proper investigating of the various problems arising in connection with developing a cotton-growing industry in this State. Accordingly the demonstration area in the Callide Valley under the control of the Director of Agriculture, Mr. H. C. Quodling, was taken over by the Cotton Section in July, 1924. *It is now known as the Callide Cotton Research Station.*

Valuable progress of a preparatory nature had been effected under Mr. Quodling's direction, which allowed investigations on a fair-sized scale to be carried out in the first season in which the Cotton Section assumed control. The writer wishes to acknowledge his appreciation of the kind assistance rendered by Mr. Quodling, which enabled the Station to function smoothly under somewhat difficult conditions.

The report of the first year's operations was published last season in conjunction with other reports on experimental work in cotton. Owing to the increasing importance of the nature of the investigations being conducted at this centre, it is proposed to publish the annual report separately.

During this past season Messrs. G. Evans, C.I.E., Director of Cotton Culture, and L. W. Ball, the Manager of the Station, have resigned from the staff of the Cotton Section. It is to be deeply regretted that the services of these Officers will no longer be available to assist in the development of the various investigations being conducted.

I wish to acknowledge my appreciation of the very valuable suggestions which Mr. Evans so kindly gave me, based on his years of experience in such matters, in the development of the Station, and to record the important part that Mr. Ball had in effecting the same.

The opportunity is taken here to express my appreciation to Mr. A. Nagle, a Senior Field Assistant of the Cotton Section, for the excellent progress which has been made in the development of the Station under his direction since he temporarily took charge after Mr. Ball resigned.

Mr. I. G. Hamilton, who was the Experimentalist at the Station last season, has resigned to take up duties with the Empire Cotton Growing Corporation.

Mr. K. V. Henderson, Junior Field Assistant of the Cotton Section, has been responsible for the experimental work of this season, and the report is written largely from the notes taken by this Officer.

W. G. WELLS,
Cotton Specialist.

Location.

The Callide Research Station is located in approximately the centre of the Callide Valley Land Settlement scheme, at a distance of 1½ mile from the town of Biloela, on the Rannes Branch of the Dawson Valley Line. Generally speaking, it may be stated that the soils and climatic conditions of this valley may be taken to represent the average of the conditions existing in the inland valleys where cotton is being successfully grown. Geographically, it is nearly in the centre of the largest cotton areas. The location is ideal, from several viewpoints, for studying the various problems in connection with establishing a cotton-growing industry in Queensland.

Soils.

The soils on the Station vary from a light sandy loam along the banks of the Callide Creek to heavy box soils. In between these two extremes are to be found various loams ranging to a heavy dark type along the Washpool Creek. Such a wide variation of soils affords an excellent opportunity of studying the behaviour of the cotton plant on most of the different types of alluvial soils which may be met with in the cotton areas.

Climatic Conditions.

The climatic conditions, while somewhat on the dry side during the last two seasons, appear to be very suitable for producing a good quality of cotton if the proper methods of cultivation are exercised. The temperatures are of the temperate zone, the maximum reading rarely exceeding 100 deg. F., and then only for a few days in midsummer. As the valley is approximately 60 miles from the sea-coast and in behind the costal range, at an elevation of 530 feet, relatively low humidity readings are recorded except in the very rainy season. A climatological station equipped with instruments supplied by the Commonwealth Weather Bureau has been established, and daily readings are recorded of the air and soil temperatures, the relative humidity and the amount of evaporation taking place.

Appropriations.

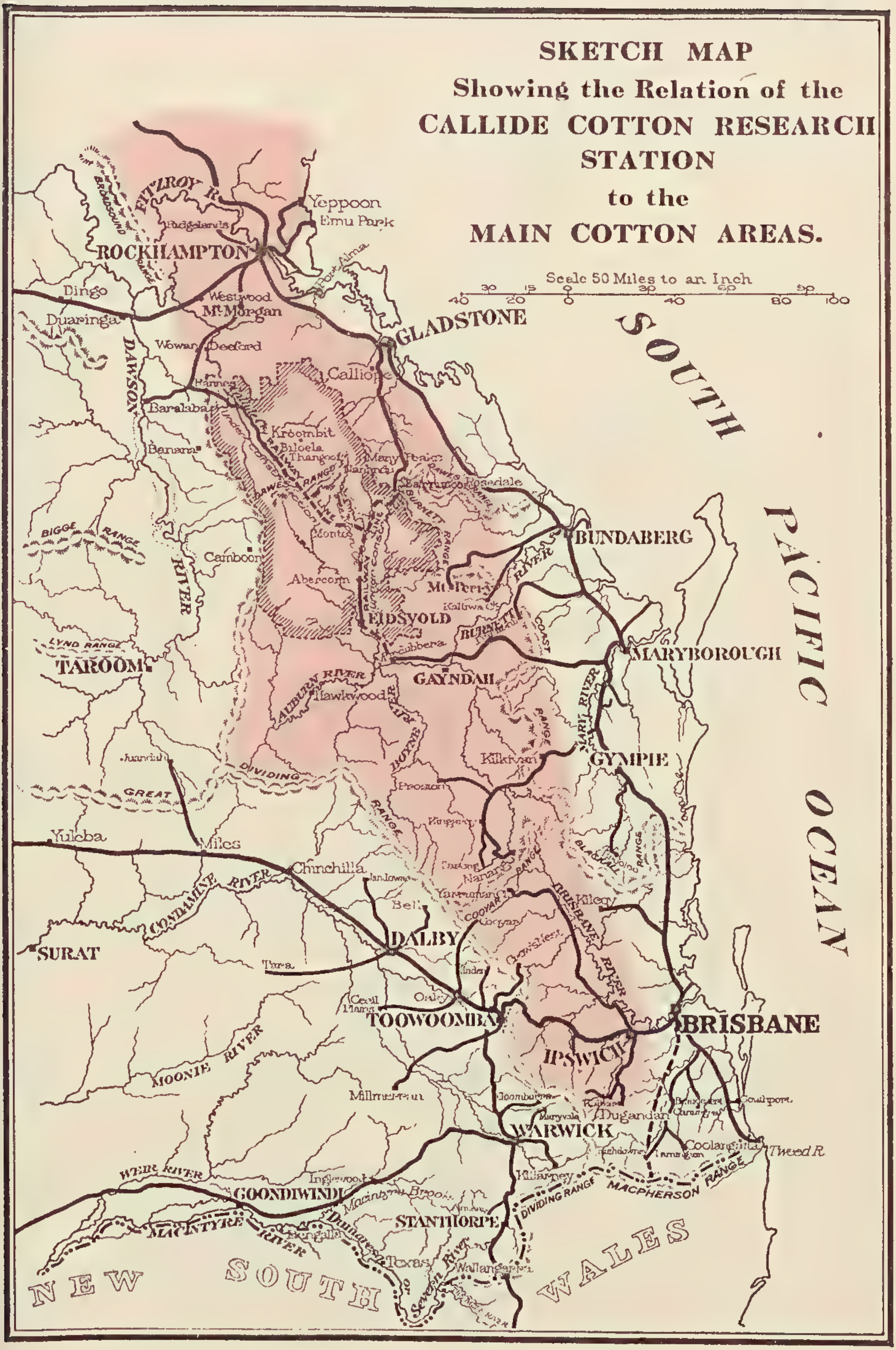
The funds for developing and running the station are supplied by the Empire Cotton Growing Corporation, and the Commonwealth, and the Queensland State Governments. The grants from the first two organisations assist in meeting the annual recurring expenditures, while the development work is borne by the Queensland Government.

Staff.

The technical staff positions consist of the Manager, an Assistant Plant Breeder, an Assistant on general cotton problems, and an Assistant Entomologist. With the exception of the latter, who is instructed by the Commonwealth Cotton Entomologist, the staff is under the direction of the Cotton Specialist employed by the Queensland Department of Agriculture.

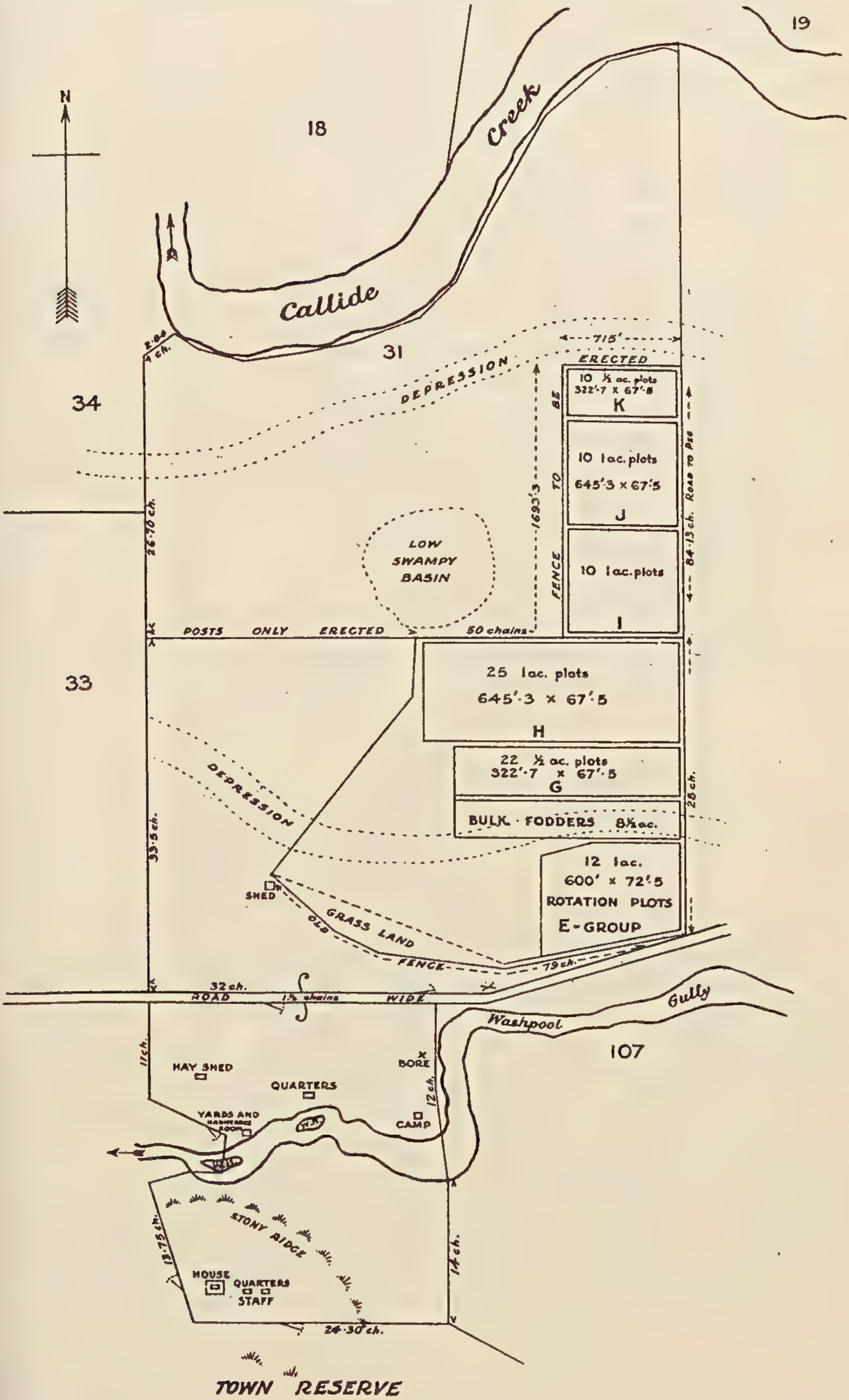
Plan of the Station.

The area of the Station consists of 417 acres, of which a major portion had standing dead ringbarked trees at the commencement of the development operations. Approximately 135 acres have been brought under cultivation, which will be sufficient for the present for the investigations which are being carried out. The plan shows the general layout.



SKETCH MAP
Showing the Relation of the CALLIDE COTTON RESEARCH STATION to the MAIN COTTON AREAS.

PLAN OF
CALLIDE COTTON RESEARCH STATION, BILOELA.



Unfortunately most of the blocks G and H are unsuitable for producing cotton except under very favourable rainfall conditions, due to the soil having a mixture of clays which occur close to the surface in irregular patches. Under the droughty conditions which have existed during the past two seasons, the cotton plants have developed normally until the beginning of January, when the effect of the drought which has existed in this month for both seasons, was soon apparent, the plants shedding all young squares and bolls, and even the leaves to some extent. In the hope of improving this soil so as to make it suitable for pure seed propagation, borders 6 to 17 in the H group were planted to cowpeas this season. The prolonged drought throughout the latter half of the season has checked the growth of these plants as well, so that the full benefit of their presence has not been obtained.

The soils in blocks K and J, which have just been brought under cultivation this season, seem to be very suitable to the production of cotton, and are of exceptional uniformity. This affords an excellent series of plots, for the conducting of various investigations in the problems of spacing of the plants and rows, &c. The distance of these blocks from the barns makes the conducting of any experiments requiring frequent cultivation somewhat expensive. Accordingly the D group block of country along the main road through the farm is being cleared, and it is hoped to complete this in time to allow a bulk crop of maize to be planted during the coming season. The trees on this country had to be ringbarked on the taking over of the farm, as they were practically all green—hence the delay in clearing this apparently suitable piece of soil.

In addition to this new group a further plot of approximately 4 acres in area will be brought under cultivation this coming season. This plot will be used as a place for the progeny investigations, and affords a good isolation from the rest of the cotton plots.

Improvements.

The construction of the necessary farm buildings has been continued this season as follows:—

One machinery shed with enclosed blacksmith shop.

One pump house.

Increasing the size of the hayshed to a total capacity of 46 tons of wheat hay.

In addition to the construction of these buildings, the pump and pipe lines to the barns and to the quarters on the hill were installed. The farm is now in a splendid position as regards the water supply. The pipe line to the hill, where the quarters of the Manager and technical staff are located, fills a long-required want and will also be valuable for irrigating the young orchard which is to be set out this coming season.

Seasonal Conditions.

The climatic conditions at the Callide Research Station this past season may be described as having been somewhat unfavourable for producing high yields of good quality long-stapled cotton. Good rains fell during the months of May to August inclusive, a total of 647 points having been recorded. This enabled the old cultivation areas to be brought into a good state of tilth with fair moisture in the subsoils.

Light planting rains fell in September, which enabled only the cotton in the rotation series to be planted. Unfortunately a dry period was experienced from then until the first part of November, when good rains fell, which allowed the rest of the crops to be planted.

Rains fell at sufficiently frequent intervals from then until the end of December to develop a well-grown plant with deep-rooted tap-roots. By the middle of January the early planted plots gave promise of yielding the highest yields that the Station had ever recorded. Unfortunately at this period a very severe storm of 4·55 inches was experienced, which fell in two hours and was accompanied by heavy winds which blew over a considerable percentage of the crop. The force of the storm set the soil to such an extent that small benefit was derived and owing to the height of the plants no cultivation could be effected to conserve the moisture, which penetrated beneath the surface. In a surprisingly short time all plots required added moisture, which was received in the middle of February through a storm of similar nature, 4·57 inches falling in two and a-quarter hours. The hard surface, however, prevented much of this storm penetrating to the subsoils, so that only a partial recover was made in most plots. From then on for the rest of the season a dry period accompanied by high temperatures was experienced.

In spite of such erratic and unfavourable weather conditions the yields on nearly all of the plots were good and the quality of the cotton produced was of much higher standard than that of any previous crops of the Station.

This may be explained by the fact that the soils have improved with cultivation, and that 6½ acres of the crop produced cotton grown from selected seed. It is anticipated that in the coming seasons the quality of the crops will show further improvement as the processes of improving the seed become more effective and the cultural practices more refined to suit the various soil requirements.

Considerably higher yields would have been obtained if the first killing frosts had occurred about the middle of June. A good top crop of large, well-developed bolls was present in nearly all of the plots at the time that the plants were cut down and burned, preparatory to the ploughing of the soil for the next season's seed-bed. The bolls while green contained fully-developed fibre, and only required a light killing frost to hasten their opening.

The advantages of early prepared seed-beds are so pronounced in a country with as precarious a spring rainfall as has Queensland that it is believed that more profit is obtained from the yield of the succeeding crop, where such methods have been practised, than by letting the old crop stay on until all the top bolls are harvested. A further point in favour of eradicating the crop by the end of June is that it increases the chances of more effectively destroying any pests which may be present towards the end of the season.

Temperature Records.

Unfortunately the temperature records for July, August, September, and up to the 18th October are not included owing to circumstances which need not be discussed.

DAILY TEMPERATURES (MAXIMUM AND MINIMUM). CALLIDE RESEARCH FARM, BILOELA, 1925.

Day.	October.		November.		December.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1	..	..	88	56	95	62·5
2	..	..	92	61	89·2	65·7
3	..	..	88	60·5	95·5	65
4	..	..	89	58·5	93	63
5	..	..	88·5	58·5	95	62
6	..	..	87·5	57·8	96	63
7	..	..	92	57·5	97·5	62·5
8	..	..	88	57	92	64·2
9	..	..	91·5	61	94	55·5
10	..	..	91	58	94·2	58
11	..	..	85	63·2	95·2	69·5
12	..	..	87	62	99	70
13	..	..	88	62	85·5	67
14	..	..	89	61	83·5	63·2
15	..	..	80	62	80·5	60·5
16	..	..	82	63	87·2	69
17	..	..	82	62	88·5	69
18	86·5	46·8	80	59	92	68
19	85·5	46·8	82·2	60	90·8	66
20	85	57	85	63	91·5	63
21	85·6	60·5	85	68	95·5	66·5
22	85·5	53	90·8	59	93·7	59
23	88·8	43	85·8	54·2	96·2	63·2
24	83·8	44	87·5	52	97·2	65·1
25	80	48·5	87	49	87·2	64·2
26	81·5	51·5	87	57·2	90·5	65·1
27	83	49	89	55	90	63·2
28	86	51	88	56	89·1	61·7
29	87·9	53·4	90·5	52·5	89	62·5
30	90	52·3	91	54	84	60·8
31	86·8	54	..	..	82·7	61
Average ..	85·4	51·2	84·1	58·6	91·2	63·9

DAILY TEMPERATURES (MAXIMUM AND MINIMUM). CALLIDE RESEARCH FARM, BILOELA, 1926.

Day.	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	84·2	65·5	94	68·5	90	59·5	89	57	84	47	78·5	33
2	85	69	96	63	88·5	58·5	89	56	87	46	67	32
3	89·3	66·8	92·5	60·5	89	54	88	54	83	47	66	54
4	86	68·1	94	60	87	56·2	89	56	85	48	67·4	38·8
5	87	71·5	95	59	88	57	85	55	85·5	45·5	72·5	38·8
6	88·5	68·9	95	61·5	88·2	59	88	54	81	55	75	45
7	92	75	94	63	90	55	86·5	58	85·8	45·5	75·5	49
8	93	67·5	96	60	91	50	92·8	64	87	47	66	36
9	90	65·5	94	69·5	91	53	93	61·5	87·5	52	66	39
10	87·5	60·5	94	71	87	65·5	92·5	61	86	64	72	42·5
11	90	63·5	95	71	87	62·5	92·5	61	84	59·5	72	44·5
12	92·2	64	88	69·5	91	64	90	62	81	52·5	71·8	51
13	92	67	88	66·8	94	64	93	61·5	61·5	47	69	34
14	91	65·2	92	70	94	71·5	92	57·5	70	54·4	71·5	48·2
15	84·5	62·5	92·2	67	95	64	92·5	63·5	70	51	67	52·5
16	89	70·5	91·6	64	97	64	87	44	78	58·5	73·5	50
17	87·6	65	92·5	67	93	64	80·5	38	68	53·5	74	47

DAILY TEMPERATURES (MAXIMUM AND MINIMUM) CALLIDE RESEARCH FARM, BILOELA, 1926—*continued.*

Day.	January.		February.		March.		April.		May.		June.	
	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
18	88·5	72	95	66	86	65	80	34	70·2	47	73	52
19	88·5	67·5	97	68·5	88·8	62	78	37	72·8	41	74	53
20	90·6	65·6	90	69·5	90	69·5	83	40	72·5	35·5	75	51·5
21	92·5	61·5	90	64	89·2	61	87	41·5	72·2	40·5	73	53·5
22	90·5	62·5	91·2	61	90	59	90	42·5	72	39	73	44·5
23	91	70·5	92	62	90·8	62	91	56·5	71·5	35·5	77·5	60
24	90·5	67	93	65	91·2	63	92	53	73	34	77	65
25	92	64·8	92	61	91	67	90	67	74	35·5	75	60·5
26	94	64	92·5	58	87·5	64·5	80	38	77·5	39	74	49
27	97	66	93	50	81·5	60	80	36	79·2	41·5	75	51
28	93·8	62	91	71	83	63·5	85	40	79	47	75·5	51
29	94	63·2	..	..	87	57	88·5	47	75·5	36·5	70·8	35·8
30	97	69·2	..	..	90·2	57·2	89	49·5	73·5	39·5	71	34·5
31	95	65	..	..	88·9	58·5	..	..	73·5	49·5	..	..
Average ..	90·9	66·3	92·8	64·1	89·5	60·9	81·4	50·9	78	43·2	68·9	46·5

DAILY RAINFALL, CALLIDE RESEARCH FARM, 1ST JULY, 1925 TO 30TH JUNE, 1926.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1 ..	..	..	..	..	..	36	267	..	..	..	..	2
2 ..	..	..	..	..	..	..	3	..	..	..	..	..
3 ..	..	..	..	..	4	11	60	..	..	..	..	..
4 ..	25	..	..	..	..	..	24	..	..	..	..	..
5 ..	..	..	18	..	75	11	..	..	..	..	..	..
6 ..	..	..	..	..	..	..	169	..	..	4	..	..
7 ..	..	..	..	..	..	..	9	..	..	..	..	79
8 ..	..	..	..	..	..	..	455	..	..	..	..	..
9 ..	..	..	..	..	141	..	..	..	..	..	..	..
10 ..	..	..	..	18	4	..	..	457	33	..	..	..
11 ..	58	..	..	..	..	..	..	86	36	..	2	..
12 ..	..	..	..	..	..	..	..	37	..	5	13	..
13 ..	..	..	..	..	..	..	..	68	..	..	2	..
14 ..	..	..	..	..	6	..	..	..	..	..	..	..
15 ..	..	..	..	..	..	96	..	..	..	6	6	..
16 ..	..	..	137	..	..	35	..	..	..	..	6	..
17 ..	..	..	52	..	..	..	9	..	..	..	195	..
18 ..	..	..	..	..	..	..	14	..	..	..	..	..
19 ..	..	..	..	..	..	..	..	..	..	..	..	..
20 ..	..	..	..	..	..	..	9	..	..	..	..	2
21 ..	..	..	..	..	..	..	..	..	..	..	..	..
22 ..	..	..	..	..	54	..	..	..	..	..	..	..
23 ..	..	..	..	..	..	..	..	..	..	..	..	..
24 ..	..	..	5	..	..	135	..	..	..	..	..	65
25 ..	..	..	..	..	..	..	..	65	..	..	..	15
26 ..	13	..	..	..	..	..	..	..	..	..	..	..
27 ..	..	..	..	..	..	..	..	..	..	..	..	..
28 ..	..	..	..	..	..	..	..	..	..	..	..	..
29 ..	..	29	..	..	..	..	..	..	..	..	..	..
30 ..	..	10	..	..	..	22	..	..	..	..	..	..
31 ..	..	..	..	..	..	47	..	..	..	..	40	..
Monthly Total ..	96	39	212	18	284	393	1,019	713	69	15	264	163

Yearly total—32·85 inches.

PLAN OF PLANTING, CALLIDE COTTON RESEARCH FARM, SEASON 1925-26.

Border Number.	Crop.		Rate of Yield per Acre.
E 1 ..	Sudan grass	rotation series	Approx. 3 tons dry hay
E 2 ..	Sorghum	"	Not weighed
E 3 ..	Giant panicum ..	"	Estimated 25 cwt. dry hay
E 4 ..	Maize	"	Not weighed
E 5 ..	Sudan grass	"	Approx. 3 tons dry hay
E 6 ..	Cotton	"	1,248 lb. seed cotton
E 7 ..	ditto	"	1,130 "
E 8 ..	ditto	"	925 "
E 9 ..	ditto	"	926 "
E 10 ..	ditto	"	1,021 "
E 11 ..	ditto	"	1,473 "
E 12 ..	ditto	"	1,370 "
E 13 ..	Sudan grass		Approx. 3 tons dry hay
E 14 ..	Cotton Ridging Experiment—		
	Five rows flat finished ridged		950 lb. seed cotton
	Five rows flat		1,011 "
	Five rows ridged-continuously		1,081 "
E 15 ..	Cotton, paired rows		..
E 16 ..	ditto		..
E 17 ..	Cotton, bulk yields	poor stand, droughty North end	859½ lb. seed cotton
E 18 ..	ditto		922½ "

F Group—Fallow.

G Group—

1. Maize trap. Poor growth; droughty soil.

2–4. Fertiliser test cotton. Failure owing to droughty conditions completely checking growth of plant and size of bolls. Not picked.

5. Maize trap. Poor growth; droughty soil.

6–10. Fallow.

11–23 (inclusive). Fodder crop trials.

Rest of group—Fodder.

H Group—

1. Maize trap. Fair growth except on Southern end, where droughty.

2. Spacing and thinning test cotton.—Abandoned, on account of poor stand.

3. Spacing and thinning test cotton.—Abandoned, on account of poor stand.

4. Spacing and thinning test cotton.—Abandoned, on account of poor stand.

5. Maizetrap.—Poor to fair growth; droughty.

6-17. Cowpeas—Black. Green manure crop, very poor growth; planted rows 4 ft. 6 in. apart, but droughty soil prohibited proper growth. Ploughed under in end of June.

18. Fallow.

19. N.S. and E.W. direction of row experiment. Only four south plots harvested. Swamps backed up and water stood over the rest of experiment, killing plants.

20. Cotton, check row experiment.—Abandoned account of poor stand.

21. Maize, Reid's Yellow Dent.—Large per centage of plants died from effect of overflow.

22. Maize, Reid's Yellow Dent.—Large percentage of plants died from effect of overflow.

23. Maize trap. Good growth. No records, not planted entirely, five rows fallow.

24. Cotton progenies.

25. Fallow. Under fodders, previous season.

I Group—

1. Maize trap.—Fair growth.
2. Fallow.
3. Cotton, harrowing experiment.—Poor stand. Not completed, 478 lb. per acre.
4. Maize trap.
5. Maize trap.—Good Growth.
6. Maize.—Five rows; rest fallow.
7. 8. Height of thinning.—Only middle section used, as South end of both plots developed very stunted growth.
9. December planting; 116 lb. per acre.
10. Maize trap.—Good growth; some water killed.

Border Number.	Crop.	Rate of Yield per acre.
		Lb.
J 1 ..	Maize trap.—Fair growth	..
J 2 ..	Bulk planting.—Good strike	1,034
J 3 ..	November planting.—Poor stand in northern end ..	933
J 4 ..	Maize trap	..
J 5 ..	Monal Creek.—Bulk selection	1,100½
J 6 ..	Maize trap.—Good growth	..
J 7 ..	Monal Creek.—Bulk selection	916
J 8 ..	ditto	759
J 9 ..	ditto	1,343
J 10 ..	Maize trap.—Good growth	..
	HALF-ACRE PLOTS.	
K 1 ..	Maize trap.—Good growth	..
K 2 ..	Bulk planting.—Many plants missing	486 = 972
K 3 ..	November planting	465½ = 931
K 4 ..	Bulk planting.—Very good spacing on uniform soil ..	687 = 1,374
K 5 ..	Monal Creek bulk selection	623½ = 1,247
K 6 ..	Maize trap	..
K 7 ..	Monal Creek bulk selection	543 = 1,086
K 8 ..	ditto	589½ = 1,179
K 9 ..	ditto	698 = 1,396
K 10 ..	Maize trap.—Good growth	..

Operations under Review.

The results from the operations on the Station for the past season have been somewhat varied in the degree of success which has been obtained. Generally speaking it has been a successful year. The progress which has been made in the various lines of investigations, while not always of a clear-cut, definite nature, must be considered fairly satisfactory. The results contribute towards the necessary accumulation of evidence which is required in dealing with problems in agricultural crops. Several of the lines of investigation require several years of repetition before any definite conclusions may be expected to be reached.

Cotton.

With some exceptions, the cotton plots gave very good yields, considering the climatic conditions, and demonstrated that cotton can be grown very successfully in the Callide Valley, provided the proper cultural operations are practised. The yields from the various plots on the different types of soils indicate, as was the case last season, that considerable care should be exercised in selecting a suitable type of soil in this valley for growing cotton.

It appears that a desirable type of soil should be of a medium to heavy loam containing a slight mixture of clay and overlying a heavy subsoil. Such a combination not only affords a good, moisture-carrying soil for the early development of the young cotton plant, but also holds the lower moisture up to the roots during excessive periods of heat or drought in the later stages when the plants may be heavily laden with fruit.

Owing to the variable climatic conditions every endeavour should be made to follow the best methods of cultivation, such as early establishment of a well-prepared seed-bed; planting on the first rains after the danger of late spring frosts has passed; the spacing of rows and plants so as to give a maximum amount of insurance against severe periods of drought and still not lower the yields to an unprofitable basis; thinning at the stage which best assists in establishing the plant to resist climatic variations; and frequent cultivation during the growing season so as to conserve moisture and reduce weed and grass growth.

These are the principles which are used in the growing of the bulk of the cotton crops on the Station. Many of the experiments deal with the various problems bearing on these points, and it is hoped that sufficient accurately determined evidence may be obtained to assist in arriving at the proper method for each operation.

Fodder Crops.

It is realised that dairying is the basic industry for most of the areas where cotton is being grown. Accordingly a rotation series has been included in the Station's activities in the endeavour to determine the most profitable of the customary fodder crops of the district which can be grown in combination with cotton.

In conjunction with this experiment a test has been established in which various fodder crops and combinations of crops are tested out in an endeavour to determine which is the most valuable for use in the rotation series.

As in the past seasons, a considerable acreage of wheat was grown during the winter to augment the supply of hay required by the work stock of the Station. A very fine quality of hay was made this season, and yields averaging 30 cwt. of dry hay were obtained from most of the bulk plots.

Fodder Crop Trials.

In order to determine which crop or combination of fodder crops is the most suited for the fodder plots in the rotation experiments, a series of half-acre plots was grown during the past winter. These were planted in the last week in June, following 348 points of rain on 20th June, and harvested in the second week in October.

The following yields were obtained*:—

	tons.	cwt.	qrs.	lbs.
Wheat	3	12	2	3
Wheat and vetches	3	11	1	6
Oats	1	11	0	6
Skinless barley	3	2	1	15
Skinless barley and vetches	3	3	2	7
Cape barley	2	19	3	4
Rye	0	19	0	3
Rye and vetches	1	0	1	0
Wheat and field peas	3	10	3	16

The notes taken by the Manager record that planting was effected following the fall of 320 points of rain. A good strike was secured, and by the end of July all crops were growing exceptionally well except the oats, which were somewhat backward.

The fodders started earing during the first half of September—the skinless barley being well out in ear by 12th September. All of the crops were short strawed, however, owing to the lack of soaking rains falling during the growing period. Storms yielding a total of 187 points occurred on the 16th and 17th September, which stimulated a good growth, especially in the wheat plots.

Harvesting started on 3rd October, and was completed on 17th October, the various plots being cut when they were in the proper condition to make good hay. The rye and oats failed to mature properly, having been burnt off to a great extent during the dry period in September.

Rotation Plots.

The series of rotation plots E 1–12 were continued this season along the established lines of the experiment. A substitution of Giant Panicum for Japanese Millet was made in E 3, as the results of the previous season had shown the latter to be unsuitable for the experiment.

* These yields are computed from the weights of representative samples. The samples were dried for two weeks under shelter before weighing.

PLAN OF SYSTEM OF ROTATIONS.

Year.	1	2	3	4	5	6	7	8	9	10	11	12
1924–25	Fallow Cotton	Fallow Cotton	Fallow Cotton	Fallow Cotton	Fallow 24 Nov. Sudan grass 25 June, Wheat	Fallow Cow-peas Hay Long Fallow	Fallow Cotton	24 June, Wheat 24 Dec. Cow-peas Green Manure	24 June, Wheat 24 Dec. Pea-nuts	24 June, Wheat 24 Dec. Sudan grass	24 June, Wheat 24 Dec. Maize	24 June, Wheat 24 Dec. Japan-ese Millet
1925–26	Sudan grass	Sorghum	Giant Pani-cum	Maize	25 Dec., Sudan grass	Cotton	Cotton	Long Fallow Cotton	Cotton	Cotton	Cotton	Cotton
1926–27	Cotton	Cotton	Cotton	Cotton	Cotton	Cowpeas Hay	Cotton	Cotton	Peanuts	Sudan grass 27 June, Wheat	Maize 27 June, Wheat	Giant Pani-cum 27 June, Wheat
1927–28	Sudan grass	Sorghum	Giant Pani-cum	Maize	Sudan grass	Cotton	Cotton	Cotton	Cotton	27 Dec., Sudan grass	27 Dec., Maize	27 Dec., Giant Pani-cum
1928–29	Cotton	Cotton	Cotton	Cotton	Cotton	Cowpeas Hay	Cotton	Cowpeas Green manure	Peanuts	Cotton	Cotton	Cotton

YIELDS FROM ROTATION CROPS.

E. Group.	1	2	3	4	5	6
1924–25	Cotton (*), 1,186 lb.	Cotton planted 30th September, 1,450 lb.	Cotton, 30th September, 1,420 lb.	Cotton, 30th September, 1,374 lb.	Sudan grass, 2 tons 9 cwt. Hay	Cowpeas ploughed in (†)
1925–26	Approx. 3 tons dry hay	Not weighed	Estimated 25 cwt. dry hay	Not weighed	Approx. 3 tons dry hay	Cotton, 1,248 lb.
E. Group.	**7**	**8**	**9**	**10**	**11**	**12**
1924–25	Cotton, 30th September, 1,392 lb.	Wheat, 30 cwt. Hay Cowpeas ploughed in	Wheat, 30 cwt. Hay Peanuts, 590 lb. nuts	Wheat, 30 cwt. Hay Sudan grass, 2 tons 1 cwt. hay	Wheat, 30 cwt. Hay Maize, 8 tons green fodder	Wheat, 30 cwt. Hay Japanese Millet, 15 cwt.
1925–26	Cotton planted 22nd September, 1,130 lb.	Cotton, 22nd September, 925 lb.	Cotton, 22nd September, 926 lb.	Cotton, 22nd September, 1,021 lb.	Cotton, 22nd September, 1,473 lb.	Cotton, 1,370 lb.

(*) Six outside rows were on newly broken ground.

(†) Not made into hay on account of poor quality owing to seasonal conditions.

NOTE.—All plots are ploughed as soon as crop is off in order to secure as long a fallow as possible.

Seasonal Results.

The results secured from the series as a whole were good, although some damage was done to the stand obtained in some of the cotton plots by cutworm attacks. This is especially true of borders 8 and 9. Little effect of the previous crop could be seen on any of the plots with the exception of border 8, in which cowpeas had been turned under as a green manure crop. In this border the plants were of decided coarser vegetation and the foliage of a much darker hue. A slight depression extends across one portion of this plot and the plants in this area were of an extremely vegetative type and bore a light crop of small bolls as compared to the rest of the plot.

It will be noted that the exact weights are not recorded for the fodder crops of this season. This omission is necessary owing to an unfortunate loss of the records containing the exact figures, during the transitional period in the change of management. The weights taken can be taken to be approximately correct. The maize crop was not harvested owing to the serious losses caused by attacks from crows and cockatoos. The sorghum crop, while making a very heavy tonnage, was not weighed on account of a severe storm lodging the same to such an extent as to make it impossible to harvest economically.

Maize.

No bulk plots of maize were grown this season owing to the large acreage of maize which was devoted to the maize trap experiments in connection with the maize grub or corn ear worm (*Heliothis obsoleta*) investigations. The records of the yields were not kept owing to only a portion of the plots being left to mature grain. Plantings were made on 11th November, 15th and 26th December, and 14th January. The 15th December planting gave the best type of ears, and would probably have given the heaviest yield per acre.

The results secured this season from the maize plots indicate that average yields of maize may be expected in this district. Soils of high moisture-carrying capacities should be planted, however, as the periods of high temperatures accompanied by droughty conditions which frequently occur in this district, have a very detrimental effect on the quality of the crop unless grown on such soils.

Green Manure Crops.

In an endeavour to build up some of the soils which are of a droughty nature owing to a high percentage of very fine particles of clay being present, a considerable acreage of the Black variety of cowpeas was grown for ploughing under this season. Unfortunately the very heavy storms in January and February seemed to set the soil in the rows to such an extent that although inter-row cultivations were made after the rains, the plants were not able to produce much growth during the long drought which existed for the rest of the growing period.

This crop was ploughed under late in the season, and will be allowed to fallow all winter preparatory for another planting of cowpeas next season.

In addition to this work, the effect on cotton following a green manure crop such as cowpeas or a nitrogenous crop such as peanuts, is being tested out in the rotation series.

Cotton Breeding.

Marked progress in this very important phase of the activities of the Station has been made this season. A 6½-acre plot sown with bulk selected seed grown on the Monal Creek Demonstration Area of last season, was grown on the newly-cleared section of the farm, and yielded at the rate of 1,254 lb. of seed cotton per acre. The seed obtained from these plots will be sufficient to plant the whole of the bulk and experimental plantings which will be made next season, and in addition any growers within half a mile of the Station will also be supplied with this seed in order to prevent cross-fertilisation with the old stocks from taking place.

PLATE 49 (Fig. 1).—THE B. TYPE OF THE DURANGO VARIETY.

This is the standard type for the cotton breeding operations at the Callide Cotton Research Farm. (Leaves picked off to show fruiting habit to better advantage.)

This block of 6½ acres of bulk selected seed was carefully inspected plant by plant when the crop was mature, and 670 plants were selected as representing the B type of Durango plant. This type, which is of an erect stiff habit of growth with fruiting branches of some four to six internodes in length, appears to be the most suited to the inland valley conditions, and all selections are confined to this type. 220 lb. of seed cotton were obtained from these plants, the seed of which will be used in planting a 5-acre plot on the Station this coming season for further increase work.

It is appreciated that the system of building up a supply of seed by the method of "bulk selection" is but a quick way of obtaining a fairly uniform commercial lot of cotton. It is only by means of careful selection of the individual plant under the progeny row system that a uniform strain in all respects may be obtained. Accordingly, several plants of a very desirable type were selected at the Monal Creek Demonstration Farm, in the Upper Burnett, and on the Research Station last season. The best of these were planted on the Research Station this season, and several progenies have shown remarkable uniformity for the first year under test. Individual selections for further progeny study were made in the best rows, and the remaining plants of the row which gave the most promising results were picked in bulk separately from the rest. The seed from this row will be planted in an isolated plot this coming season for further study, and, if investigations prove it to be desirable for increasing for general distribution, it will eventually supplant the bulk selected cottons.

It can be seen then that a definite system of supplying seed of a uniform variety, bred up to meet local requirements, has been established, which will enable the growers in the Callide Valley and other portions of the Central Queensland district to produce an excellent class of cotton.

Cotton Experiments—Time of Planting Experiment.

This experiment was conducted on the newly-prepared block of country—groups J, K, and I—in an endeavour to obtain a uniform piece of soil. Unfortunately, not enough rain fell in September to firm such a newly-prepared seed-bed sufficiently to allow a planting to be made in that month. October was extremely dry, so that no plantings could be made in this experiment until the 6th of November, when good rains fell. Another planting was made on 15th December. The test really does not cover the situation, but is recorded on account of the very low yield which was obtained in the December planting. The ripening season was characterised by extremely warm weather until late in the season, and frosts did not occur until after the picking season should be completed.

The results obtained from the December planting are somewhat in line with those obtained in the 19th December planting of the season 1924-25, when 220 lb. per acre was recorded. An earlier frost probably accounts for the increased yield of that season.

The yields for the two years are included:—

Season 1924-25.	
7th October planting	912 lb. per acre
10th November planting	885 lb. per acre
19th December planting	220 lb. per acre
15th January planting	Not picked, failed to mature
Season 1925-26.	
No October planting.	
5th November planting	933 lb. per acre
15th December planting	116 lb. per acre

Direction of Rows Experiment.

In a country where cotton is subject to fungous diseases, and where heavy rains may fall during the early part of the boll-opening period, the obtaining of plenty of light and circulation of air may be advantageous. In this connection the point has been raised as to whether any advantage is obtained by planting the rows in an east-west direction or a north-south one.

An experiment along these lines was performed this season, with the rows 4½ feet apart and the plants spaced 2 feet apart. Unfortunately, in a very severe storm occurring in January, the water backed up in a depression and overflowed to such an extent as to submerge this experiment for some days. All but four of the plots were killed, and in two of these the soil was set so firmly that a very restricted plant growth was made.

With the material available, careful observations were made of the presence of boll rots, but only three cases were noticed—two in the east-west plots and one in the north-south plots. A light attack of the corn ear worm (maize grub) was also experienced, but of about equal value in all plots.

The period of ripening did not appear to be influenced to any extent—only a few bolls in the east-west plots opening earlier than in the other plots.

The rate of yields secured from these plots was as follows:—

Plot 1. North and south rows.—1,434 lb. of seed cotton per acre.

Plot 2. East and west rows.—1,501 lb. of seed cotton per acre.

Plot 3. North and south rows.—1,424½ lb. of seed cotton per acre.

Plot 4. East and west rows.—1,348 lb. of seed cotton per acre.

The growth of the plants on a portion of Plot 4 was influenced by the water somewhat more than the rest of the plots, so that no reliance can be placed on the results obtained from this plot. This experiment is being repeated in the coming season.

Paired Row Experiment.

The peculiar irregularities of the climatic conditions in the various parts of the cotton areas in Queensland makes it a problem to space the rows so as to be suitable to the variable conditions. The months of January and February may be very wet, as shown by records of former years. With the exception of 1924 they have been very dry and hot during the last four years. Another factor which complicates the problem is the time of planting, which may extend from early in September until the middle of November, according to the receival of the spring rains.

The experiences of growers and the results obtained on the Government Stations indicate that where early planting is obtained much of the difficulty is overcome. The plants from the early sowings develop a stocky, well-laden structure, with a good tap-root system. This controls the development of the plant in any periods favourable to vigorous growth, while the well-developed tap-root system assists the plant in withstanding the effects of periods of drought. It can be seen that with such a plant the problem of the proper spacing is very much simplified. On the average of the Queensland soils, spacings of 4½ feet between the rows and 20 to 24 inches between the plants give very good results, and are used by most of the growers and in the bulk plantings on the Research Station, where yields per acre of 900 to 1,200 lb. of good quality seed cotton are obtained.

In seasons when early strikes of cotton cannot be secured the spacing problem becomes more difficult. The latter half of October is usually dry, and ordinarily, if planting has not been effected before this time, it becomes necessary to wait for the November storms. November planted cotton is of the tendency to make somewhat of a vigorous growth, and unless checked by short periods of dry conditions during early January enters the period when heavy rains may be experienced in a very unsatisfactory stage. This is also the time of the heaviest incidence of the corn ear worm (*Heliothis obsoleta*), and if a severe attack is experienced the resultant loss of squares makes it all the more difficult to control the growth of the plant during luxuriant growing conditions.

The crop of 1923-24 experienced such conditions, the general plantings not taking place until November. A heavy corn ear worm attack occurred in January, followed by severe storms in February. The result was that nearly all crops on fertile alluvial soils were failures, the plants growing to 6 to 7 feet tall, with only a scattering top crop of bolls which did not mature.

Experiments in controlling the growth of irrigated cotton on heavy soils by the United States Department of Agriculture have indicated that some control may be effected by spacing the rows in pairs, with sufficient distance between the pairs to give an "outside row" effect. In most cotton fields the outside rows are usually the most heavily laden, and especially in fields of rank growth. An experiment based on this principle has been conducted on the Research Station this season, the following spacings being included:—

Single spacing of rows, 5½ feet apart.

Pairs 4½ feet between the two rows, 6½ feet between the pairs.

Single spacing of rows, 4½ feet apart.

Pairs 4½ feet between the two rows, 5½ feet between the pairs.

Single spacing of rows, 5 feet apart.

No significant differences between the yields were obtained. Owing to the newness of the Station unexpected irregularities in the soil conditions are often experienced, and unfortunately the experiment was effected in this manner this past season. From notes taken on the development of the plants, it appeared that the wider single spacings—especially the 5½ ft. spacing—were much more inclined to vegetative growth. Counts of plants in each treatment showed the following data regarding the number of vegetative branches per plant:—

5½ ft. spacing	..	4·45 branches per plant	..	p.e. ± ·103
6½ ft. pairs	..	4·03 branches per plant	..	p.e. ± ·078
4½ ft. spacing	..	3·8 branches per plant	..	p.e. ± ·076
5½ ft. pairs	..	3·6 branches per plant	..	p.e. ± ·069
5 ft. spacing	..	3·7 branches per plant	..	p.e. ± ·077

The experiment is being repeated this coming season. It is believed that by pairing the rows, the competition between the two rows of the pair may assist in restricting the growth, while the wide spacing between the pairs, and also the tendency of the plants to spread outwards during the later stages of development, may reduce the amount of shade and humidity around the lower crop to such an extent as to prevent loss from boll rots during excessive wet seasons.

Height of Thinning Experiment.

The effect of the height of the cotton plants at the time of thinning is believed to be of the utmost importance in Queensland. The average cotton-grower does practically all of the work in the crop. This is in addition to his regular farm duties, so that it can be seen that there is a likelihood of some of the work being somewhat delayed. This is particularly true of the thinning operation. Unless one is accustomed to "chopping" cotton, an acre a day is a fair performance, especially if a portion of the day is necessary for dairying, &c. A grower with a plot of 10 acres of cotton is likely to be at least ten days in thinning it, and generally more. If the growing conditions at that stage are favourable to luxuriant growth the last plants to be thinned may be considerably taller than were the first plants where the operation was commenced.

An experiment to demonstrate the effect of the thinning at the different heights, and also the effect of spacing, was designed for distribution among the farmers. This experiment was also conducted on the Research Farm this season. Briefly, it consisted of thinning plants to distances of 15 and 24 inches apart when they were at the following heights:—4–6 inches, 8–10 inches, and 16–18 inches. The first two stages represent the different heights at which the average commercial 10-acre plot is thinned, but occasionally greatly delayed thinning is met with, so the 16–18 stage was included to demonstrate what the comparative effect would be when the plants were thinned at that height.

Unfortunately a slightly irregular strike was secured in this experiment, which did not allow for the uniform proper spacing in all the rows. The results are included, however, as they indicate a tendency for heavier yields being obtained at the earlier thinnings. General observations over the last four seasons in Queensland indicate similar conclusions.

From the material obtained it appears that if the farmer starts to thin when the plants are 4–6 inches high, and completes this operation by the time they are 10–12 inches high, there will be a small loss of yield experienced on the portion of the field which was thinned last, other factors being equal.

Owing to the slight irregularity of spacing no definite conclusions could be drawn from the spacing feature of the experiment. The whole investigation will be repeated in the following season, as several seasons of carefully conducted experiments are required before any definite conclusions can be drawn.

It is possible that when such material is available it will be shown that the thinning should be hastened so as to complete this operation before the plants are over 8 inches in height.

The yields are as follows:—

Mean yield of 100ft. rows in lbs. of seed cotton.		Rate per acre.
24-in. spacing, thinned when 4 to 6 in. tall, mean 11·8	p.e. ± ·42	1,142
24-in. spacing, thinned when 10 to 12 in. tall, mean 10·4	p.e. ± ·60	1,006
24-in. spacing, thinned when 16 to 18 in. tall, mean 9·9	p.e. ± ·56	958
15-in. spacing, thinned when 4 to 6 in. tall, mean 11·2	p.e. ± ·68	1,084
15-in. spacing, thinned when 10 to 12 in. tall, mean 10·12	p.e. ± ·28	979
15-in. spacing, thinned when 16 to 18 in. tall, mean 10·1	p.e. ± ·33	977

In order to determine the effect that the different spacings and thinnings had on the size of the bolls, fifty four-lock bolls were collected from each treatment, one boll per plant. The following table gives the mean weights per boll and the probable error of the result:—

Thinned 6 in. high to 15 in. spacing, mean weight 6·17 grams.	p.e. ± ·08
Thinned 6 in. high to 24 in. spacing, mean weight 6·21 grams.	p.e. ± ·17
Thinned 12 in. high to 15 in. spacing, mean weight 6·67 grams.	p.e. ± ·13
Thinned 12 in. high to 24 in. spacing, mean weight 6·31 grams.	p.e. ± ·11
Thinned 18 in. high to 15 in. spacing, mean weight 5·98 grams.	p.e. ± ·08
Thinned 18 in. high to 24 in. spacing, mean weight 6·87 grams.	p.e. ± ·13

It will be noted that with the exception of the 15-inch spacing at 18 inches high there is a decided tendency for the weight of the bolls to increase as the height of the thinning is delayed. This may be explained by an examination of the yields of the plots which show a tendency in the early thinned rows to increased yields. It would appear that the early thinned plots gave a greater number of bolls per plant, but under the droughty conditions which existed a certain reduction

Plate 50 (Fig. 2.)

Illustrating the height of the Plants when thinned at the Callide Cotton Research Farm. These plants average about 6 inches in height.

in the size of the bolls resulted. This did not lower the yield per row, however, to less than that of the other spacings, and under more favourable climatic conditions it is probable that much higher yields would have been obtained in the earlier thinned plants owing to an increased weight of the bolls.

Ridging Experiment.

In the endeavour to reduce the expense of hand eradication of weeds and grass the general system of cultivation on the Research Station has been to gradually work the soil to the plants at each cultivation by means of the disc cultivators so as to smother any young growth. Excellent yields have been obtained each season with such a method, but the question arose as to whether such a system was as conducive to conserving moisture as flat cultivation would be. It has been considered desirable to leave the plants well ridged up at the last cultivation in order to afford a brace for the well-laden plants against any storms which might occur during January and February. This would assist in preventing their being blown over sufficiently to "lodge," which is very undesirable on account of increasing the danger of boll rots and also as it handicaps the pickers. The point arose could this be done as well just at the last cultivation.

Accordingly an experiment was designed which included the following features:—

Five rows to be cultivated flat until the last cultivation, when as heavy a ridge as the machine could put up without damaging the plants would be effected.

Five rows to be cultivated flat all season.

Five rows to be gradually ridged with each cultivation.

Unfortunately, heavy rains occurred in January, following good growing conditions in December, so that the Manager "barred" off the plot in order to prevent excessive growth. This procedure consists of reversing the discs on a disc cultivator and cutting away the soil around the plants so as to leave them in a ridge of about 8 inches in width. This ridge is left exposed for a few days according to the amount of sun and temperature in order to dry out the soil somewhat, and then covered up again so as to leave a high ridge of loose soil to give the proper mulch. This method of "barring-off" is a very efficient way to check the growth of rapidly growing plants if done at the proper stage, and gave excellent results at the Research Station in both this and last season's cotton crops. The main precaution to take is not to cut too deeply with the discs as the operation is a soil-drying one rather than root pruning.

This "barring-off" may have complicated the experiment somewhat, so that the results obtained may not be strictly representative of the effects of the different methods of cultivation. It is being conducted again this coming season. However, some differences were obtained as the means of the rows of each treatment were as follows:—

Treatment.	Rate of yield per acre.
	Lb. Seed Cotton.
1. Flat cultivated, until last cultivation, when ridged	950
2. Flat cultivated throughout	1'011
3. Gradually ridged through whole period of cultivation ..	1,081

While the yields between the flat cultivated and the ridged throughout plots are not very different, there was a noticeable difference in the behaviour of the plants of the plots during the extremely hot dry period of the latter part of January. The ridged plants in Plot 3 remained much fresher throughout the day than did the plants in the other two plots. The explanation of this may be that the continuous ridging of loose soil around the plant gave a better mulch and assisted in conserving the moisture directly under the plants, even though there was a possibility that the ridge prevented the full effect of light storms penetrating to the subsoil immediately around the tap root.

Insect Control.

Generally speaking, with the exception of the Corn Ear Worm (*Heliothis obsoleta*) the season under review, at Biloela, was remarkably free from insect attack. This may be accounted for by the severe heat waves and drought which existed at this Station during January and February. Such climatic conditions must have checked the populations of *Dysdercus, Tectacoris lineola,* and *Oxycaraenus* to a marked extent, as was shown by the very high grade of cotton which was received from the whole of the Callide Valley.

PLATE 51 (Fig. 3.)—ILLUSTRATING THE PROCESS OF "BARRING-OFF."

When cooler weather, accompanied by light showers and dews, was experienced, these insects increased in numbers to more normal proportions at the end of the season. The whole of the farm's crop was cut when in a green condition and stacked for burning. *Dysdercus,* in particular, likes such resting places at this period of the year, so that it is believed that burning the crop under such a system, greatly reduces the population for the winter carry-over.

The incidence of *Tectacoris lineola** and *Dysdercus* is closely associated with the occurrence of the internal boll rots, and the accompanying low grades of cotton. Methods which assist in controlling them, therefore, are of the utmost importance.

The cutting and burning of the plants before all of the top crop of late bolls are matured also materially assists in checking the occurrence of the Pink Boll Worm (*Platyedra gossypiella*) the Peach Grub (*Conogethes punctiferalis*) and the Rough Boll Worm (*Earias hugelli*).

* "The life history of *Tectacoris lineola* and its connection with internal boll rots in Queensland." E. Ballard and F. G. Holdaway. Bulletin of Entomological Research, vol. xvi., part 4, 1926.

Maize Traps.

The use of maize plantings to control the attacks of the Corn Ear Worm (*Heliothis obsoleta*) was carefully investigated on a large scale at the Station this season. The observations and experiments of the Commonwealth Cotton Entomologist, during the preceding crop gave evidence which indicated that this pest might be controlled by the planting of plots of maize at intervals which would provide continuous green maize plants to attract the moth of this insect. The first two crops of maize should be cut when in full silk, as this is the period when the largest number of grubs are present. If allowed to remain uncut, the grubs pass into the surface soils, where they pupate preparatory to emerging as moths for laying eggs of another generation. Accordingly all of the cotton plots, with the exception of the early planted cotton in the rotation series, were planned so as to allow for a border of maize for every four borders of cotton. This works out at the rate of fifteen rows of maize for every sixty rows of cotton.

The cotton plots included in the experiment were planted from 5th to 9th November inclusive. Four rows of maize were planted 11th November, the second four 15th December, and the third planting 14th January.

The results secured from the experiment were very striking. In the Monal Creek bulk planting, which was included in the test, the average yield per acre was 1,254 lb. of good quality cotton. In addition a heavy top crop of green bolls, which needed but a light frost to open them, was destroyed when the plants were cut preparatory to ploughing for the following season's crop. In the H group, on a 3-acre plot where the second planting of maize was delayed from 15th to the 26th December, a very heavy attack of the maize grub was experienced. The effect was so severe that the lower crop of bolls was practically a failure, with the exception of one end where the soil was of heavy moisture retaining properties which forced a greater rate of production of squares. In addition to this factor, the borders of cotton were only separated by a narrow roadway from the maize traps of the adjoining plots, in which the rows of maize of the second planting had been sown on 15th December. It is reasonable to believe that this maize would attract a certain number of the moths occurring in the H group, and thus lessen the degree of attack experienced in this plot.

The loss of the lower crop over the major portion of the H group resulted in a rank vegetative growth occurring, accompanied by shedding. This was followed by heat waves checking the growth and causing further shedding. The final result was practically no fruit on this plot with the exception of the portion on the heavier moisture retaining soils.

It appears that the maize trap offers a solution to the problem of corn ear worm attack on late-planted cotton. The results obtained on the Station, and by farmers in nearly all districts, indicate that early planted cotton generally escapes serious injury from this pest. It may not be possible to effect early planting in every season. The usual result obtained from late-planted cotton—*i.e.*, late October on through November—is a considerable loss from the attacks of corn ear worm, therefore it is advisable for the grower to utilise any methods which assist him in protecting his crop.

It is realised that in some seasons it may not be possible to plant the maize at the proper intervals. Accordingly, during the coming season, experiments in the use of calcium arsenate will be conducted. For this purpose, a three-row dusting machine of the latest pattern has been imported from the U.S.A.

METEOROLOGY AND AGRICULTURE.

A second conference arranged by the British Ministry of Agriculture between workers engaged on the study of various aspects of the effect of weather on crop growth was held at the Meteorological Office, London, on 30th September and 1st October, 1926, under the chairmanship of Sir Napier Shaw, F.R.S. Those present included representatives from the research institutes at Rothamsted, Cambridge (Plant Breeding), Aberystwyth (Plant Breeding), Imperial College of Science (Plant Physiology), and Long Ashton (Fruit Growing), from the five crop-testing stations in England, and from several agricultural colleges and county agricultural staffs.

The following papers were read:—

"The Influence of Summer Rainfall on the Fruiting of Apples" (Mr. A. H. Lees, Long Ashton Research Station).

"Meteorological Conditions and the Growth of Barley" (Dr. F. G. Gregory, Plant Physiology Research Institute, Imperial College of Science).

"Essentials of Theory and Points of Practice in Crop Weather Work" (Mr. F. L. Engledow, Cambridge Plant Breeding Institute).

"Technique of Crop Observations" (Mr. T. Eden, Rothamsted Experimental Station).

"Solar Radiation" (Mr. R. Corless, Meteorological Office).

"The Effect of Solar Radiation on Plant Growth" (Prof. V. H. Blackman, Plant Physiology Research Institute, Imperial College of Science).

"The Value of Co-ordination in Phenological Observations" (Mr. J. E. Clark, Royal Meteorological Society).

"The Value of Phenological Observations in Practical Agriculture" (Mr. A. Roebuck, Midland Agricultural and Dairy College).

Space does not permit of a full account of these papers, but a brief summary* of each is given below.

"*The Influence of Summer Rainfall on the Fruiting of Apples*" (Mr. A. H. Lees).—Flower buds of the apple, with their surrounding leaves, expand towards the end of May, and the weather following this period may be expected to influence their development. The leaves remain on the tree until the end of October or beginning of November, but conditions after the end of August appear to have but little influence. Attention was therefore focussed on the months of June, July, and August.

Although many meteorological factors may be expected to affect the plant, rainfall was selected partly as presenting a simple issue and partly because of the existence of suitable data. Again, rainfall is probably the most important single factor, and it is a rough index of sunshine, soil moisture, and humidity.

Rainfall data were compounded from those for two Clifton stations and from the Long Ashton Research Station. For the purpose of comparison with fruit data these rainfall figures were classified into three groups: (1) *dry* (rainfall under 6 in. in the three months), (2) *medium* (rainfall between 6 in. and 9 in.), and (3) *wet* (rainfall over 9 in.) These figures correspond very closely to a resulting dry, moist, and very wet soil during these three months.

Descriptions of crop production were obtained from the Ministry for the general crop in Somerset, Devon, and Cornwall. Description of bloom was obtained from notes in the "Gardeners' Chronicle".

On comparing the rainfall in the three months in question with the flower production in the following year it was found from pomological consideration that a further factor had to be taken into account, namely, that of previous crop.

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*From "The Journal of the Ministry of Agriculture" (Great Britain), November and December, 1926.

As a result of the correlation of the various factors over the years 1906 to 1925 the following is put forward as a scheme for estimating the apple crop of any year given data for rainfall of the summer of the preceding year and the amount of the crop of the preceding year:—

Previous crop.	*Previous rainfall.*	*Succeeding crop.*
Heavy	Wet	Very Poor
"	Medium	Poor
"	Dry	Medium
Medium	Wet	Poor
"	Medium	Medium
"	Dry	Good
Light	Wet	Medium
"	Medium	Good
"	Dry	Very Good
None	Wet	Good
"	Medium	Very Good
"	Dry	"

This table only applies to adult trees over a large area, and cannot be applied to younger trees or those having special treatment unless those special conditions are duly allowed for. The table has been found to apply over a period of twenty years, provided always that excessive frost, or continuous cold winds do not interfere in spring.

"Meteorological Conditions and the Growth of Barley" (Dr. F. G. Gregory).—This investigation represents an attempt to simplify the complex problem of ascertaining the effect of weather on crops; attention was confined to a single pure line of barley grown in pot culture from 1921 to 1924 at Rothamsted. The effect of variation in rainfall was largely eliminated by controlled watering. During the investigation a large range of variation in climate was encountered; in 1921 the weather was remarkably fine and temperature high; in 1922 a warm spring was followed by almost continuous dull and rainy weather; in 1923 and 1924 a cold wet spring was followed by a warm and fine summer. In addition to standard meteorological observations of maximum and minimum temperatures and hours of bright sunshine, continuous records of temperature and sunshine were kept.

In collecting quantitative measurements of plant growth against which to measure the effect of weather conditions the aim was to select such measurements as would reflect the action of the chief physiological processes taking place. These roughly fall into two classes: (1) those concerned with nutrition and gross dry weight increase, and (2) those regulating development and structural changes. The first class is represented by the net assimilation rate, which measures the amount of dry matter produced per unit of time per unit area of the leaf surface. The second class of processes is represented by the relative leaf growth rate, which records the percentage increase in leaf area per week. The progress of the whole process of growth is expressed by the percentage increase in dry weight per week. The three measures of growth used were thus: (1) Net assimilation rate, (2) relative leaf growth rate, (3) increase in dry weight per week, or efficiency index. These three quantities were calculated for weekly intervals up to the time of maximum leaf area. The conclusions drawn as regards each measure of growth are:—

(1) Assimilation.—The process of carbon assimilation is almost completely controlled by climatic factors, such other factors as manurial treatment being secondary in their effect. The highest correlation is with total radiation, higher light intensity leading to more rapid assimilation. Increased day temperature has an accelerating effect; high night temperature has a retarding effect, partly due, no doubt, to losses of material by increased respiration at night.

(2) Leaf Growth.—The rate of leaf growth increases with increased day temperature and decreases with increased night temperature; and it decreases with increased light intensity. This last finding indicates that, after allowance has been made for high temperatures associated with bright sunshine, the effect of strong radiation is to inhibit leaf growth.

Leaf growth is hardly affected at all by variation in net assimilation rate; this seems to indicate that under weather conditions such as prevail during early summer in this country net assimilation is maintained at such a level that the carbo-hydrate material formed is always in excess of the immediate needs of the plant for leaf growth material, and an excess must be laid down as reserve. It rarely happens, apparently, that adverse weather conditions last long enough to exhause these reserves for maintenance of leaf growth. Leaf growth is therefore relatively independent of external factors.

(3) Efficiency Index.—The dry weight increase increases with higher day temperature and decreases with higher night temperature; it is, however, almost independent of radiation, the effects of which on assimilation and leaf growth counterbalance one another. This means that the increase in dry weight proceeds at a normal rate whatever the conditions of illumination may be. This of course holds true only for the range actually investigated, viz., average early summer conditions.

The facts emerging from this analysis are as follows: The two processes which determine the final amount of material accumulated by the plant, and hence to a large extent the yield, are: (1) the rate of development of the leaf surface, and (2) the efficiency of the leaf surface in building up carbohydrate.

The relative leaf growth rate determines the size of the effective area, and the net assimilation rate measures its efficiency. Bright sunshine has opposite effects on these two processes. A dull summer, other things being equal, will lead to a large leaf development, whose large size will tend to compensate for the low efficiency due to lack of light limiting the assimilation rate; conversely a bright summer will tender to reduce the size of the leaf surface, but this will be compensated for by high efficiency. In this way yield will tend to be maintained within narrower limits. Temperature has an accelerating influence on both processes; the range over which a plant may be successfully grown will therefore obviously depend on temperature relations. Perhaps this may explain the general relationship between the distribution of cereals and the run of the isotherms or zones of equal temperatures.

The facts determined enable us to visualize a clearer picture of the adaptation of plants to climatic conditions, and perhaps by closer studies of this kind the problem of adapting the variety to climate or the breeding of new varieties to suit the climate will become a practical possibility.

"*Essentials of Theory and Points of Practice in Crop Weather Work*" (Mr. F. L. Engledow).—The study of the effect of weather on crops represents an integration of almost all cropping problems, and is therefore a most complex and difficult task. The work involved is well worth while, however, if any definite relationships can be established: e.g., the establishment of the relation between the weather and growth of the wheat plant in the first six weeks of its life would represent a fundamental advance; and, in fact, the connexion between any phase of weather and any phase of crop growth would be valuable.

In this work meteorologists have set the standards and the pace. Their work is done extremely well; they give to agriculturists definite accurate measurements of certain aspects of the weather every day, or even several times a day, right through the season. Agriculturists can, of course, measure yield with considerable statistical accuracy, but if no more than the yield is recorded the work is very incomplete. They should follow the meteorologists and give a series of numerical records from their plants right through the season.

Yield is most confusing; it is the final expression or resultant of growth. It can never be understood unless growth is understood. Agriculturists must contribute systematic observations on growth, and, as every day counts in the plant's life the plant must be studied every day.

In addition to the weather, the soil and the farming procedure influence the plant, so that the study must be carried out on different soils and under different farming conditions. The present crop weather scheme provides for this and also for uniformity in crop observations. Difficulties met with in taking observations are apt to upset observers' schemes of recording, and consequently the greatest possible effort should be made to conform to specified procedure. The study should also pay the greatest possible attention to agricultural circumstances; the effect of weather on wheat following clover, for instance, may be different from that on wheat following fallow.

Growth is never smooth; it proceeds, as it were, by jumps; constant attention is necessary to perceive and appreciate the importance of the various stages.

Some instances may be given of the importance of knowing all the factors influencing yield. Three wheat varieties sown under similar conditions in 1924 and 1925 germinated in 25 days in 1924 and in 58 days in 1925; delayed germination in the latter year was due to frost after sowing. In 1924 on three plots the number of plants surviving in an investigation was 180, 176, and 165; in 1925 the numbers were respectively 116, 114, and 84. In another case 88 per cent. of plants were attacked by wheat bulb fly. Again, at Cambridge dry weather during the last week in April and the first week in May is common and hinders plant development. As a consequence the plant may be unable to take full advantage of succeeding spells of weather which, with a more suitable May, might have been very favourable to growth. In another year the weather may be favourable throughout. The agriculturist must obtain analytical data upon germination, the number surviving, the spacing of plants, critical periods, disease and pest damage, etc. The plants must be watched throughout life.

It is also important to ascertain whether the general inferences from the observers' own plots or fields are supported by the evidence from fields in the neighbourhood; a practice should therefore be made of carefully studying the fields in the neighbourhood of the crop weather station.

Lastly, continuous observation of plots and fields will undoubtedly indicate plant characteristics and vital relationships that will prove very useful.

"Technique of Crop Observations" (Mr. T. Eden).—It is well known that different observers form different opinions of the progress of crops. For this reason Rothamsted Experimental Station has been compelled to consider the possibility of making metrical observations of crops.

Observations on crops can be made in two ways. The present crop weather scheme provides for records of the date of sowing, date of brairding, date of four-leaf stage (in spring oats), and so on. This method of observation is difficult because plants do not come up regularly and the fixing of a criterion is not easy. It seemed preferable, however, to Rothamsted workers to adopt a second method of observation, viz., to go out on to the plots or fields regularly and obtain as many measurements as possible of the conditions of crops on the plots or fields. It is easier to say that on a certain date 20 per cent. of the plants had put out one subsidiary tiller than to fix the date when the average tiller production was, for example, one.

It is necessary to follow the growth of the plant and analyse out the factors contributing to yield. Metrical observations give more information than phenological observations because they provide a series of comparable growth data—such as number of tillers, height, &c., all easily measurable—the latest of which are brought about by weather and by previous growth stages. The following characters can be recommended at this stage as giving the best measure of performance of the plant:—

(1) The capacity of the plant to tiller. There is a high correlation between tillering and the total yield; in fact, tillering is a better indication of yield than the number of ears before harvest. It is worth while spending a good deal of time and care on records of tillering.

(2) The character of the leaf. Some plants will produce a large and some a small amount of leaf. In Rothamsted work the total number of leaves on the main stem and the width of the topmost fully opened leaf were recorded.

(3) The total height of the plant. The total height and shoot height, i.e., height to the last developed leaf and also ear height, were taken on Hoos Field. The total height will probably tell all we want to know about the plant in the first instance.

The next question that arises is how the characters shall be recorded and with what sort of accuracy. At Rothamsted twenty rows of one metre each have been taken and averaged; 100 records in all have been averaged for height. Four stations—Rothamsted, Cambridge, and two crop-testing stations—are conducting special investigations in the next two years in connection with crop observations for the agricultural meteorological scheme. It is hoped, as a result of these investigations to introduce improvements in the present crop-reading scheme.

The following are brief summaries of the remaining papers read at the second conference, arranged by the Ministry, of workers engaged on the study of various aspects of the effect of weather on crop growth, which was held on 30th September and 1st October, 1926. It is proposed to issue, later, a full report of the conference, and a limited number of copies will probably be available for free distribution.

"Solar Radiation" (Mr. R. Corless).—One of the questions which arises in regard to solar radiation is whether the heat-radiation, in which meteorologists are mainly interested, and which is confined chiefly to the red and infra-red rays of the spectrum, suffices for the requirements of the botanist. There is no definite information as to the extent of the band of wave-lengths which is important for plant growth; but it is common knowledge that light, as well as heat, is vital for plants, and it may be that radiations of much shorter or much longer pave-lengths are also important for their development.

The intensity of solar radiation at the outer boundary of the atmosphere is approximately constant; the variations in solar radiation which we experience are due almost entirely to the effect of the atmosphere (including clouds, haze, dust, &c.)

in absorbing more or less of the energy stream. When the sun is in the zenith the length of the path of the radiation through the atmosphere has its minimum value. When it is on the horizon the length has its maximum value. In the latter case every layer of the atmosphere contributes an increased amount to the path of the rays, but the lower layers contribute much more in proportion than the uppermost layers. The lower layers contain the whole of the clouds, haze, dust, and other foreign matter, all of which absorb radiation freely, and so we have the explanation of the low radiation in winter, and in the early morning and evening at all seasons. A growing crop on a level field receives only the vertical component of the radiation which falls on the field. If the field is not horizontal it can deal only with the component of the radiation at right angles to its surface. Hence in the case of the level field the effective intensity of solar radiation when the sun is low is considerably reduced below the value which represents the whole intensity of the radiation stream received.

The sunshine recorder, in general use at crop-weather stations, is not intended to give any measure of the total amount of solar radiation received; all that it purports to do is to record the duration of "bright sunshine." So far as the instrument is concerned bright sunshine experienced in the late afternoon of a frosty winter's day is equivalent to an equal duration of midday sun on a hot day in June or July. An instrument which gives a continuous record of the intensity of sky and solar radiation is the Callendar radiograph. Experiments with it have shown that radiation from clouds forms an appreciable part of what is recorded. The "greenhouse effect" of the glass bulb of the instrument is shown by the fact that outward radiation at night is not recorded, and is presumably not able to pass through the glass. At the other end of the spectrum, ultra-violet radiation, which is pronounced at midday, is also excluded. The selective absorption of the glass is therefore a factor to be kept in mind. By replacing the glass bulb with quartz or other selected transparent materials it is possible to obtain records of the intensity of other wave-length bands. The Callendar radiograph measures the radiation of a certain band of the radiation which falls on a horizontal surface, and it is therefore likely to give records which can be compared with statistics of crop growth provided the frequency band recorded by the Callendar is similar to that which is of importance for crop growth. An examination of sunshine data and radiation data for corresponding periods of a week or longer reveals a decided relationship between the two; it is only with an exceptionally dull or sunny week or month that there are striking discrepancies between the two sets of data. The similarity between the two sets of data does not, of course, extend to individual days.

The author could not state what effect on crop growth is exercised by the longer and shorter wave-length radiations, which are not transmitted by ordinary glass, and are, therefore, not recorded by the Callendar radiograph. Dr. Leonard Hill states that ultra-violet radiation has, in his opinion, little effect on plant life. However that may be, the ultra-violet radiation curve also follows the sunshine curve rather closely. Indeed, there seems to be good reason for stating that in all probability mean serial values of the vertical component of solar radiation, taken over consecutive periods of a week or a month or longer, and having regard to a wide band of wave-lengths of radiation likely to affect plant life, bear a fairly close resemblance to the corresponding curve showing mean aerial values of sunshine. The exceptional cases are either very sunny or very dull periods and are explained by the variations in the relative importance of the sky-shine contribution to the total radiation which are characteristic of such periods.

"*Solar Radiation and Plant Growth*" (Professor V. H. Blackman).—The solar radiation reaching the earth is of course of the greatest biological importance. It is the sole source of energy available for food production by the green plant, and so is essential for the growth and fruiting of the crop. The question of the exact manner in which light affects plant growth is, however, a very difficult one which has not yet been fully elucidated.

We observe in the plant two main effects of light. The first and more direct is that on the process of carbon assimilation, where the light energy absorbed by the plant is used in food production; the plant is here almost solely concerned with that part of the solar radiation which is recognised by our eyes as light. The second and more complex effect, of which we know much less, is the so-called formative (morphogenic) effect of light, i.e., the effect of light on the form and structure of the plant. The rays mostly concerned in this action are the blue-violet ones.

As regards the effect of various intensities of light on the form of the plant, it is well known that plants grown respectively in bright light and in shade have a very different form and structure, and the two can usually be distinguished at a glance. It will be remembered that Dr. Gregory (see summary of paper above) found a negative correlation between relative leaf-growth and total radiation. In other words low light intensity, within limits, favours leaf-growth, while high light intensity tends to retard it. We have practically no knowledge of quantitative relationships between this formative effect and the intensities of radiation. The problem is complicated by adaptation effects, for example, a plant exposed for some time to a given light intensity reacts differently from one newly exposed.

There have been a large number of observations on the action of solar radiation on the rate of food production by the plant. The earliest observations with any attempt at precision were those of Brown and Escombe about twenty years ago. These investigators worked with single leaves in chambers exposed to a current of air in ordinary sunlight. They measured the CO_2 absorbed by the leaf and, assuming that sugar was formed, they calculated the useful work done. By estimating also the energy used in evaporation of water and that used in warming the leaf, they determined the efficiency of the leaf. In one experiment with bright sunlight, using a sunflower leaf, they found that only 0.66 per cent. of the radiation falling on the leaf was used in assimilation, and of the radiation absorbed by the leaf only about 1 per cent. was used. A close examination of this work shows, however, that the precision is illusory. Apart from the crudity of some of the measurements, this result is found to hold for only a particular set of conditions; a particular light intensity, a particular concentration of the raw material of assimilation (i.e., CO_2), a particular temperature, a particular concentration of chlorophyll in the leaf, &c. It was found, for example, that if the light intensity in the above experiment was reduced to one-twelfth, the efficiency in relation to the light falling was over 4 per cent. It is a well-known fact that the efficiency of the assimilating machine goes up markedly with reduction of light intensity.

In particular the concentration of CO_2 has a most striking effect on the efficiency. In some experiments carried out last month at the Imperial College, with a given light intensity, the growth of cucumber plants was increased 85 per cent. in eleven days by raising the CO_2 concentration. Light of different wave-lengths also has very different effects. In some recent, very careful work of Warburg and Negelein, using high concentration of CO_2, a medium temperature and very weak light, the average efficiency was, for red light, 59 per cent. and, for blue light, 33.8 per cent. Then again different plants are "tuned" (using a word which merely hides our ignorance) to work efficiently at different intensities. Assimilation takes place in the light and respiration in the dark, and the "compensation point" between the two, where they are equal in amount, is different with different plants.

We see that the efficiency of the plant stated as an absolute number has no meaning, and that laboratory data from single leaves and from plants grown under artificial conditions are of very little value. The most satisfactory method is to treat the crop as a whole, and attempts have been made to calculate the efficiency of field crops in relation to solar radiation. The calorific value of the aerial and underground parts of the crop is determined by burning in a bomb calorimeter. The energy stored up in the crop at harvest time is thus determined; the solar radiation falling on a unit of soil area being also known, the efficiency of the crop can be estimated.

The following crop efficiency data are given by Putter:—

Spring-sown wheat	2.8 per cent.
Rye	2.3 per cent.

If the loss by respiration is taken into account, the percentages become 3.3 and 2.6 respectively. Red Clover appears to be the most efficient crop, for, when respiration is considered, the efficiency reaches 5.4 per cent. The figures of crop efficiency are higher than those which might have been expected from Brown and Escombe's results. These two authors, however, worked with single leaves through which the light passed once only, whereas in the crop growing under natural conditions, the light is more fully absorbed as it may pass through several leaves in succession.

These calculations are based on estimations by Hertsprung of the solar energy reaching the ground at Kiel. For the period 22nd March to 21st September, the radiation (of a wave-length less than one metre) received per square metre is calculated as 285,400 calories (large), the radiation received during these six months being four-fifths of that received during the whole year. It is probable that differences of crop-yield of different varieties may be partly due to their different efficiencies in the utilisation of solar radiation.

"The Value of Co-ordination in Phenological Observations" (Mr. J. E. Clark).—Doubtless man's earliest conscious attention to the weather would have regard to his bodily comfort. The hunter would soon realise its relation to the coming and going of his prey, especially in temperate regions. Then, too—and of yet greater import—he would watch how the weather affected the growth of plants and fruits used as food, realising its association with their various stages. When he turned cultivator of the choicer kinds, keener weather observations became essential. Thus man gradually became a student of the seasonal influences on animal and vegetable life.

With writing began records of these associations. We may recall those of the Nile floods, going back thousands of years; of vintages for over a thousand years. Indeed, we are largely able, thanks to such records, to ascertain now the variation from year to year of the ancient weather conditions. As we shall see later, even for the latter half of the eighteenth century, observations upon animal and plant seasonal changes have provided a welcome confirmation of the unexpected difference of the average temperature of that period, relatively to later years. With the eighteenth century the necessary accuracy in the case of individual enthusiasts had reached the stage when their records deserved to rank as the "science of appearances"; that is, phenology.

Phenology is usually included as a special branch of practical meteorology. But our introductory remarks show that the subject transcends the normal purview of that science, since it could be also regarded as a special branch of biology or of agriculture and horticulture. For its object is to ascertain the real relationship between the subjects of all these sciences, in other words between life stages and climate, laying special stress upon the influence of the seasons. Briefly, therefore, we may accept the definition in "Whitney's Century Dictionary": "the science treating of the influence of climate on the recurrence of the annual phenomena of animal and vegetable life."

The possible lines of investigation arising out of this definition are enormous. Practical work has in the main been concentrated in two directions—of botany and ornithology. In the former, choice has fallen upon the phases of budding, leafing, blooming, fruiting, autumn colouring and leaf-fall for a select series of flowering plants. In the latter, upon bird movements, especially in spring migration.

Phenology co-ordinated had taken firm root half a century ago, though lacking coherence and presentation of results in a common, tangible form. Earlier still we have the admirable isolated observers from whom we get a fair idea of phenological events in south-east England over a period of 190 years. Graphs from 1750 on, when fairly reliable temperature records begin, confirm in an interesting manner that the mean temperatures from then to the end of that century were abnormally low compared to later times.

The present Royal Meteorological Society Phenological Scheme, carried out at some 300 stations, is based on the blossoming of thirteen plants, six bird events and six of insects. Tables showing the variation from average of temperature, aggregate temperatures, rainfall and sunshine are included for comparison.

Except in the United States there is little co-ordinated observation outside Europe. In the States the chief organiser has been Dr. A. D. Hopkins, head of the Entomological Bureau of the Department of Agriculture, working mainly on its economic aspect. But the wider results are summed up in Supplement No. 9 of the "Monthly Weather Review" (1918), entitled "Phenological Events and Natural Law as Guides to Agricultural Research and Practice." One of his most striking early successes was in circumventing the ravages of the hessian fly by correlation of grain sowing with phenological events. More theoretical is his far-reaching "Bioclimatic Law," covering the American North Temperate Zone. Both he and we have found that, with slight modification, it appears to be transferable to our own continent. It runs: "Other conditions being equal the variation in the time of occurrence of a given periodical event in life activity in temperate North America is at the general average rate of four days to each degree of latitude (each) 5 deg. of longitude and (each) 400 feet of altitude; later northward, eastward, and upwards in spring and early summer and the reverse in late summer and autumn.

The Ministry of Agriculture in connection with its Crop Weather Scheme has instituted precision records of selected crops and flowering plants. (See summary of following paper by Mr. Roebuck.) These should give a basis of correlation between the two series, incomparably more reliable than anything yet attempted.

In phenological work we possess a most valuable ally for transferring and applying from country to country discoveries of economic importance dependent on more intimate knowledge of growth stages. But this predicates much closer

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correlation in the methods in vogue in different countries. Neither the schedules nor the methods have much common basis, though each is excellent in its own field.

An attempt to make an advance has been made through three articles in "Nature." These have met with a gratifying response practically from all over Europe except France, and also from more distant countries. To the three known centres, Holland, Belgium, and Germany, nine more are now known, each with its networks of stations, some of long standing. More than ten schedules were available, upon which have been based a schedule of thirty-one plants, seven birds and five insects, with the hope that in each country at least ten to twenty would be suitable for inclusion in their respective schedules. If this is carried out, each centre working up its own results, then in some ten years' time we should be well placed for carrying out correlation on a basis vastly more satisfactory than is now possible. By then, also, we should be reaping the first fruits of the Ministry of Agriculture scheme.

"*The Value of Phenological Observations in Practical Agriculture*" (Mr. A. Roebuck).—Crops are at the mercy of the weather complex. Its effects determine the success or otherwise of a crop to a far greater extent than the sum total of the diverse operations performed by the cultivator. Since the effect of climate is so great it is all the more important that we should take fullest advantage of it by a proper arrangement of all farm operations. Soil conditions may operate at times in a contrary direction, for example, by preventing earlier access to the land; but with improving methods of tillage, and better and speedier implements, these difficulties may in time be overcome.

It is then most important to have plants at any time in the proper stage of growth to take fullest advantage of the weather. We are all aware of a sequence of seasonal changes in plants. We also know that the same physiological state (say flowering) takes place at different times of the year in different species. For example, the hazel has flowered and set fruit long before the petals of the dog rose appear. Throughout most of the year some striking phenomenon (leafing, flowering, fruiting, &c.), is taking place. Can we, then, utilise a number of such observations on established native species and correlate these with appearances on our crop plants so that we can get maximum results from year to year?

All our cultivated plants and, with few exceptions, our native plants show a pronounced yearly periodicity due to the alteration of a period of active growth in summer with a period of winter rest. The duration of the dormant period may be extended by severe weather or may be shortened by a mild winter. It also varies in different plants. After a prolonged winter, once activity has started, it proceeds more rapidly than after a mild winter. All the factors which compose climate help to bring about this annual periodicity by influencing the physiological qualities of the plants. No single factor is responsible. Even if the temperature in February be higher than in March, the growth in March would still be more energetic than that of February.

Side by side with this periodicity in plants we have periodical farm practices such as ploughing, rolling, harrowing, seeding, planting, harvesting. These also are arranged to take fullest possible advantages of soil conditions brought about by climate. Considering sowing, there is an early time before which it is unsafe to sow. Then there is a later time after which it is virtually useless, and somewhere between these two dates there is probably a time for maximum benefits. Hopkins has designated these as the early and late theoretical limiting times and the optimum time. The same applies to other farm operations.

Every cultivator from time immemorial has instinctively gauged the earliness or lateness of the season by the growth exhibited in our native plants. The efforts of phenological workers culminated in Hopkins enunciating his bioclimatic law in America in 1918 (see summary of paper above). It is specially interesting to note that Continental, American, and British workers have confirmed this law on quite different series of observations. While the bioclimatic law marks a very important step in the science, and while it is of great value for one or two operations on the farm, it is nevertheless much too limited in its application for our purpose. The law is for average conditions for approximately half a year, either the early season or the last season. The cultivator in England is concerned with much more detail. Take two places in different latitudes (altitudes or longitudes), there is a much bigger difference between their seasons in January and February than there is in March and April, which again is bigger than in May or June. In other words, there is a catching up as the season of optimum vegetative activity approaches. Arnell has shown that, going northwards from Schonen, for each degree of latitude, vegetative activity is later 4.3 days in April, 2.3 days in May, 1.5 day in June, and 0.5 day in July. In other words, because one place should sow oats a week later than another, it does not mean turnips should be sown a week later, but more likely two or three days. This emphasises the need for having the observations spread over a long period by means of several observations on the same plant and several selected plants.

The appearance of a certain physiological state in a plant is not sudden in the same sense as a rise in temperature, but is often dependent on the climatic conditions several months previously and how those conditions have continued since then. The dates of these periodical phenomena in plants are accurate indices of the bioclimatic conditions at any place, since they are in response to all the factors which constitute climate. The best indices of climate must, therefore, be the plants themselves, especially perennials. To a far less extent, insects and birds also may be of use as indices of climate.

It would be of supreme importance if we could with certainty be able to point out plants which would accurately gauge the state of the season so that we could say—when such a plant is in flower, oats should be sown; or, when another is in fruit, swedes should be sown, &c. During many years of observation the writer has noticed that oats sown when the purple plum (*Prunus pissardi*) commences to flower have yielded well and been free from fruit fly attack, the pest most feared by growers. The flowering of the elder (*Sambucus nigra*) has also coincided with seeding of swedes to obtain good crops. The best time for seeding of winter oats appears to be between the flowering of ivy (*Hedera helix*) and the ripening of holly berries (*Ilex aquifolium*).

The author has constructed curves of growth for oat varieties in 1925 and 1926 and also curves for emergence of fruit flies. Six inches is taken as the crtiical height for the oat plant; if it reaches this height when the flies appear it is not likely to be attacked. The curves have been compared with the date of flowering of purple plum and the conclusion is drawn that oats should be sown by this date.

With a view to testing the possibility of using index plants in practice, a scheme of observations has recently been formulated under the Ministry of Agriculture's Crop Weather Scheme. The idea is to place the plants in a garden surrounding, or side by side with, the plot containing the meteorological instruments. In all, twenty-four plants are to be used. They are perennial herbs and shrubs. Five observations are to be made on each species—namely, (1) date of first leafing; (2) date of flowering; (3) date when the fruit is ripe; (4) date of leaf colour change; (5) date when they are leafless. A study of the list of plants shows that, with the possible exception of December, there will be two or three striking phenomena showing each month of the year in one or other of these species. From these it should be possible to test the regularity of the series as a whole and the applicability of index plants to practical agriculture.

THE DIPPING OF LAMBS.

The results of New South Wales departmental experiments suggest that lambs for market may be dipped without ill effects provided ordinary care is taken.

Owing to the very wet weather during last winter (writes the Sheep and Wool Expert of the Department of Agriculture), ticks and lice have been very prevalent, and this has necessitated the quarantining of a number of holdings until the sheep have been dipped. As no records are available as to the effect of dipping lambs intended for market, in respect of either growth or appearance of the wool, it was decided to carry out an experiment at Bathurst Experiment Farm, and on 10th September eighteen average lambs were divided into three lots and weighed, after which one lot was dipped in an arsenical powder dip, a second in a carbolic fluid dip, and the third was kept as a check. No ticks or lice were present.

The lambs were again weighed on 21st October, and the wool was examined. It was found that the lambs were all in excellent condition without noticeable difference between the several lots. Very little difference was to be seen in the wool, except that in the case of the lot dipped with the carbolic fluid dip the wool appeared slightly brighter than that on the other lambs. The average weight of the lambs dipped in the arsenical dip had advanced from 68.3 lb. to 84.5 lb., those dipped in the carbolic fluid dip from 65 lb. to 89.3 lb., and the check lot from 59 lb. to 85 lb. The increases were therefore as follows:—Arsenical powder dip, 16.2 lb.; carbolic fluid dip, 24.3 lb.; check lot, 26 lb.

It will be seen that the lambs dipped in the arsenical dip did not make the same gains as the other two groups, but the increase of almost ½ lb. per day may be regarded as satisfactory.

The test is to be repeated next year to ascertain if the lower gain in the lot dipped in the arsenical mixture is due to the dip or to some other circumstance.

BEES IN DROUGHT TIME.

EFFECT ON THE ECONOMY OF THE HIVE.

It is not very often that serious drought conditions occur in the coastal area, with its high average rainfall, but this season there has been a prolonged stretch of dry weather, and, to make matters worse, in many cases serious bush fires have destroyed much of the flora. It is anticipated that very little surplus honey will be produced on the coast this season, and this, combined with the off season inland, will show a low average production over the State generally. The market, which has been in a glutted condition during the past few seasons (writes the Senior Apiary Instructor of the New South Wales Department of Agriculture), will no doubt be relieved during the coming winter.

There are interesting aspects of the economic conditions found in the hive during drought periods. As the adverse weather begins to have effect on the flora, and consequently the food supplies of the bees, the brood-rearing is gradually reduced to effect economy in the stored food. Further economy is effected by the worker bees destroying the drones. The whole working force will reserve its vitality by rsting as much as possible and very little useless searching in the fields for supplies is evident. The colonies eventually arrive at the stage where a minimum amount of brood-rearing to keep up the population is carried on, the smallest quantity of stores being consumed, and as full as possible a reserve of vitality (which means lengthened life) is effected. Even where there is an ample store of food in the hive we generally find that the economic conditions are noticeable, and they are intensified where there is a shortage of stores, in which case, if the apiarist does not attend to it, a complete cutting out of brood-rearing may occur.

At Wauchope Government Apiary it has been necessary to keep a close watch on the colonies; in some cases the bees were found to be practising economy to too great an extent, and a little stimulating feed was given to induce sufficient brood-rearing to keep up the population. It is not a wise plan to overdo the stimulation, especially where pollen is on the scarce side. Efforts were directed toward holding the colonies until a change in the weather and good rains allowed some improvement in the conditions.

BREAD MAKING.

MARGARET A. WYLIE, Inspectress and Organiser Domestic Science, Education Department, Western Australia.*

The science of bread making involves some knowledge of both Chemistry and Physics. A complete study of this art, therefore, necessitates familiarity with some of the fundamental principles of these sciences. Though bread has been made for countless ages, and has been the staple food of man, its successful making has been really the result of knowledge gained empirically. Modern hygiene has, however, demanded a more definite basis to justify its continuance as the main part of human diet.

Flour.—Of all cereals, wheat yields the best flour for bread. This is due to the fact that it is the only grain which contains the constituent gluten in the proper proportion and of the desired quality essential for turning out light, spongy bread. Flour also contains a large proportion of starch. The following is a simple test of their presence:—A cupful of white flour in a muslin bag, if saturated with water and pressed, leaves a yellowish, tough, elastic substance in the bag, somewhat the size of a walnut. This is the gluten, the starch having been expelled. This experiment gives a rough estimate of the proportion of gluten to starch in a standard flour.

White flours are classified differently in different countries. There is the millers' classification, the classification for commercial convenience in buying and selling, but the housewives' classification is from a very different standpoint, and should be as follows:—

1. Strong or old flour.
2. New flour.
3. Fine flour.
4. Weak or feeble bodied flour.

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*In the "Journal of Agriculture," Western Australia, for December, 1926.

The first is of a deep, creamy colour, the kind that tumbles in a fluffy light manner out of a bag. If examined with a microscope, its gluten cell walls will be found to be very strong, having power to hold the gases that are formed by the action of yeast. Old flour is dry, and will absorb a large proportion of water.

The second type is whiter than the above and on account of its inherent dampness absorbs less water. It may be noticed that some flours retain their shape when pressed, an invariable sign that the flour is new.

The third, fine flour, is soft and elastic, not spongy and puffy, and producing a smaller loaf to the same proportion of flour. Its gluten is usually plentiful, its flavour in general being fine and "nutty."

Weak or feeble bodied is deficient in gluten, and hence in the capacity to retain the gases produced by the action of the yeast, as well in the power of absorbing moisture.

Strong flours therefore are most suitable for bread, fine flours for Christmas cakes, short pastes and short bread.

Yeast.—The article on jam making showed that various moulds and bacteria were the cause of decomposition and putrefaction of foods, and how the spores of moulds float about in the air. It must be remembered, however, that as well as harmful organisms, the air around furnishes useful bacteria. Wine, vinegar, and cheese are the result of these bacteria, properly employed.

Yeast also enters this category. It is a minute plant of the "fungi" family, so small that one million would cover only one cubic inch. Warmth and moisture speed its growth, its food being the sugar formed from starch. It thrives best at 78 deg. F. Its chief power is that of changing starch to sugar, and then converting the sugar into alcohol and carbonic acid gas. Provided the right food and conditions are given it, yeast propagates rapidly, at the rate of one million an hour.

The gas generated by the action of the yeast is all important in bread making, for it is that which causes the sponge to rise, striving as it does to escape from its imprisonment in the gluten cells. It is possible to classify yeasts thus:—

(*a*) Liquid yeast.

(*b*) Distillers' yeast.

(*c*) German or compressed yeast.

(*d*) Dried yeast.

(*e*) A semi-dried form called putty yeast.

Liquid yeast is cultivated from a mixture of potatoes, sugar, water and hops.

Distillers' or brewers' yeast is a natural type, skimmed from fermented rye.

German or compressed yeast is bought in cakes, chiefly in England or the Continent of Europe. Unfortunately this often spoils in transit through the tropics.

The dried variety is made from hops and potatoes, mixed with starch and pressed into cakes.

The last type is built up in layers of semi-dried yeast.

Hops.—Hops act as an antiseptic, i.e., they help to destroy the power of certain bacteria and prevent thus the propagation of wild yeast. Consequently it is advisable to use yeast made from hops, as the use of poor potatoes and impure materials produces wild yeasts which spoil bread. As well as this negative use, hops improve the flavour of the bread.

To ensure really successful bread the making of yeast should be attended with every care and cleanliness. An old bottle (used before) can be used, but the corks and fittings must be perfectly clean, as the entry of foreign germs tends to spoil the value of the true yeast and start different cultures.

Preparation of Yeast.

Hop Yeast.—1 large potato, 1 pint water, 1 tablespoon sugar, 1 tablespoon flour, 1 teaspoon hops.

Method.—1. Boil potato, add hops while still boiling. Boil 20 minutes.

2. Strain, cool slightly, add flour and sugar.

3. Bottle and cork tightly.

4. The yeast should work in a few hours in a bottle previously used for yeast, 24 hours in a new bottle.

5. A fig or a raisin added will make it work more quickly.

Acid Yeast.—A medium sized potato, 1½ tablespoons sugar, ½ teaspoon citric or tartaric acid, 1 cup warm water, 2 teaspoons flour.

Method.—1. Boil and mash potato, add other ingredients and sufficient water to keep mixture at cupful.

2. Bottle and cork tightly.

3. Keep in a warm place 12 hours in an old yeast bottle and 24 hours (at least) in a new bottle.

WHITE BREAD.

Small quantity.—1½ lb. flour, ¾ pint tepid water, 2 tablespoons home-made or 1 level tablespoon brewer's yeast, 2 teaspoons sugar, 1 teaspoon salt.

Method.—1. Sift and warm 1 lb. flour, make a well in the centre.

2. Beat yeast and sugar to a cream.

3. Pour yeast and tepid water into flour and stir to a moist dough. Beat well.

4. Cover and stand in a warm place till the dough doubles its size. (Brewer's yeast takes about 1 hour and home-made several hours).

5. Turn to a floured board and knead in the extra ½ lb. flour and salt until the dough is of even texture.

6. Shape into loaves, put into greased and floured tins.

7. Allow to rise in a warm place about half an hour.

8. Cook in a hot oven until the loaf is well risen and brown, then place in a cooler part until the bread is cooked through—30 to 40 minutes in all.

9. When cooked the bread should give a hollow sound when tapped on the bottom.

WHEATEN MEAL BREAD.

1½ lb. whole meal or half wholemeal and half plain flour, 1 tablespoon yeast, 1 teaspoon salt, ¾ pint tepid water, 1 teaspoon sugar.

Method.—Proceed as for white bread, but more moisture, a hotter oven, and longer cooking is required.

The actual baking of bread is perhaps the most important part. With the utmost care in choosing flour, making yeast, and carrying out the correct procedure for mixing, if the oven is not at the right temperature the bread may be spoilt. The scientific baking of bread is to fix the air cells as quickly as possible by means of the hot oven. A novice would do well to test the oven thus:—Place a tablespoon of flour on a saucer for five minutes in the oven. If the oven is—

(*a*) Hot—the flour becomes dark brown.

(*b*) Moderate—the flour becomes a golden brown.

(*c*) Cool—the flour becomes pale brown.

The yeast will go on working or growing in the flour if the oven is too cool, still splitting up the starch and more alcohol is formed, which cannot escape. The bread has then a "beery" taste. If, on the other hand, the oven is too hot and the loaf begins to brown in less than 15 minutes, a crust is formed and the inside of the loaf remains damp and uncooked.

Abnormal Fermentations.—The normal fermentation in bread making is due to the energy of the yeast plant growing and multiplying in the dough, giving off CO_2 and producing changes which result in making bread palatable and digestible. Other fermentations, however, sometimes occur.

Sticky or sour bread is due to lactic acid bacteria. These are associated with low-grade flour. The germs of these bacteria often lie dormant until essentials, such as warmth and moisture, necessary to their growth, are provided, and they then develop. Injurious germs also appear with yeast. This is sometimes overcome by the use of hops, which assists true yeast to overpower poor yeast. Dirty utensils and troughs harbour injurious bacteria. All crevices and cracks are teeming with unseen life, which reproduce enormously when given favourable conditions.

Musty or mouldy bread is usually noticed only after bread has been cut. This is due to damp flour in which fungi or mould has developed. Bags, containers, &c., holding this flour should be thoroughly scalded and scoured before being used for a fresh supply.

The same procedure should be carried out if bread is what is termed "ropy," or when tiny red marks appear. These, too, are the effects of wild yeasts, which have found their way into the dough.

POWER ALCOHOL PRODUCTION.

THE CASSAVA PLANTATION AT MACKAY.

Subjoined is a precis of a report from Mr. G. B. Brooks, Instructor in Agriculture, to the Under Secretary, Department of Agriculture and Stock, Mr. E. Graham, on the present position of the Cassava Experiments at Plane Creek, Mackay:—

There are two trial areas, one at Koumala, the other at Sarina, representing the southern and northern portions of the district.

The Koumala Plot.

The Koumala plot is located on the farm of the Salter Estate Company. Operations at this centre were commenced from the date of the arrival of the first consignment of Cassava from Java. Owing to the lateness of the season and the fact that the varieties came to hand at different periods, it was not possible to carry out comparative tests. The objective was to get all the Cassava varieties, arrowroot, sweet potatoes, established on the farm in readiness to be planted out for the 1926-1927 trials, when conditions were favourable.

All the crop varieties made good growth, with the exception of the sweet potatoes, which were destroyed by bandicoots.

Conditions were exceptionally dry during the winter and spring months. Fortunately rain fell early in October, which permitted the working up of the land and the planting on 14th October of the various crops.

The following is a list of the crops under trial:—

Eleven named Cassava varieties from Plant Breeding Station, Java.

Seven unnamed Cassava varieties from Java.

One variety Queensland arrowroot.

Five varieties saccharine sorghums.

One variety grain sorghum.

An excellent germination of the Cassava was secured, while subsequent growth has been most satisfactory. The other crops are also doing well.

At the time of the arrival of the Cassava from Java there was difficulty in obtaining an area of land suitable for experimental purposes, as representing the northern portion of the district.

The Sarina Plot.

Arrangements were, however, made with Mr. P. C. Brooks, Sarina, to plant out the Cassava and other crops for the 1926-27 trials. A site was subsequently secured on the farm of Mr. C. Edmunds, Upper Plane Creek, and adjacent to the main road, Sarina-Nebo.

This new area was planted during the second week in October, the material being procured from the original plot on the farm of Mr. P. C. Brooks.

The crop varieties are identical with those under trial at Koumala.

The Cassava is coming on exceptionally well. Mr. V. Board, director, International Power Alcohol Company, informed me that he inspected the plot during the very dry conditions prevailing in November, and that it was the only green patch in the district.

In conversation with farmers throughout the distrct, the general opinion expressed is that as a drought-resistant crop, Cassava stands alone. In fact, the luxuriant growth made on many farms, even under drought conditions, has given rise to a feeling that the harvesting of the tubers and getting rid of the heavy top will be a somewhat laborious and costly operation. The usual practice is to plant Cassava very shallow in the soil, so that in harvesting the plants can be pulled up by hand. Unfortunately, when the Cassava arrived from Java, conditions were so dry that deep planting had to be resorted to in order that the cuttings would get the benefit of any bottom soil moisture. The continued drought also had a tendency to draw the root down, so that lifting the tubers out by hand will not be practicable. Until such time as a special implement has been devised to perform this work, the harvesting of the crop is likely to be the most serious drawback to its adoption as a rotation crop with cane.

Reliable data in regard to cost of production will, however, not be available until the crop has been planted and harvested under normal conditions.

Although fresh areas have recently been planted out, many of the farmers are delaying operations until the crop is harvested, when the tops can be utilised for propagation purposes.

Quite a number have expressed themselves as being very favourably impressed with the possibilities of arrowroot as a crop for the production of power alcohol, as it gives promise of being more easily handled.

Much research work has yet to be carried out before the growing of starch-producing crops becomes a settled practice.

Points for Investigation.

Some of the more important points in regard to such crops that require investigation are:—

1. Cost of production.
2. Suitability as a rotation crop with sugar-cane.
3. Their effect on the soil leading to increased or decreased cane production.
4. Their effect in minimising losses in cane through pests and diseases.
5. Their bearing upon the price of cane through a reduction in the area under crop.
6. Their usefulness in freeing the land of weeds, nut-grass, &c.

The assistance given by the Department of Agriculture by the introduction of Cassava and other starch-producing crops to the district, together with the carrying out of comparative trials in order to determine those most suitable for the production of power alcohol, should be of very great value in putting the industry on a sound foundation.

It is expected that the factory will be completed early in March.

FOREST COMMERCE.

By E. H. F. SWAIN, Chairman of the Provisional Forest Board.*

The issue which I have been called upon to place before you is that of the commerce of the forests. It is an issue not unknown to you in your ordinary avocations because upon the products of the trees depends very largely indeed the lives you lead. Whether sunk in the wooden armchair of ease or smiting a 300-yard drive over seven bunkers and three waterjumps the result depends upon wood. Your industries, your commerce, your professions, and your amusements subsist upon trees. At your office tables and chairs, at this festive board, in your correspondence by post or telegraph, in your transport by boat, by train or by automobile, in your golf and your cricket, in your beer and your newspaper, the forests support or console you, as they console also the baby of the house when the rubber tree provides the dummy with which alone he may be solaced.

And so it has been throughout history. Without forests there scarcely could have been a history at all. The wooden arrow of the invader would not have pierced the eyeball of the Saxon Harold, and the Viking coracles would not have turned the pages of history upon the seas of England. The timbers of the ship that carried Columbus formed the cradle of the United States of America, and the trees that made the "Endeavour" made the Commonwealth of Australia.

To-day the forest has its triumphs in the wooden printed sheets which carry the news of the world, and the thoughts of men, and counter-attacking the rural interests which have decimated it in the past, it invades the commercial sphere with silk and wool manufactured by the direct route from the tree instead of via the silkworm and the sheep.

Since the Druids practised their mystic rites among the oak groves of Britain, and the Shinto priests of Japan practised silviculture some thousands of years B.C. in the vicinity of their temples, and since the Brahmins appointed their Masters of the Forests, and placed them in charge of "the huntsmen who cleared the land of wild beasts and of fowls which devoured the seeds," the practice of forestry has acquired a material trend, so that to-day it concerns itself with the unromantic factory production of wood upon a mathematically calculated scale.

The first really practical organisation recorded in history appears to be that of the King Solomon-King Hiram co-partnership on the mountains of Lebanon, in

*In a public address at Brisbane.

Syria, where at an elevation of over four thousand feet, among a succession of the hardest limestone crests and ridges, bristling with bare rock and crag and divided by grassy ravines, among purple rhododendrons, geraniums, violets, and buttercups, goodly cedars of Lebanon grew in scattered groves of gnarled and branchy trees 50 to 80 feet in height, with numerous large horizontal branches; trees which would be despised by an Australian bushman, yet trees made glorious by the scriptural facts as "the excellent cedar, high and lifted up, its top among the thick boughs, its multiplied boughs, its long branches, and its shadowing shroud."

The Mount Lebanon forest in the time of Solomon and Hiram was a timber reserve. In the year 332 B.C. King Alexander the Great made forest history by declaring it to be the first State Forest, and to-day the Mount Lebanon State Forest still survives with a hundred or so cedars yet remaining, where the Maronites and the Druses now hold sway and do battle against the Frank invader.

The Solomon-Hiram transactions were purely business transactions in timber. The only difference between the transactions of then and of now is that the poesy of yesterday has vanished, and the hard commercial diction of 1926 takes the place of the graces and the loving kindnesses of the business correspondence of B.C. king.

Solomon, as you will remember, "had wisdom and understanding exceeding much, and largeness of heart even as the sand that is on the sea shore. He spake three thousand proverbs and his songs were a thousand and fine. He spake of trees, from the cedar tree that is in Lebanon even unto the hyssop that springeth out of the wall."

He conceived the idea of building a temple. Even temples depend upon forests for their building, and Solomon dictated a business letter of which the following is an exact modern rendering:—

"Dear Sir,—

"As you are doubtless aware my late lamented father, David, had in mind the erection of a temple, but owing to the long continuance of war the proposal had to be indefinitely deferred. It is my intention to proceed with this undertaking forthwith. In connection therewith I should be glad if you would be good enough to undertake the supply of material for which your firm has a well deserved reputation. I am prepared to finance the proposition throughout.

"Yours faithfully,

"SOLOMON."

The reply of King Hiram in the cause was equally businesslike—

"Dear Sir,—

"I am receipt of your letter of recent date and beg to advise you that I am prepared to undertake the contract for the supply of cedar and fir from Mount Lebanon reserve, delivered c.i.f. and e. Joppa. My terms are cost plus a percentage. The basic wage to be paid my employees, consisting of measures of beaten wheat and baths of oil and wine as set out hereunder.

"Yours faithfully,

"HIRAM."

For his purposes, Solomon rounded up all the strangers in Israel, 3,000 of them, and put them on shifts, one month at Lebanon and one at home. In addition, Hiram had 70,000 carriers and 80,000 hewers, under 3,000 gangers appointed by Solomon. In the high-faluting and most alluring phraseology of the day Hiram then declared "with the multitude of my chariots I am come up to the top of the mountains to the heights of Lebanon and I will cut down the cedar trees thereof and the fir trees thereof."

The first materials were assembled after four years' work, the foundations were laid and the building was completed in seven years. It measured about 90 feet by 30 feet and was 45 feet high; and were the measures of beaten wheat and baths of oil and wine transposed into the Arbitration Court basic wage of the day, the cost to the country of King Solomon's temple was well over £250,000,000. After the temple was completed he built a house for himself, which took thirteen years to complete, and he then paid Hiram a bonus on the job consisting of twenty cities in Galilee.

I have cited this historic example of the first really commercial forest organisation because it closely approximates to the forest organisation extant in Queensland to-day. Solomon was not merely an exploiter of State Forests, a logger and a sawmiller, and builder, but he was also a forester. Not only did he make silver to be in Jerusalem as stones, but, best of all, "he made cedars to be as sycamores in the vale for abundance."

The parallel between the Solomonian organisation and that of the Queensland Forest Service is thus rendered complete. True it is that we cannot round up all the strangers of Israel to do the work of forestry, but on the other hand, our standards of efficiency are at least as high as those of King Solomon. I am perfectly satisfied that the Queensland Forest Service could do the work of Hiram and Company and also build the 90 feet by 30 feet temple for £250,000,000.

Our broad-axemen are, I am sure, as skilled at timber hewing as were the Sidonians; our State sawmills excel in glory and profit the results achieved by Hiram and Solomon; our range of logging operations is much more extensive than that of this historic example, and before the glories of the forests of Queensland, the glories of Lebanon pale with insignificance. Only in the poetry of the times do we fail, and I commend to the business and professional men of the Constitutional Club the greater excellence of the business diction of those glorious days.

The Queensland Forest Service conception is as that of Solomon to "make the cedars to be as sycamores in the vale for abundance." The need for wood is no less now than it has been throughout history. Indeed it is greater, for the 22,000 newspapers of North America, and the many thousands of publications elsewhere issuing in the world, swallow up daily forests at a gulp. Wood silk and wood wool are invading the textile spheres, and the sugar farms of Queensland may yet shiver at the sight of a sawdust heap. The world at large uses each year about 700 billion superficial feet of wood, of which half is for firewood. The per capita consumption is about 400 superficial feet per annum, of which 200 feet is firewood and 200 feet sawn timber. Of that 200 feet of sawn timber per capita per annum about 100 feet is hardwood and 100 feet is softwood. The Queensland consumption about equals the world's average and this then is the basis of our calculations of Queensland's yearly need in wood. One hundred feet of sawn softwood and one hundred feet of sawn hardwood each year for each unit of the population—this is the ration to be provided to the community by the Queensland Forest Service. The total requirements are easy to calculate for our population numbers 800,000, and it is multiplying at the rate of $2\frac{1}{3}$ per cent. per annum, so that in sixty years the population of Queensland will be around 3,000,000 souls, and their timber demands will be at that time 300,000,000 superficial feet of sawn softwood and 300,000,000 superficial feet of sawn hardwood each year.

It is quite a simple sum easily checked. But the position is that the 4,000,000 acres of State Forests and timber reserves which we now hold are supplying only 50,000,000 superficial feet of sawn softwood per annum, and in thirty years will be providing only 10,000,000 superficial feet because they are being cut at a greater rate than they growing. During the period 1925-1955 we shall be short of normal requirements for our population to the extent of 2,700,000,000 superficial feet of sawn softwood, and this we shall have to import at cost of about £40,000,000, which will go to America and Scandinavia. This cannot be helped and could only have been avoided if we had started wholesale planting 'way back in 1676. Could we rely upon imports for the future then the idea of reforestation in Queensland might be dismissed; but the situation is that the world at large is nearing a softwood famine, and the responsibility lies upon us of rendering ourselves self-sufficient in the matter of wood.

The job before us is to grow crops of timber, which, maturing sixty years hence, will supply at least 300,000,000 superficial feet of sawn softwood each. Carrying the calculation further we must determine the rates of wood growth per acre in order to determine the acreage now to be put down. There are now extant in response to the approach of forest shortages a number of private forestry companies operating largely in New Zealand, and these companies have issued prospectuses in which are set forth statistics and figures of forest growth, a study of which proves interesting. One such company undertakes to plant 680 trees per acre, and calculates that 500 will reach maturity in twenty years with a tree content of 500 feet each; that is 250,000 superficial feet per acre of log timber, or reduced to sawn timber allowing 25 per cent. waste in sawing, say, 187,500 superficial feet of sawn product in twenty years, or 562,500 superficial feet in sixty years. Dividing this acreage result into our need of 300,000,000 superficial feet we find that 530 such acres would furnish our wants, so that if we lay down 530 acres of plantations each year our provision would be ample. That indeed was the acreage of plantation laid down by the Queensland Forest Service last year in this State. We are, however, not satisfied with this accomplishment because we are not as successful in our estimates as private enterprise appears to be. Our calculations suggest that planting 680 trees per acre, as do the private forestation companies, we may expect each acre to put on wood at the rate of 1,000 feet per annum, which is perfectly satisfactory to us. In such case, there would be 60,000 superficial feet on each acre at the end of sixty years, and 5,000 such acres would supply our requirements. We believe that 5,000 acres per annum of new plantation is much nearer the mark than the 535-acre proposal of the private prospectuses, and this figure we have accepted as the basis of our planting plans. That makes our 1926 provision perfectly inadequate. Next year, however, we expect to lay down 1,000 acres, and thereafter to increase as fast as possible until we attain the 5,000 acre—our minimum objective.

There is no reason why private enterprise should not compete with State Forestry Departments in providing the wood timber stocks and woods heaps of the nation. But history establishes that forest efforts to be profitable must be on a large scale, that the soils and species must be suitable, and most important of all that the plantations should be located as near as possible to the consuming of the big cities. That lesson was conveyed to the afforestation companies which, in California in 1910, sold acre shares to the public to establish the fast-growing eucalyptus forests, which in America had a fame similar to the fame enjoyed in Australia by the Californian *Pinus insignis*. When the eucalyptus forests were ripe for cutting, their locations were found to be such that costs exceeded the realisation values of their products.

State enterprise in forestry has undoubted advantage over private forestry in Queensland in its possession of lands, and in its ability to get cheap money undiminished by commission brokerage and advertising costs. Moreover, it is more conservative and therefore safer, and is not likely to wilfully overproduce. Finally, there is no reason why Nature should adopt the Government stroke to go slower for State enterprise than for private enterprise. For these reasons I believe that forestry will remain an especial field for Governmental rather than for private effort, and it is significant that in older countries where private forestry is largely practised that private forests are beginning to fall back into Governmental hands.

Believing, therefore, that it its special function and responsibility to provide for and to safeguard the community's timber supply, the Queensland Forest Service proposes to proceed with its programme of logging and harvesting and marketing and milling the old wood crops, and by applied silviculture to renew the forests of Queensland on such a scale that future generations may be assured of a renewal of the forest bounties, which the past generation has so carelessly wasted and despoiled, so that "Instead of the thorn shall come up the fir tree, and instead of the briar shall come up the myrtle tree." "The glory of Lebanon shall come unto thee. I will get in the desert the fir tree, the pine tree, and the box tree together. I will plant in the wilderness the cedar, the shittah tree, the myrtle and the oil tree," and in Queensland the cedars shall be made to be as the sycamores in the vale for abundance.

CONSERVED FODDER—ITS REAL MONEY VALUE.

Dicussing pasture improvement at a recent gathering of farmers, Mr. H. K. Nock, of Neulungaloo, New South Wales, pointed out that, having by this means increased his carrying capacity and the number of his stock, the farmer increased proportionately his risk in relation to drought. Hence, an essential companion of pasture improvement was fodder conservation. In this connection the speaker made a very significant point.

"Few people appreciate the real monetary value of the security," said Mr. Nock. "They say: 'Five years ago I put £100 cash into the production and erection of that stack. I have paid £10 insurance on it. Look at it now. If I sold it I wouldn't get back £20.' Stock have broken through the fence, hurricanes and wet and mice have all done their damage, and the owner thinks he has lost £80, but in reality he has probably made £300 or £400 through the possession of that stack. Each of these five years he has been game to stock to the carrying capacity of his holding because he knew he was safe. One hundred extra ewes would return him the full cost of the stack in one year; instead of wasting part of his grass he has used it, and has not lost sleep with each temporary dry spell.

"It is not necessary for a man either to use or sell his stack to get his money back."

CONTAGIOUS MAMMITIS.

THE SIGNIFICANCE OF VACCINES.

Considerable publicity is being given to this disease at present, and active steps are being taken in the way of vaccinating animals against it. In view of this activity, writes the Chief Veterinary Surgeon of the New South Wales Department of Agriculture, it is considered desirable to place certain facts before farmers on which they may base a decision as to their future action.

In the first place, it is necessary to understand that at least four different kinds of contagious mammitis exist in this State, and that the various vaccines on the market, according to the descriptions of the makers, all deal with the same type—that is, the streptococcic type. Such a vaccine will have no power at all to protect against other types, and unless the farmer realises this he may unjustly blame the vaccine for a failure to protect his herd. For this reason, the farmer is recommended to employ his own veterinary surgeon in vaccinating the cattle, and the veterinary surgeon should make absolutely sure of his diagnosis before he involves the farmer in the expense of vaccinating.

It is not known how great is the protective power of these vaccines, nor for how long cattle can be protected by them, and farmers should be cautious in accepting statements made in this connection.

The question whether the vaccines can cure cases of mammitis is debatable, but it is quite certain that where serious changes have taken place in the tissues composing the udder, little (if any) improvement can be expected.

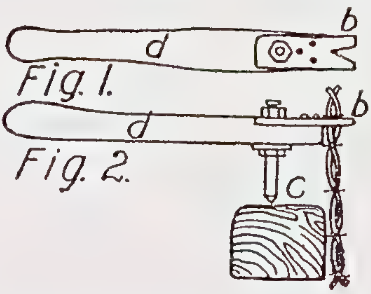
Again, it must be remembered that the vaccines deal with only one type, and if tried on cases of other types the farmer will be wasting his money.

As it is understood that statements are being made to the effect that the Government departments are endeavouring to get hold of certain proprietary vaccines, it seems desirable to point out that before the war the Department of Agriculture carried out extensive work with an anti-streptococcic vaccine with very promising results, but that owing to pressure of other circumstances, the work was dropped during the war period. During the last few years the Commonwealth serum laboratories have been turning out a vaccine which has yielded promising results when carefully used on suitable herds under the supervision of departmental officers and of veterinary surgeons generally.

It appears that attempts are being made to establish a scare through the dairying districts regarding the likelihood of children's affections of the ears and so on being due to the milk of cows affected with contagious mammitis, all apparently based on one instance in which a medical man concluded that the streptococcus he obtained from the abscess of the ear was the same as that obtained from the udders of cows; but no conclusive work on this point has appeared, and in view of the world-wide prevalence of streptococcic mammitis among cows, it would be remarkable if such a fact had not been brought forcibly to light.

A BARBED WIRE STRETCHER.

Figs. 1 and 2 show a wire stretcher that will do good work. Part d is a bar of tough wood. One end is shaped as a handle; to the other end is riveted the small metal plate, b, with a claw like a hammer. A few inches back a half-inch hole is



bored in d and fitted with a short piece of threaded iron rod, c, clamped in place by two nuts and washers. The long end of the rod is filed to a point. The stretcher is used as shown in Fig. 2, fitting the claw just back of a barb on the wire.—"Australasian."

HOW TO MAKE A ROPE PIG-NET.

EASILY CONTRIVED BY THE HANDY MAN.

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

In the transport of pigs to rail, sale, show, or market, per wagon, truck, cart, or other open conveyance, some form of net or cover is required to prevent the pigs escaping and to protect them from injury or mishap. The rope pig-net illustrated and described in this article is the type usually recommended for the purpose, for it has the advantage of being simple in structure, easily contrived by the handy man, and is inexpensive, withal durable and convenient.

It is worthy of mention, however, that it is not a sunshade and will not protect the pigs from the blistering effects of the sun when they are exposed to its direct rays as they frequently are when removed from cool protected sties and placed in the cart or wagon for transport by road to the township or trucking station. This suggests the necessity of providing some form of shade or protection, even if it is only a few green bushes or a wet bag or two.

It is important that bacon pigs en route to the factories, and store or pork pigs en route to sales, &c., should be thus protected in order that they will arrive at destination in good order and condition, and, in the case of the bacon factory, free from sunburn or sunscald or other ill effect.

The method of procedure in the making of a pig-net such as is illustrated herewith is extremely simple, and should be readily understood by all concerned. The illustration is by courtesy of "The Weekly Times and The Farmer Settler." The materials required are rope and a length of softwood or hardwood board rounded at the edges and 12 to 18 inches long and of the same width at both ends. This piece of board is referred to by net makers as the mesh stick, its principal use being to keep all the meshes the same size. In actual use a mesh stick 2 inches wide will make a 4-inch mesh; a 3-inch stick a 6-inch mesh, &c. The objective is to have the stick half the width of the mesh it is intended the net shall carry.

In measuring the meshes it is necessary to draw them out to a diamond shape. The 4-inch mesh is preferable for bacon or pork pigs, a smaller mesh for suckers and weaners. Where fishermen set out to fashion a fishing net they use a long needle and the cord is held on a reel or short length of timber, but in the case of a pig-net the rope had better first be rolled up in the same way as the ordinary rope clothes-line or sash cord is when purchased; it will then be a simple matter to pass the hank of rope through the loops when making the knots at the corner of each mesh, for the knotting is rapidly performed by an experienced worker.

The Method to Follow.

In setting out to make the net, first tie a loop in one end of the rope as in A, Figure 1. Place this knot on a strong spike or hook attached to a post or wall or some other convenient place as at A in Figure 2. Now place the mesh stick under the loop as at B, put the rope around the mesh stick, then pass the rope through the loop and pull rope tight, proceeding to place the thumb of the left hand on the rope beyond the loop as at A in Figure 3, and with a turn of the wrist of the right hand throw the rope to the position shown at B. Next pass the rope behind the loop C, and then through the bight of B and down as at D; draw knot tight, which should now assume the shape indicated in Figure 4. This figure shows the knot made loosely to enable the method of making it to be clearly seen and readily understood. The rope must be held firmly with the thumb at A, Figure 3, when pulling up the knot, as on this depends the uniformity of the shape and size of mesh.

To continue the netting, the stick is withdrawn and placed under A, Figure 4. The rope is then passed around the stick as in Figure 2 and brought through the loop A, Figure 4, and the process shown in Figure 3 is repeated to form another mesh, this being continued to make a chain of meshes, say, the width of the conveyance to be used when transporting the pigs to rail or sale. The loop A, Figures 1, 2, and 5, first tied is then untied and it will be found that all the meshes are equal in size. Next, the chain of meshes is opened out at right angles to the line in which it was made, as shown in Figure 6; in other words, remove the chain of meshes from a vertical position as in Figure 5 and place them in a horizontal position as in Figure 6. A line is run through the meshes D. E. F. G. and secured between two posts to hold the net while continuing the meshing. Working across is then begun by making a mesh at A, Figure 6, then at B, C, and so on until the length of the first lot of meshes has been reached, when the right-hand side of the net is turned around and placed where the left-hand side was and the left-hand side placed where the right-hand side was. Another row of meshes is started on the left-hand side (facing the net) and worked until the one under A has been reached on the right-hand side.

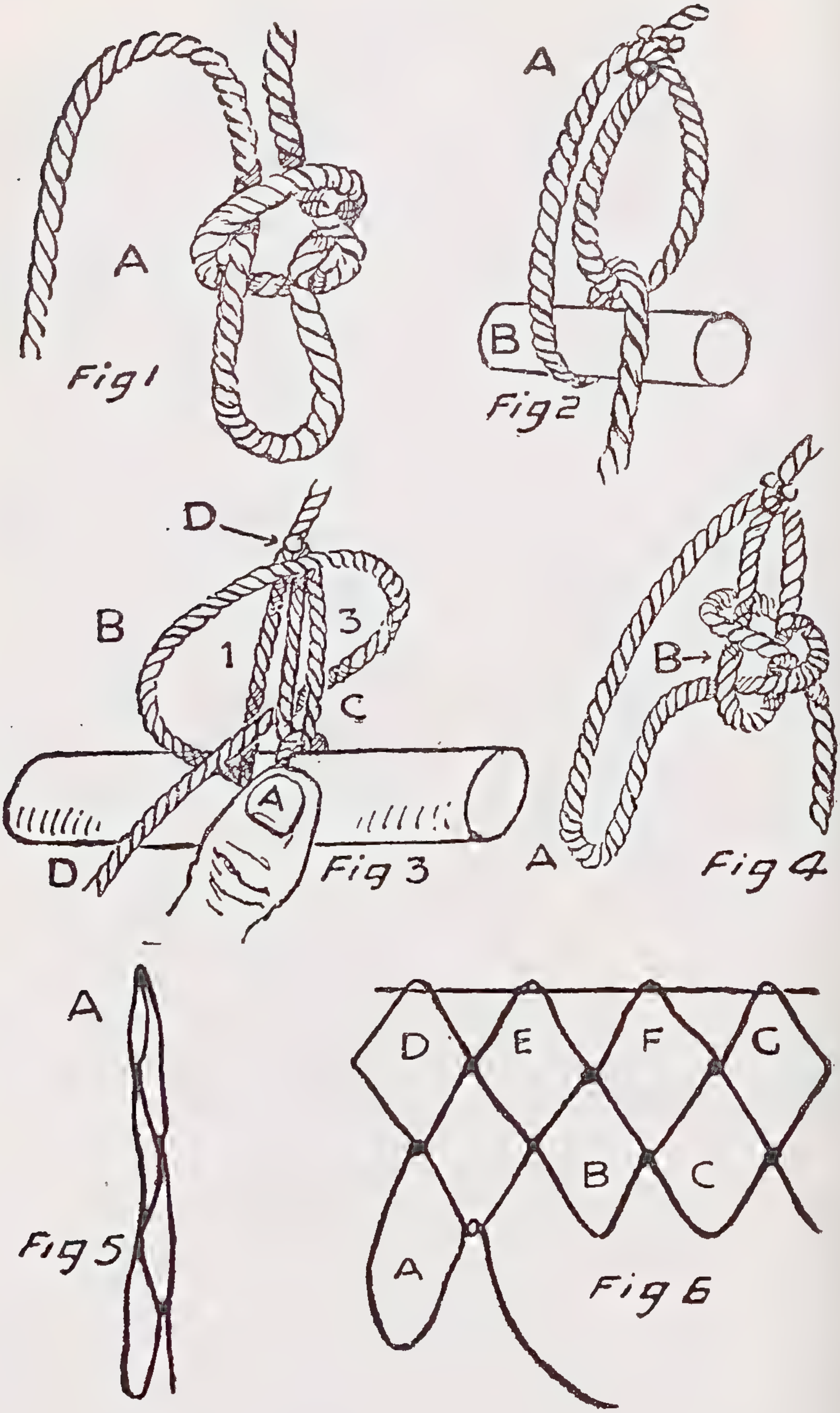


PLATE 52.

The net is turned again, and another row of meshes commenced on the left-hand side, and so on until there are enough rows of meshes to cover the vehicle. To secure the net to the vehicle use rope plough lines, and reeve them through each mesh and around the side and end rails of the body of cart. The method described herein of making the meshes is the same as is used in making ordinary hammocks.

Rope pig-nets may be purchased at most country stores, or if not on hand could readily be ordered, but it is neither an expensive or difficult task working one up, and from the instructions given above and illustrated any handy person should be able to complete the job. If wet bags are being used as a cover when the pigs are loaded, tie the bags to the net at each corner of bag; this will save inconvenience and loss, and will be more satisfactory.

It is preferable that the net and bags should be at least twelve inches above the backs of the pigs, otherwise the net is inclined to rub and injure the flesh and blister the skin. Every possible care and attention should be given to see that this does not happen, hence it is desirable that the net be made six or more inches wider than the vehicle on which it is to be used.

In loading secure the net on both sides and in front, first leaving a good length of plough rein free to tie the net to rail of tailboard when pigs are loaded and vehicle is free from loading race.

Plate 53.—Feeding the Orphan Pigs.

Percy V. Campbell, the well known Duroc-Jersey pig breeder of Lawn Hill, Lamington, Q., is fortunate in having an enthusiastic partner in his wife, who is intent in doing her share of the daily round of farm life. She loves the pigs and is here seen tending some of her pets and seeing to the needs of their rapidly developing bodies. Care and attention to every detail of management counts much for success in the pig-raising industry.

PLATE 54.—PART OF THE CONSIGNMENT OF 200 PEDIGREE LARGE WHITE PIGS PURCHASED BY THE RUSSIAN GOVERNMENT FROM MEMBERS OF THE NATIONAL PIG BREEDERS' ASSOCIATION OF ENGLAND A YEAR OR TWO AGO. THEY WERE SHIPPED FROM LONDON TO LENINGRAD PER THE S.S. "LOOS."

Very high prices were paid for the pigs, one 18-months old boar realising £250 and another £150. This photograph emphasises the importance of providing suitable crates in which to transport stud pigs whether by sea or rail. The crates are subject to rough handling even on railway journeys, hence need to be constructed of strong material, yet not heavy or too bulky. Details of suitable material, method of construction and sizes, are available on application to the Department of Agriculture and Stock, Brisbane.

THE GLOUCESTER OLD SPOT BREED OF PIG.

THE G.O.S.

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

That the interest created in the breeding of a better type of pig is being well sustained and that the slogan "Better Pigs on Every Farm" is being realised is amply evidenced by the fact that quite recently several new or comparatively new (to Queensland) breeds of pigs have been introduced into Australia and to this State from countries overseas.

The New Breeds.

The Large Black, formerly known as the British Large Black or the Devonshire breed, and whose home is in the counties of Devon and Cornwall (England). The Duroc Jersey, emanating from the United States of America and Canada—and a pamphlet dealing with which is now available with other Pig Raising pamphlets on application to the Department of Agriculture and Stock, Brisbane. The Duroc Jersey, or the Red Pig of America, came to Queensland as a result of a careful investigation into the merits of the breed while that well-known stud master, Mr. F. G. Brown, of Goodluck and Mooroombin Farms, Toogoolawah, Q., was visiting Canada several years ago. The Poland-China is also an American breed new to many of the pig farmers of this State.

More recently we have had a further introduction in the nature of the Gloucester Old Spot (more frequently referred to as the G.O.S.), a breed whose original home centred around the lowlands of Gloucestershire and Somerset, counties well and favourably known in the Old World.

History of the G.O.S. Breed.

The G.O.S. is one of the very old English types, interest in which had, it would appear almost been allowed to lapse until about twelve or fifteen years ago, when fanciers of the type gathered together and initiated what has since come to be known as The Gloucester Old Spot Pig Society. At the original and later meetings of this society a scale of points with relative values was drawn up and adopted, and propaganda arranged for with a view to further popularising and distributing this (to them) famous old breed. The result of early propaganda was that the breed attained great prominence, a fact as one author puts it as "giving ample evidence of the value of propaganda and advertisement," for in a few short months a breed previously practically unknown except to a few people suddenly sprang into the lime-light and at auction sales realised almost record prices. Then came a lull and pigs which within a few months previous had been making averages of £100 per pig at sales suddenly dropped to an average of little over £20. In the western part of England it is stated the breed was at one time very popular because it proved to be extremely hardy and a good grazer. In a report in the "Live Stock Journal Annual" (1924) an article appears in which it is stated that the G.O.S. Pig Society after an exceedingly turbulent time—which did little good either to the members or the pig—appears to have steered the ship into calmer waters during 1923. During that year the chairman of the society, Mr. Henry Bridgman, died. He was one of the founders and most enthusiastic members of the society, and his name will go down to fame as the breeder of the six young gilts (young sows) of one litter which made the record price of £1,120 at the Winterbourne stud sale.

Acting on the advice of bacon curing experts the G.O.S. Pig Society during 1923 initiated a crusade for the elimination of wrinkles in the animals brought forward to the various show rings. This had a very beneficial effect, though its effect was a very harsh one on some of the original exhibitors of this somewhat loose-bodied rangy type.

The first consignment of G.O.S. pigs to land in Australia arrived per s.s. "Boorara" during 1923, the shipment consisting of thirty-two sows and eight boars selected from the leading studs in England. These pigs were sent out by the society controlling the interests of this breed in charge of Mr. A. E. Ball, a Somerset farmer who with his wife and family of seven sons had decided on settling in Victoria. In a communication received from Mr. Ball shortly after his arrival in Australia, and in dealing with the merits of the breed, he had the following to say:—"First of all

PLATE 55 (Fig. 1).—GLOUCESTER OLD SPOT BOAR "BRECHIN PRIDE" (41).

Photograph taken when 22 months old. First and champion prize winner Royal Agricultural Show, Melbourne, 1925 and 1926. Bred and exhibited by Messrs. Russell and Johnston, "Brechin," Beto Bolong, Orbost, Victoria. A typical, well-developed, upstanding sire of this old world breed. Note the strength of legs and sturdy vigorous build of this animal.

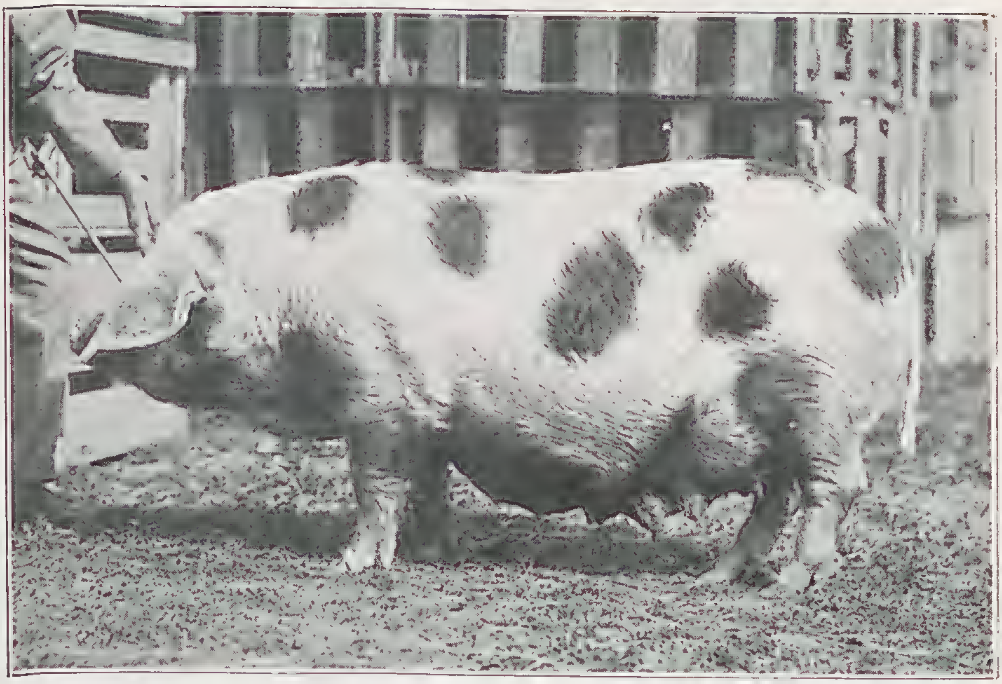


Plate 56 (Fig. 2.)—Gloucester Old Spot Sow. A. E. Ball's "Kitesnest Sylvia 4th" (Imported) (17069).

Bred by Mr. F. H. Rea (England). Champion Prize Winner Royal Agricultural Show, Melbourne. 1926. A well developed matron, a successful dam, and a typical representative of the breed. Note her colour markings, depth, and quality.

Plate 57 (Fig. 3).—Gloucester Old Spot Sow "Holmwood Colonial" (Imp.) Second Prize Winner in over 15 months old class at R.A.S., Melbourne, 1926.

Exhibited by Messrs. Russell and Johnston, exhibitors also of the Champion Boar "Brechin Pride." This sow is a proved breeder of really choice stock. She was shown in breeding condition only in a keenly contested class.

I would say the G.O.S. pig was, until recent years, kept entirely in the West of England over a large area on which practically no other breeds were kept as far back as we have any knowledge or record of pig breeding. So pure had they been kept that there were no records of a pure black or a pure white pig being born. Some representatives of the breed have less spots than others, some have more, but they always have been and are now a spotted black and white breed.

It was not until 1913 that three West Country farmers met at the London Dairy Show and first talked over the question of founding a breed society for the preservation and protection of these Old Spotted pigs. The outcome of this convention was that a society was initiated to control the destinies of the breed. Shortly after came the great war, which severely handicapped the young committee thus formed and compelled them to go easy. Nevertheless so well and favourably known had the breed become that where £8 to £10 had been a good price for a spotted pig in former years as much as 600 guineas was paid for a young boar at the Royal Agricultural Show of London in 1919, and £1,120 for half of a litter bred by the late Mr. H. Bridgman, and a sale average of £103 secured for forty-eight head. The secretary of the society, writing during the first year of that body's activities, stated that after the founders had paid for the incorporation and other fees and purchase of other necessary books exactly twopence was left to purchase a receipt book. Seven years after the assets of the society reached the value of £4,000, while during the month of December, 1919, between £1,300 and £1,400 was received for entry and membership fees, an incredible income for any pig breed society a year or two before, whilst the Herd Book of 1920 was the largest published by any pig breed society of Europe. The Herd Book of 1921 carried the boar numbers from 2,507 to 3,914, and the sow numbers from 7,030 to 12,412. To-day the G.O.S. pig is a popular pig in every county of England, and bred more or less in nearly every country in the world.

The G.O.S. pig has always been noted for its great length of side with big hams and broad loins, a thick belly and yet not a coarse or heavy fat back. They are very popular with the butcher as they provide a young tender carcase, full of lean meat, with the bulk of its weight in the hind quarter, from which the highest priced meat is obtained. They also weigh exceptionally well. Some critics say that they will not fatten readily, but it must be remembered that a pig that grows very fast does not put on the fat on the back like an older or a matured pig will, and as G.O.S. pigs are 120 to 140 lb. when little more than half grown, they do not carry a heavy proportion of waste fat. However, pigraisers nowadays aim at marketing baconers at 5½ and 6 months old, and if they can obtain, as they do, the same or a higher price for these pigs as those that are 9 or 10 months old, besides finding a ready sale for them, they will not tolerate the coarser heavier strains, hence G.O.S. pigs and their crosses which mature early are becoming more and more popular. With good feeding G.O.S. porkers are ready for market at between 4 and 4½ months and baconers at under 6 months of age. The sows are splendid breeders and have maternal instincts even superior to some of the medium types. One of the characterstics of which G.O.S. breeders are proud is that the pigs are very quiet and docile in their habits. It is a characteristic of several of the breeds of pigs who have lopped ears that they are exceedingly docile and readily handled. The Gloucester Old Spots are ideal paddock pigs, being specially suited to grazing and hunting up portion of their living out of doors. The crosses of this type with the Berkshire have also proved to be very hardy and equally suited to paddock conditions.

The Colour Markings.

It is interesting to note that prominent breeders of this type of pig hold the opinion that colour should not necessarily be a deciding factor in the show ring, though it is highly desirable that the animals should be distinctly spotted with black spots, the white markings being clear and as free from bluish or dark spots or splashes as possible. It is considered that type and conformation should be the principal deciding factors, and where other qualifications are equal that colour should then be considered. G.O.S. breeders do not look upon their favourite breed as "pretty," or even as attractive looking; it is their carcase value alone that counts with the butcher and bacon curer, hence breeders have to be content with the somewhat variable colour markings. This is an imporant point with all new breeds, and even with Poland-Chinas and Duroc-Jerseys, a good deal of latitude is allowable in judging. In the older established breeds, the Berkshires, Yorkshires, and Tamworths, colour is one of the most important characteristics—it is frequently practically a deciding factor. Heavy wrinkles in the skin, a coarse rose on back, or pronounced line of mane bristles, or a decidedly sandly colour are disqualifications and should not be tolerated in G.O.S. pigs. Likewise pigs with thick floppy, coarse or elevated ears are objectionable, while pigs showing skew- or pie-bald or saddle-back markings, or practically all white or all black, are not to be tolerated.

Further details in regard to this breed and the experience of other than the breeders referred to herein may be obtained on application to the Department of Agriculture and Stock, Brisbane, at any time.

In an interesting review of the G.O.S. breed in Robert Morrison's "Individuality of the Pig," recently to hand, it is remarked that "from times beyond the ken of man there has existed in Gloucestershire, part of Wiltshire, and the north of Somerset a breed of Spotted Pigs. They are hardy, prolific, good feeders, quiet, and docile; while the sows are good mothers. In the zenith of the production of Gloucestershire cheese (with its by-product whey) before a town fresh milk trade was built up, the G.O.S. breed was found in happy surroundings in the fertile fruit-growing district of the Berkeley Valley, from near Gloucester to the river Avon at Bristol. The pig was general with farmers, smallholders, and cottagers, roaming about all day and lying in a shed at night; at least that was the life of the sow and young, the boar being kept at the village inn or blacksmith's shop for the use of the community. The breed is an open-air grazing one, and breeding animals do not take kindly to confinement."

In dealing with the organisation of the G.O.S. Pig Society Mr. Morrison states that in 1913, when Mr. W. Nixon was appointed Live Stock Officer of the Bristol area under the Ministry of Agriculture and Live Stock Improvement Scheme, he recognised the qualities possessed by this old local breed, and the dangers of it dying out, as grants for boars could not be given without the breed becoming registered. After talking over matters with Henry Bridgman and E. G. F. Walker at the London Dairy Show, a meeting of the local men was convened and held in Bristol, which approved of the formation of a society, from which date matters progressed rapidly until the breed is known and bred far beyond its former environments. Its advocates claim that the prepotency of the G.O.S. is very remarkable. A sow of any pure or cross breed mated with a pure G.O.S. boar will almost invariably throw a litter of spotted pigs with the well known ears of their sire. The G.O.S. have been bred on utility lines. Notwithstanding the prepotency claimed for pure bred Old Spots it may take time, Mr. Morrison thinks, to eliminate all the alien blood that has at different times crept into the breed, so that all pigs of the breed can be trusted to breed true to type.

Opinions Expressed by Local Breeders *re* the G.O.S. Breed.

Mr. C. Tucker, of the Homelea Stud, Maffra, Victoria, has this to say: "In general we find the litters average eight to twelve in number, and we have no difficulty in getting them under correct ordinary conditions on to the market 140 lb. under 6 months. They are excellent mothers and will live in the paddock, if you have grass, clovers, or lucerne for them. My sows are fat and we are not feeding at all with any grain, &c."

Messrs. Russell and Johnston, of Orbost, Victoria, are extremely enthusiatic in regard to the prospects for the G.O.S. breed, and will be pleased to forward details of weights attained by quite a number of their pigs over a period covering ten or more weeks to any breeder sufficiently interested to write for same.

Mr. C. W. Roseblade, of Yungaburra, Atherton Tableland, North Queensland, who was the first Queenslander to introduce pigs of the G.O.S. breeds, speaks highly of their early maturity, docility, and quality. He has had excellent results, and considers no other breed could have equalled the weights attained by his cross-bred G.O.S.-Berkshires under similar conditions.

Mr. A. N. White, of the Blakeney Stud Piggery, Penrith, N.S.W., writes that he has tried the G.O.S. boars on sows of the Tamworth, Poland-China, pure G.O.S., and Berkshire breeds, and at date of writing had a Berkshire sow suckling an excellent litter of spotted pigs. So far, he says, this has proved the best cross and we are well pleased with them.

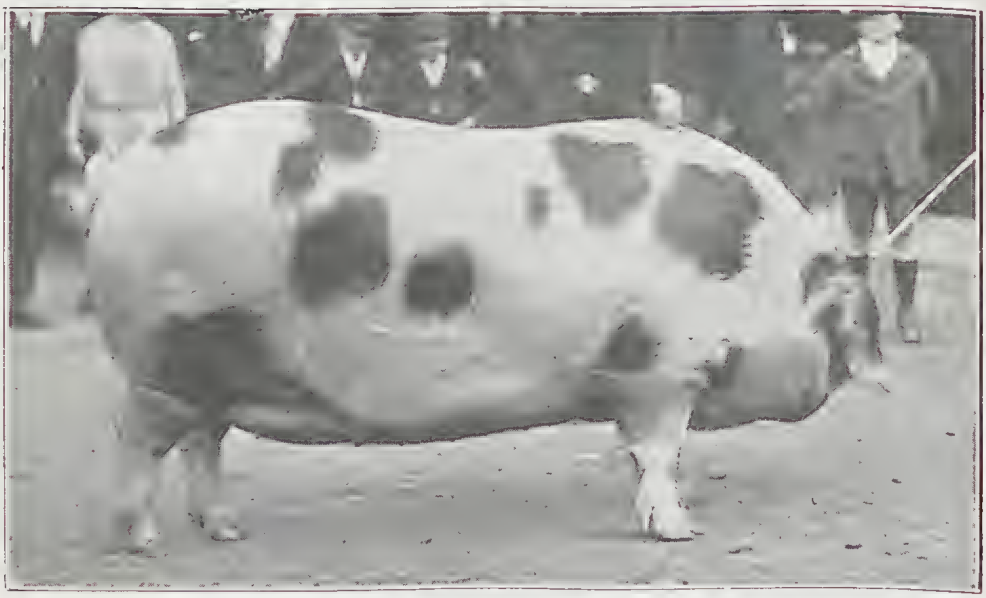


PLATE 58 (Fig. 4).—G.O.S. SOW, "SOMBORNE SARAH" (IMP.), CHAMPION PRIZE-WINNING SOW at the R.A.S., Melbourne, Victoria, 1924.

Exhibited by Mr. A. E. Ball, the importer of the G.O.S. breed. She was also a winner at the Bendigo Show, Victoria. This sow was shown in the very best of condition. Her characteristic markings, as well as the development of middle piece and hindquarter, will appeal to G.O.S. fanciers. Her hams are exceptionally well-developed, carrying a "cushion" and a compactness for which the breed is noted.

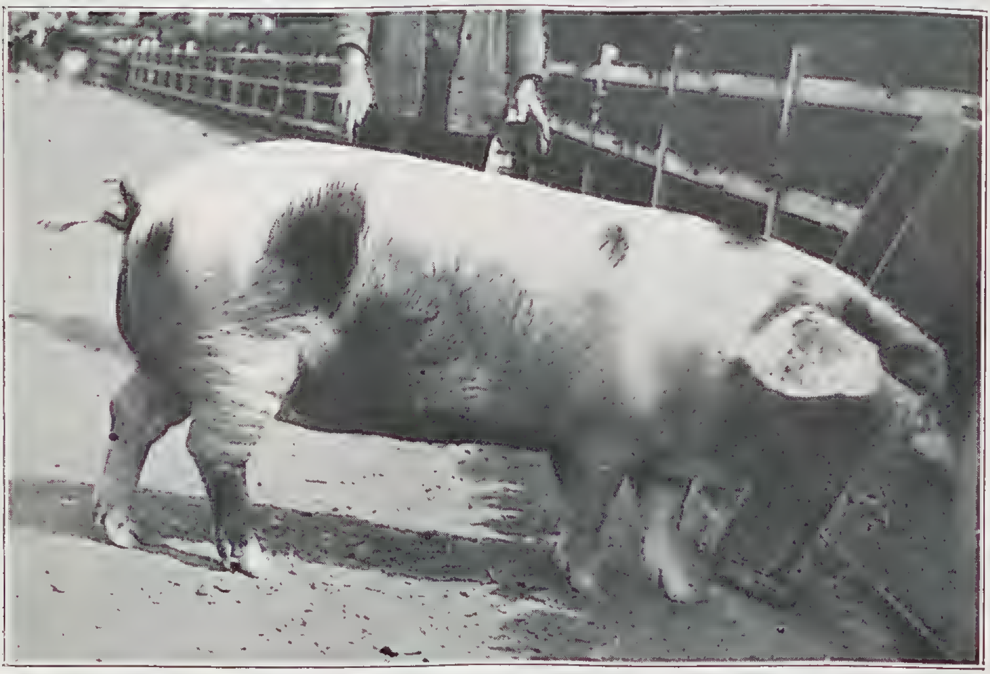


PLATE 59 (Fig. 5).—G.O.S. SOW, 10 MONTHS OLD, "BRECHIN COLONIAL." SECOND PRIZE SOW UNDER 15 MONTHS AT R.A.S., MELBOURNE, 1926.

A well made, roomy, fine quality sow; somewhat leggy but strong, active, and vigorous. Many breeders prefer stock that stand well up off the ground provided they are otherwise of good type and conformation.

PLATE 60 (Fig. 6).—G.O.S. "CHARTERHOUSE PRIESTESS" (52) AND LITTER. SHOWN BY MR. C. TUCKER, HOMELEA STUD, MAFFRA, VIC.

Note development of head and ears and position of ears of this sow, the ears should stretch to the point of nose and not hang side whisker fashion dull and lifeless. The ear carriage is an important point in judging stock in this breed. Unfortunately the photograph does not do the stock justice. It is not easy to secure good photographs of live stock.

PLATE 61 (Fig. 7.)—G.O.S. Sow "WINTERBOURNE GIFT" AND LITTER.

Two sisters of this sow were sold for 200 guineas each, while six of her half-sisters realised 1,055 guineas at auction in England. This sow was the property of Mr. A. E. Ball, of Blagdon, Somerset, England, and later of Murrabit, Victoria. Unfortunately the photograph does not show the sow, but her eight pigs are well developed.

Mr. T. A. Knowles, of the Knockrow Stud Piggery, Binna Burra, Richmond River, N.S.W., writes *re* G.O.S. pigs: "I may say that I journeyed to Victoria, in 1924, to Mr. A. E. Ball's stud sale in Gippsland, and selected four G.O.S. sows and one boar. One of the sows farrowed sixteen shortly afterwards, of which she weaned twelve fine growthy pigs." Mr. Knowles has crossed the G.O.S. boar with Berkshires, and has also crossed a Middle Yorkshire boar on to G.O.S. sows. His experience is that they are both prolific and prepotent and ideally suited to the bacon trade. He says the first G.O.S. sow he had farrowed eleven pigs, of which she reared ten pure G.O.S. pigs. These were sold for £70, at reduced prices, in order to popularise and distribute the breed among farmers anxious to try them.

The management of the Kingston Stud Piggery, Kingston, Q., now the largest stud of the G.O.S. breed in Queensland, forward the following remarks as indicating the opinion formed as a result of practical experience and observation of this breed not only in the pure state but also when crossed with various types and kept under exactly the same conditions as the other types referred to.

The Gloucester Old Spot Pig at Kingston Farm, Q.

In writing of the part played by the Gloucester Old Spot pig at Kingston Piggery, it would perhaps be as well to let readers first know something of the conditions under which all the pigs are kept at Kingston. Kingston piggery is essentially a commercial proposition, not merely a stud farm. Approximately 700 pigs are kept all the year round, including about 125 breeding sows. The principal feed is buttermilk, supplied under contract from the Kingston Butter Factory. All the pigs are running in paddocks, except the sows with litters under three weeks old, and the bacon pigs in the last stage of fattening. From this readers can quite realise that none of the pigs on the farm are pampered.

The Gloucester Old Spot breed was introduced to the Kingston Piggery by the previous owner, who purchased in Victoria a number of selected animals of this breed at the original sale of the importer, Mr. A. E. Ball. Mr. Ball was sent to Australia by the G.O.S. Pig Society with a consignment of young stock specially selected from the leading herds of Great Britain. Included in the original purchases by Kingston Piggery were the following pigs:—Imported boar, "Kimberley Best Boy" (5163); young boar, "Charterhouse Pride" (126) by the imported boar "Oaklands Nut (17094) from "Shipway Flower 5th" (imp.); and three imported sows, "Hempstead Molliel" (17065), "Kimberley Jill 1st" (17072), and "Shipway Flower 5th." A number of young stock were also purchased. From these at the present time Kingston Piggery has four unrelated families of this breed. That the breed is popular in England is evidenced by the sale of half a litter of the Shipway strain which sold at the Winterbourne sale for £1,120.

The Gloucester Old Spot has done well at Kingston. It has met in competition there every other breed at present used in Queensland—for Kingston Piggery is still in the experimental stages. Meeting the other breeds which are more acclimatised than the G.O.S. has proved its true worth, and it can be said that all the best young stock are now either G.O.S. or G.O.S. crossbred. The sows have proved splendid quiet mothers. A special feature of the breed is the docility of both sexes. Though big, the sows are particularly careful mothers, and not at all clumsy; they are very heavy milkers; they have farrowed and reared good litters, both in the paddock and in pens. Pigs from a recent litter of "Charterhouse Queenie" (90) weighed 46 lb. at 7 weeks and 2 days old, whilst the whole litter of ten from "Charterhouse Hope" (125) averaged 43.4 lb. the day they were 10 weeks old, and during that ten weeks there was over five weeks rainy weather, which caused the litter to contract a chill and develop scours, putting them back considerably. The crossbred pig (G.O.S. boar-Berkshire sow) also makes an ideal bacon pig. In this cross the whole litter is black and white, proving the prepotency of the G.O.S. breed. They develop early into very lengthy bacon pigs. The G.O.S. -Tamworth cross has also been tried, producing a light tan and black pig of abnormal length, which is very easy to put to 175 lb. live weight, producing about 125 lb. of prime bacon—not too fat. It is the length and early maturity of the G.O.S. pig and its crosses which makes it specially attractive to the commercial fattener.

At present at Kingston there are numbers of young stores and growers—G.O.S.-Berkshire and G.O.S.-Tamworth crosses, the same age and younger than Berkshire, Berkshire-Tamworth, Berkshire-Yorkshire, and Tamworth and Tamworth-Yorkshire growers—and without exception it can be truthfully said that the G.O.S. litters are all showing more forward than the other breeds. All these pigs have been treated under the same conditions.

The G.O.S. and its crosses are not gross feeders. The arrangements at Kingston Piggery with the conveniences of its weighbridge make it possible to carry out

PLATE 62 (Fig. 8).—GLOUCESTER OLD SPOT SOW "CHARTERHOUSE HOPE" (125) AND LITTER OF TEN SIRED BY "CHARTERHOUSE PRIDE" (126).

Litter ten weeks old; average weight 43·4 lb. Kingston Stud Piggery.

PLATE 63 (Fig. 9).—CROSSBRED G.O.S. STORES, END OF SEPTEMBER, 1926, LITTERS. AVERAGE WEIGHTS 95-110 LB., 1ST FEB., 1927, AT KINGSTON STUD PIGGERY.

Note also roomy, well shaded yards, and "K" netting fences, providing for the comfort and well being of growing pigs. The grazing area adjoins these yards.

observations as to thriftiness and meat production, and pens of five G.O.S.-Berkshire crosses have made an average gain of 2.2 lb. per pig per day. Individual pigs of other breeds (Berkshire-Tamworth) have beaten this, but the G.O.S. average is the highest for any pen.

Anyone interested in the pig-breeding industry would always be most welcome to visit Kingston Piggery. They can there inspect for themselves the different breeds—and only good purebred boars of each breed are kept as sires—and arrive at their own conclusions. The management cordially invites readers to inspect the herds, where production on a commercial basis is the aim. Arrangements can be made at any time by getting in touch with the Manager at Kingston or with the Instructor in Pig Raising at the Department of Agriculture and Stock, Brisbane.

Other breeders of this type of pig would also be pleased to supply particulars of their experience on application.

Whether G.O.S. pigs will be equally as successful in the hands of the average farmer here remains to be seen. Our market demands are for a comparatively light fleshy bacon carcase not more than 125 lb. dressed weight at between 5½ and 6 months old. It is well-known that the G.O.S. pig has no difficulty under normal conditions in reaching these weights, for quick growth and early maturity are their special forte. They are not a showy pig, and to the inexperienced eye they appear large, loose, and almost ungainly. One prominent breeder remarked on inspecting several mature animals: "Well, that's all right, but they are such ugly brutes."

For the time being and as with other "new breeds" we feel justified in saying to breeders interested in the G.O.S. breed, "Gain all the experience you can by study, practical observation, and, where possible, by inspection, for there is an immense field for work here in Queensland, and if G.O.S. fanciers can demonstrate by carcase test and in actual experience that this new breed possesses more advantages than those we already have in fairly large numbers, then breeders will not be slow to recognise the breed's value."

GLOUCESTERSHIRE OLD SPOTS PIG SOCIETY, ENGLAND.

SCALE OF POINTS AND THEIR RELATIVE VALUES IN G.O.S. PIGS AS ADOPTED BY THE COUNCIL.

Note.—This scale of points has also been adopted and published in the Herd Books of the Australian Stud Pig Breeders' Society.

			Points.
Head—Wide between ears, medium length	4	Head	16
Nose—Medium length, wide, slightly dished	4		
Ears—Broad at base, drooping forward over nose not to the sides, not thick nor coarse. Same length as nose ..	4		
Neck—Medium length and muscular. Jowl must not be pronounced	4		
Chest—Wide and deep	4	Body	60
Shoulders—In line with ribs and not projecting, must not show coarseness	4		
Back—Long and level, must not drop behind shoulders ..	10		
Ribs—Deep, well sprung	6		
Loin—Very broad	6		
Sides—Very deep, presenting straight bottom line. Belly and flank full and thick. Well filled line from ribs to hams	8		
Quarters—Long, wide, and not drooping. Tail set high and strong	8		
Hams—Large, well filled to hocks	10		
Legs—Short and straight	4		
Skin—Should be black under black hairs and white under white hairs. Must not show coarseness or wrinkles ..	8	Quality	14
Coat—Fairly thick, long, and silky, not curly. Must not show coarse mane bristles. Black spots on white coat. Black should not predominate	6		
Type and general appearance	10	Type	10
Total points			100

OBJECTIONS.

Head—Narrow face and nose.

Ears—Short, thick, and elevated.

Coat—A rose on the back disqualifies. A pronounced line of mane bristles very objectionable. Decidedly sandy colour may disqualify.

Skin—Serious wrinkles may disqualify.

Legs—Crooked, especially in young pigs

Neck—Heavy jowl objectionable.

Teats—Bad teats, or less than ten.

A RECENT REPORT FROM ENGLAND.

GLOUCESTER OLD SPOTS WIN PRINCIPAL BACON CUPS AT PROMINENT ENGLISH SHOWS.

Last Year's Success Repeated—First Cross Cup Goes to Large White-Large Black.

(From a Report in the "Farmer and Stock Breeder," London, 1926.)

For the second year in succession the Whitley Cup, offered for the best bacon from six pigs entered by a breed society, has been won by the Gloucestershire Old Spot Pig Society. The Harris Cup (for the best four sides in the three classes referred to in the accompanying table) was also awarded to the same exhibitors. Reserve for the Whitley Cup was the Large Black Pig Society's exhibit with 88 points, the winning sides securing the maximum total of 100.

If a trifle on the heavy side for the London trade, the bacon exhibited by the winners handled well, the fat being firm and the rind fine. Bone was light, and the sides matched evenly. The Large Black exhibit lost points for streaky, quality of bone, and back-fat, and did not handle with quite the same firmness as the winning sides. Entries were also forward in this class from the Essex and Wessex Pig Societies.

Mr. W. H. Middle won the Beale Cup for the best bacon from two pedigree pigs with his Gloucester Old Spots, so that this breed has every reason to feel proud of its successes this year. The winning sides hung well, securing 98 points, the judges considering the back-fat to be a little in excess of requirements.

Second prize went to Messrs. Bennett and Howard for sides also from G.O.S. pigs that obtained 86 points. The fat was none too firm in comparison with the others, while points were lost for thickness of belly and quality of meat and bone. Major R. L. Mullens secured the third prize with sides from Large White pigs that obtained 85 points. They were better in many respects than the other, but were not thick enough in the belly or quite of the quality to make ideal bacon.

Four sides obtained from first-class Large White-Large Black pigs were awarded the Bledisloe Cup, the exhibitor being Mr. H. H. Pickford. The number of points obtained was 93. Some considered that the thickness of back-fat was in excess of requirements, notwithstanding the maximum number of points having been awarded for this detail. The sides were even and of about the right weight. Lord Bledisloe's exhibit (Large White-Large Black) was second with 87 points, and four sides from the Cathedral Dairy, Exeter (Large White-Middle White) were third with 83 points.

On the whole, the bacon in these three classes (which appeal particularly to the pedigree and first-cross breeder) was satisfactory; but one would like to see more uniformity. In many cases the sides were coarse and uneven, as well as being almost too heavy for the first-class south country trade.

Intending exhibitors should pay closer attention to such all-important questions as quality, full hams, and even fleshing. Weight is not everything—too much back-fat is undesirable. Correct feeding is essential.

TABLE SHOWING LOSSES AND POINTS AWARDED IN THE BACON COMPETITIONS AT THE LONDON DAIRY SHOWS, 1926.

Name of Exhibitor.	Breed or Cross.	Average Live Weight per Pig.	Per cent. Loss from Live to Dead Weight.	Per cent. Loss from Live to Bacon Weight.	Award.	Award of Marks. Correct proportion "cuts" or joints, including thickness or "streaky."	Suitability of side quality of Meat, Bone, &c.	Fat on back. Proportion of Lean to Fat.	Firmness of Fat.	Firmness of Rind.	Deduct for Bad Belly up to 15 pts.	Total Points.
"Whitley" Cup (open to Breed Societies)—6 pigs—						(30 pts.)	(20 pts.)	(30 pts.)	(15 pts.)	(5 pts.)		
Essex Society	Essex	190·5	22·9	41·8	..	25	16	24	14	5	..	84
G.O.S. Society	G.O.S.	237·8	20·3	40·9	Cup	30	20	30	15	5	..	100
Large Black Society ..	Large Black	207·8	21·9	41·7	Reserve ..	25	18	25	15	5	..	88
Wessex Saddleback ..	Wessex	186·6	22·7	42·3	..	20	15	20	12	4	..	71
"Beale" Cup (open to individuals)—2 Pedigree Pigs—												
Major-Gen. R. L. Mullens ..	Large White	175·0	22·5	42·2	Third ..	24	18	25	13	5	..	85
J. H. Ismay	Berkshire	170·5	21·9	41·9	..	23	16	24	14	4	..	81
W. H. Middle	G.O.S.	194·5	20·8	42·9	First and Cup	30	20	28	15	5	..	98
Spencer, Son, and Hancox	Large White	176·0	23·5	42·0	..	23	15	20	13	4	..	75
Standen Estates	Large White	172·5	22·6	43·7	..	20	16	20	12	4	..	72
J. Rackley and Sons ..	Large White	205·5	18·2	38·4	..	20	16	22	14	4	..	76
Bennett and Howard ..	G.O.S.	215·0	20·0	40·9	Second ..	25	17	26	13	5	..	86
"Bledisloe" Cup (open to individuals)—2 First Cross Pigs—												
Lord Bledisloe	Large White × Large Black	211·0	18·4	37·9	Second ..	24	15	28	15	5	..	87
Major-Gen. R. L. Mullens ..	Middle White × Large White	164·0	21·3	41·7	..	25	15	25	10	4	..	79
J. A. de Rothschild ..	Large White × Berkshire	198·5	20·1	38·7	..	24	16	22	12	5	..	79
Major Morrison	Tamworth × Berkshire	183·0	24·5	43·7	..	24	15	24	15	4	..	82
H. H. Pickford	Large White × Large Black	212·0	23·3	43·6	First and Cup	30	20	28	10	5	..	93
Hasler and Co.	Large White × Essex ..	208·0	20·9	43·0	..	24	14	25	10	4	..	77
D. B. Rose	Large White × Middle White	179·5	21·1	40·9	..	24	13	23	12	5	..	77
A. Duckham	Long White Lop × Wessex	185·5	21·0	42·5	..	22	14	24	10	4	..	74
Cathedral Dairy	Large White × Middle White	185·0	20·2	38·9	Third ..	25	16	25	12	5	..	83
J. H. Ismay	Large White × Berkshire	201·0	20·6	40·2	..	26	15	25	12	4	..	82

QUEENSLAND SHOW DATES.

The Queensland Chamber of Agricultural Societies has forwarded the following schedule of show dates for 1927:—

March.

Goombungee, 3rd.
Milmerran, postponed.
Dirranbandi, 16th and 17th.
Pittsworth, 22nd.
Inglewood, 22nd and 23rd.
Warwick, 23rd to 26th.
Toowoomba, 28th to 31st.

April.

Goondiwindi, 5th and 6th.
Beaudesert, 6th and 7th.
Dalby, 7th and 8th.
Chinchilla, 12th and 13th.
Sydney Royal, 11th to 20th.
Herberton, 18th and 19th.
Allora, 21st and 22nd.
Nanango, 21st and 22nd.
Kingaroy, 28th and 29th.
Oakey, 29th.

May.

Taroom, 2nd to 4th.
Charleville, 4th and 5th.
Wondai, 5th and 6th.
Toogoolawah, 6th and 7th.
Blackall, 10th to 12th.
Mitchell, 11th and 12th.
Boonah, 11th and 12th.
Murgon, 12th and 13th.
Roma, 17th and 18th.
Ipswich, 18th to 20th.
Kilkivan, 18th and 19th.
Wallumbilla, 24th to 26th.
Maryborough, 24th to 26th.
Childers, 28th to 31st.

June.

Marburg, 2nd and 3rd.
Gin Gin, 2nd to 4th.
Brookfield, 3rd.
Bundaberg, 8th to 10th.
Wowan, 8th and 9th.
Gladstone, 15th and 16th.
Lowood, 17th and 18th.
Rockhampton, 22nd to 25th.
Maleny, 23rd and 24th.
Gatton, 29th and 30th.
Kilcoy, 29th and 30th.
Biggenden, 30th June and 1st July.

July.

Townsville, 5th to 7th.
Woodford, 7th and 8th.
Caboolture, 14th and 15th.
Esk, 15th and 16th.
Ithaca, 23rd.
Rosewood, 21st to 23rd.
Laidley, 27th and 28th.

August.

Royal National, 8th to 13th.
Coorparoo, 27th.
Crow's Nest, 24th and 25th.

September.

Imbil, 7th and 8th.
Beenleigh, 15th and 16th.
Stephens, 17th.
Pomona, 21st and 22nd.
Nundah, 30th Sept. and 1st Oct.

October.

Kenilworth, 6th.

CODLING MOTH—CONTROL MEASURES.

With the exception of those varieties of apples and pears which are within two or three weeks of ripening, it will be necessary to continue the cover sprays of lead arsenate (write officers of the Fruit Branch of the New South Wales Department of Agriculture in current notes). Unfortunately there are many instances this season where sufficient fruit cannot be found on each tree to pay for the cost of spraying, and to leave these neglected is only to make increased moth trouble for next season. The most economical plan would seem to be to remove such few scattered fruits without delay and destroy them—that is, providing the crop is not forward enough to market as cookers. Even where the crop is light, it should pay to give the trees extra attention, as it is reasonable to expect excellent prices this season.

Losses too Soon Forgotten.

It is marvellous how soon the depredations from moth last season are forgotten by some, and how others are comforting themselves with the thought that it was an unusual outbreak, such as is bound to occur now and then. It is quite true that it was an unusual outbreak, and it is probably true of all insect pests that certain seasons are all in favour of their breeding in great numbers rapidly, but false comfort is very dangerous, and it is wise to look squarely at the moth position. The codling moth has been destroying far too high a percentage of the crop for some years past in many districts, so that even allowing that last season was exceptional, there is still ample cause for anxiety.

Then, too, during that particularly bad year, orchards could be found in badly-infested districts that were exceptionally free from moth—and not just exceptionally free compared with badly-infested places that season, but orchards that could be considered exceptionally free for any season in the past four or five years. Moreover, everything indicated that that condition was due not only to the work put into moth control for that current season, but to previous seasons' work having reduced the moth to a minimum.

It is quite possible for certain conditions to occur at times that will cause unusual mortality amongst the moth, and thus to reduce it to reasonable limits again without any special human effort, but judging from past experience this does not seem probable—or, at any rate, such conditions may be long in coming and therefore human effort is essential.

Limitations of Spraying.

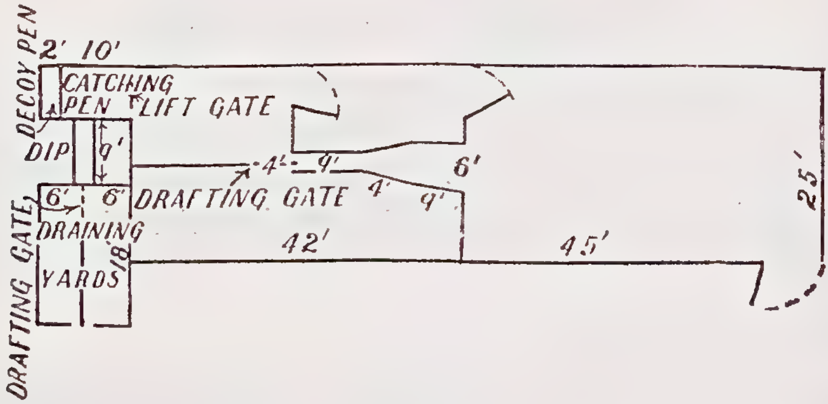
It is claimed in some districts that codling moth can be controlled by spraying with lead arsenate alone. This may be true of particular districts, but it is certain that it is not true of all districts, and where it is not every means must be employed to reduce the pest. It has been argued that methods other than spraying are too costly, but possibly when such statements have been made consideration has not been given to the extra returns due to saving fruit. Be that as it may, if the moth is not checked more successfully than it has been in the past few years many apple orchards will have to drop out or be carried on at a loss.

Some growers who have only very light crops (and here and there the fruit can hardly be termed a crop at all) will be inclined to neglect moth control on the ground that the return from the current season will not pay for it, but this is only piling up trouble for next season. Besides, an extremely light crop offers a very good opportunity for carrying out hand picking and destroying young fruit soon after the grubs have entered and before they have left the fruit. Such action carried out thoroughly will lessen the next season's infection appreciably.

It is possible that trapping on the wing may prove another useful auxilliary method of control. It is being tried at Bathurst in the course of other important investigation work on codling moth by the Entomological Branch of the Department.

SHEEPYARD PLAN.

In reply to an inquirer who seeks information concerning the construction of a sheepyard, the following is submitted:—Inquiries for small yards are received frequently, and the plans shown, while drawn to meet the needs for a flock of a couple of hundred sheep, may be altered readily to meet the requirement of larger flock holders. It is constructed of post and two rails, with pig-netting fastened on, the race being boarded. The catching pen should be paved with bricks in cement, and also the draining pens, the latter being sloped to a gutter near the centre to carry the liquid back to the dip. A grating should be used to prevent droppings being carried in along with the liquid. It is advisable to roof in the draining yards to prevent sun scald. The dip may be built of galvanised iron, bricks, or concrete, details of which have appeared from time to time in these columns.—"Australasian."



Answers to Correspondents.

BOTANY.

Flooded Gum.

E.W.H. (Rathdowney)—

Both specimens represent the same timber, viz., Flooded Gum (*Eucalyptus saligna*). This timber is not generally regarded as durable in the ground, but if well seasoned is a useful general building timber. It is very largely used in house construction on Tambourine Mountain.

Your two specimens have been handed to the Forestry Department for more detailed examination by its Wood Technologist (Mr. C. J. Watson), who will no doubt reply to you direct.

Suspected Poison Plants from Longreach.

INQUIRER (Longreach)—

The specimens forwarded were only scrappy pieces representing young growth, but as far as the material allows, can be determined as follows:—

No. 1. *Psoralea* sp. "Native Lucerne" or "Herb Vine." Most of this genus are good fodders, liked by stock, and are fattening and nutritious.

No. 2. *Boerhaavia diffusa.* "Hog Weed," or "Tar Vine." A useful forage herb.

No. 3. *Polymeria* sp. Not known to be poisonous.

No. 4. *Alternanthera nodifolia.* A useful fodder herb.

No. 5. One of the Salt-bush family, too young to state the exact species—not poisonous.

No. 6. *Euphorbia Drummondi.* "Caustic Creeper." The name "Verbain" or "Berbain" is generally applied more correctly to a very different plant. The Caustic Creeper is poisonous in the flowering stages; the symptoms are very characteristic. Death generally follows very quickly, the head and neck, particularly the latter, becoming very much swollen. Of the specimens sent this is the most likely cause of the trouble.

Hibiscus trionum.

O.B. (Kingaroy)—

The specimen is *Hibiscus trionum*, the "Bladder Ketmia." It is a small annual Hibiscus, widely distributed over the temperate regions of the globe. In some countries it is a great pest in cultivation owing to the seeds lying dormant in the soil for years. In Queensland, however, it is mostly a minor weed in cultivation paddocks. It is not known to possess any poisonous or harmful properties.

Sandalwood.

INQUIRER (Sydney)—

Santalum lanceolatum is the species that is exported from North Queensland as Sandalwood. As you know, *S. lanceolatum* is abundant in Western New South Wales and Queensland and extends well up the Cape York Peninsula. It is only when one reaches the southern Gulf country that the characteristic sandalwood odour becomes well developed. Robert R. Brown named a species *S. venosum* from North Australia, and this was reduced to varietal rank of late by the late F. M. Bailey. He believed this variety to represent the source of the commercial article. We have, however, failed to see any difference in herbarium material between the Southern and Northern trees, but our herbarium material is at your disposal.

Japanese Millet.

A.G. (Bell)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

Japanese Millet is free from poison. Sudan grass always contains a little poison, but as a rule in harmless amounts, only when cut very young (a few inches high), or short second growth after cutting or grazing off, may be dangerous.

Native Pomegranate.

W.S.K. (Byrnestown)—

The fruit is *Capparis canescens.* It and some others of the same genus in Queensland are known as "Native Pomegranate." The fruits were eaten by natives but do not seem very palatable; they are one of the native fruits that harbour the common fruit-fly. We do not think they are fruits that lend themselves very well to improvement by cultivation.

"Button Grass"—Wild Millet.

G.S.B. (Goondiwindi)—

Your specimens proved to be:—

1. *Eleusine aegyptiaca.* "Button Grass." An annual grass, springing up with the summer rains. It is much relished by stock.
2. *Panicum crus-galli.* Commonly known as "Wild Millet." This grass is supposed to represent the wild form from which the "White Panicum," "Japanese Millet," and other fodders have originated. It mostly occurs in cultivation areas or in damp situations. It requires good summer rains to be of much use and is of annual duration, so it possesses no virtues over better fodders such as those mentioned above.

G.P. (Rockhampton)—Identifications are as follows:—

1. *Erythrina vespertilio.* "Bats' Wing Coral Tree" or "Cork Tree."
2. *Heterodendron diversifolium.* A small tree or shrub, common in the drier scrubs of Queensland. In spite of its harsh nature it is said to be much relished by stock.
3. *Neptunia gracilis.*
4. *Bauhinia tomentosa.* An interesting tree. A native of India, rare in cultivation in Queensland. I would be glad of further material for the purpose of verification. Are the flowers yellow in a fresh state?
5. *Petalostigma quadriloculare.* "Bitter Bark" or "Quinine Berry." The bark and berries are both very bitter, but so far as known possess no medicinal value.

Native Lucerne—A Native Hibiscus.

J.H.L. (Bell)—

The two specimens are:—No. 1: *Psoralea patens.* This and some other of the genus are known in Queensland as "Native Lucerne." They are generally regarded as useful fodders. No. 2: *Hibiscus rhodopetalus.* A very pretty little native hibiscus, suitable for garden culture.

Pink Lily Propagation.

H.H. (Rockhampton)—

The Pink Lily (*Nelumbium speciosissimum*) is usually propagated by rhizomes, but when it is intended to germinate seeds the seed coat is first filed and broken to allow the penetration of water. The seeds you have kept in the bottle will probably still be viable.

South Burnett Plants Identified.

W.R. (Kawl Kawl)—The specimens proved to be:—

1. *Chenopodium ambrosioides.* "Wormseed." The seeds of this and an allied species produce "oil of chenopodium" largely used as a hook-worm expellent.
2. *Bidens pilosa.* "Cobbler's Pegs."
3. *Mentha satureioides.* "Native Pennyroyal."
4. *Amarantus viridis.* "Green Amaranth." The young tips can be used as a substitute for spinach.
5. *Seigesbeckia orientalis.* Sometimes known as "Farmers' Lice" on account of the seeds sticking to the clothing as one passes through the plants.
6. *Geranium dissectum.* One of the plants known as "Crowfoot," a useful fodder herb.

A Spray for Grapes.

H.M.J. (Stanthorpe)—

With reference to your inquiry concerning a spray for grapes, the Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

Bordeaux mixture should never be mixed with oil or oil emulsions. Soapy water would not remove the bluestone. Rain water or water with a little ammonia added may remove the copper salts.

Clerodendron tomentosum—Moreton Bay Ash—Ironbarks.

M.L.P. (Toowoomba)—

The specimen forwarded with your letter of the 21st instant proved to be *Clerodendron tomentosum*, a native tree of the family Verbenaceae. It is commonly of rather irregular growth, but is ornamental on account of its white tubular flowers later followed by the attractive fruits. It is sometimes seen flowering as a shrub. In reply to your other queries:—

Moreton Bay Ash (*Eucalyptus tessellaris*). Operculum very short, convex, and of rather thin texture.

Silver-leaved Ironbark (*Eucalyptus melanophloia*). Operculum conical, pointed at the apex.

Narrow-leaved Ironbark (*Eucalyptus crebra*). Operculum shortly and broadly conical.

Broad-leaved Ironbark (*Eucalyptus siderophloia*). Operculum usually long and narrowly conical.

Acacia Maidenii.

F.K. (Gundiah)—

The wattle is *Acacia Maidenii*. We have noticed it at different times along the North Coast Line about Theebine and other places. We have little doubt analysis would show it to be of high nutritive value. About seven (7) lb. should suffice for an analysis, and if you forward this we will pass it on to Mr. Brünnich.

Borer in Citrus Trees—Tomato Plant Test.

D.G. (Antigua)—

The Government Entomologist, Mr. Robert Veitch, B.Sc., advises it is somewhat difficult, in the absence of specimens, to make any definite recommendations regarding the pests mentioned. It would seem, however, that the insect attacking your citrus trees is probably one of the larger Cerambycid borers. With regard to control of these borers an extract from a departmental publication has been forwarded. In this connection the Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

"The stumps of the orange trees can be swabbed with strong arsenical solution (like a dip concentrate). Auger holes about 1 inch to 1½ inch could be bored, in downward direction, into stump and filled with saltpetre to promote burning when dry."

The same difficulty with regard to identification arises in the case of the tomatoes, but it is not improbable, from your brief description, that the sickly condition of these plants is due to the presence of Nematodes or Eel worms. Nematodes live in the tissues of the roots of plants, and as a result of irritation produced by their presence very considerable swellings are formed. The functions of the roots are very seriously interfered with, and as a consequence the growth of the plants is very severely affected. Once a plant has become infested it is, practically speaking, impossible to rid it of their presence and, so far, no satisfactory means have been evolved for dealing with Nematodes on a field scale. A rotation of crops in which resistant plants are grown between crops of susceptible species affords some measure of relief and naturally the use of uninfested seedlings is of some value, although, even if healthy stock is used, infestation will occur sooner or later if the Nematodes are present in the land that has been planted.

"Wild Gooseberry" or "Ground Cherry."

H.J.C. (Wondai)—

The specimen is *Physalis macrophysa,* a species of "Wild Gooseberry" or "Ground Cherry," a native of the United States. We have two or three of these North American perennial gooseberries naturalised in Queensland and pests in cultivation, but they are mostly very confined as regards distribution—just a few places here and there on the Downs and other places. They differ from the common Cape Gooseberry and the small wild gooseberry of coastal farms in being perennial, not annual, in habit, the large underground roots surviving during winter and drought periods and spreading afresh every growing season.

Eradication must aim at preventing leaf growth as much as possible, particularly growth at flowering period and later, for it is the leaves which assimilate the food that is stored in the underground roots. With this end the leaf tops would have to be clipped or cut off level with, or below the ground, at several intervals during the growing period, and perhaps for several seasons following. If the roots are disturbed too much there is a chance of their being cut, and the cut pieces developing into new plants.

Your letter was also referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises that it would be very difficult to destroy this weed by spraying, but in the young stages of growth an arsenical spray might kill the plants and perhaps the roots. Mr. Brünnich advises the use of 4 lb. of arsenic dissolved by the aid of 2 lb. of caustic soda in 100 gallons of water. Salt may also be tried in large amounts, only salt makes the ground unworkable for a long period.

PIG RAISING.

Pigs and Wet Sties.

W.H.S. (Miva)—

The trouble is largely due to the wet weather; it is a rheumatic affection, and is not uncommon among young pigs kept on concrete floors or on wooden floors of a damp nature. There would appear to be no better treatment than careful feeding and attention, occasional doses of Epsom salts in the food to keep the bowels in good order and massaging the affected parts with Row's Embrocation or some healing or antiseptic ointment like carbolised vaseline. Keeping the pig on soft sandy soil will certainly help, for the trouble in part may be caused by corns on the feet or foot rot, in which case careful examination is necessary, and when the affected parts are cleaned an application of Stockholm tar made, in this case; also, special care would have to be taken to keep the wounded foot encased in some form of padding temporarily until healing takes place. We believe, however, that the trouble is due to cold wet sties and yards and that it will, in due course, pass off. Of course, troubles of this nature are often due to injuries, such as when the foot is caught in between two floor boards and the hoof is partially torn away. Bruises from kicks by horses and cattle will result in lameness, as also will partial paralysis of the hindquarters. It is difficult without inspection to definitely diagnose the complaint, but from a perusal of the printed matter forwarded we feel sure you will be able to determine the nature of the trouble and effect a cure.

The addition of mineral mixtures to the food supply is also advised in all cases of this description, for it may be indirectly due to weakness of the bony structure particularly of the legs.

Extermination of Meat Ants.

C.W.T. (Yelarbon)—

Locate the meat ants' nest. If it is a large one, take a breakfast cup full of carbon bisulphide. It will cost about 6d. at the chemists's. Then get a number of cornsacks sufficient to cover the nest entirely; soak them thoroughly in water. Then pour the carbon bisulphide into the centre of the nest, stand on the windward side and throw a lighted match on to the part saturated with the chemical. The carbon bisulphide being highly inflammable (be very careful in its use) will ignite and give off fumes. Then throw the wet bags over the nest; these will confine the fumes to the area to be treated. Meat ants are, of course, not an unmixed nuisance, for they are great scavengers. If bisulphide is unobtainable try petrol and use it in the same way.

THE HOT MILK BONUS.

Mr. W. Forgan Smith, the Minister for Agriculture and Stock, stated on 16th February that his attention had been drawn to references that had been made in the Press to the conditions announced by the Board of Trade and Arbitration relative to the supply of hot milk for human consumption within the Petty Sessions District of Brisbane.

The milk vendors' comments are centred principally around the condition from the Board of Trade which stipulates that the herd from which the milk is drawn shall be free from disease and that a certificate to this effect, issued by the Department of Agriculture, shall be produced, if demanded. Compliance with this condition is necessary in order to warrant the vendor charging at the rate of 9d. per quart for hot milk, the rate of 8d. per quart being the general price. In other words, the vendors supplying milk which conforms with this special condition will be afforded a bonus equal to 12½ per cent.

In connection with this matter, it should be borne in mind by those engaged in the production of milk for sale for domestic purposes that the Dairy Products Act requires that such milk shall be drawn from cows that are free from the diseases scheduled under that Act, and within this category tuberculosis is included. Consequently, the existing law demands that milch cows shall be free from this particular disease, and the most reliable means for determining the presence or otherwise of the disease is the application of the tuberculin test. The services of the veterinary officers of the Department of Agriculture and Stock are available for applying the test to dairy herds free of cost to the owner. One of the objectives of the Milk Producers and Distributors' Association is to secure the purest possible supply of milk and dairy products as produced by the cow, or from pure milk, and it is, therefore, expected that dairymen will co-operate in the matter of safeguarding the public health and take the necessary action to have their herds subjected to the tuberculin test, particularly as the Board of Trade have provided a condition that admits of the milk vendor receiving additional monetary gain for so doing.

It has been stated that there is an appreciable difficulty in obtaining a certificate of the nature required by the Board, but the Minister thinks that the desires of the Board in this particular connection are well within the bounds of practicability. In fact, in many countries, it is the generally imposed condition that milch cows from which milk is drawn for household purposes shall be free from tuberculosis as indicated by their passing the tuberculin test.

COTTON BOARD ELECTION.

The counting of votes in connection with the election of Growers' Representatives to the newly-constituted Cotton Board took place at the Department of Agriculture and Stock on Saturday, with the following results:—

District No. 1.—Rosedale to Rockhampton and North, Rockhampton to Mount Morgan and Westwood, and the Boyne Valley Branch—

Jones, Daniel, Brisbane	199 votes.
McDonald, George Edward, South Yaamba ..	160 votes.

District No. 2.—Dawson Valley line and Central line and branches west from Westwood—

Brake, Harry Reeves, Don River	241 votes.
Young, Charles George, Wowan	109 votes.
Koets, Joseph H. J., Alma Creek	80 votes.

District No. 3.—Railway stations on North Coast line from Kanyan to Watalgan and branches thereof—

Bryant, James, Chowey	Returned Unopposed.

District No. 4.—Brisbane to Theebine and branches, Brisbane to Forest Hill and branches north of the line between these stations—

Pryce, David Charles, Toogoolawah	197 votes.
Litzow, Charles, Vernor	136 votes.

District No. 5.—Railway stations from Gatton to Toowoomba and branches, southern and western lines therefrom, and the South Coast line and branches—

Kajewski, Ferdinand August, Ma Ma Creek ..	151 votes.
Little, Edward Vipond, Miles	72 votes.
Olm, John, Brigalow	49 votes.

One representative is required for each district, and the successful candidate will be appointed for a period of two years.

Mr. L. R. Macgregor, Director of Marketing, will be the Minister's representative on the Board.

General Notes.

Cane Prices Board.

An Order in Council has been approved removing all members of Local Sugar Cane Prices Boards appointed in 1926.

A Mount Coot-tha Sanctuary.

An additional 327 acres of land at Mount Coot-tha, recently acquired by the Brisbane City Council, has been declared to be a sanctuary for animals and birds. The land is comprised in subdivision 2 of portion 310, parish of Indooroopilly.

Co-operative Associations Act—Regulations.

Consequent upon the passing of "*The Primary Producers' Co-operative Associations Act Amendment Act of* 1926," it was found necessary to have a concise set of Regulations promulgated, drawn up in sequence and numerical order, which has been effected by the Regulations now issued. All previous Regulations have been revoked and the present Regulations now embody the requirements of both the 1923 Act and the 1926 Amendment Act.

Pineapple Levy Regulations.

The period during which the Pineapple Levy Regulations, approved of in January, 1926, under the Fruit Marketing Organisation Acts, shall continue in force, has been extended from the 25th January, 1927, to the 25th January, 1928. These Regulations provide for a levy at the rate of one-half penny per case of pineapples, payable by growers to the Committee of Direction of Fruit Marketing, through agents.

Staff Changes and Appointments.

Mr. J. T. Yore, of Glenmore, Beaudesert, has been appointed Government Representative on the East Moreton Dingo Board, and Messrs. J. T. Barnes, J. Drynan, C. J. C. Philp, and E. Woods have been elected Members of that Board.

Mr. R. E. Haseler, Assistant Cotton Grader (Senior) has been appointed Senior Field Assistant, Cotton Section.

Mr. T. E. Dwyer, Clerk of Petty Sessions, Innisfail, has been appointed Chairman of the Goondi, Mourilyan, South Johnstone, and Tully Local Sugar Cane Prices Boards, during the absence of Mr. A. E. Aiken, Police Magistrate, Innisfail.

Mr. J. M. McLaren, of Cunnamulla, has been appointed Government Representative on the Paroo Dingo Board.

Mr. M. H. Campbell has been appointed Chairman of the Egg Board until the 31st December, 1927.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Grow More Lucerne in Colder and Drier Districts.

At one time it was considered that lucerne would only give profitable results on rich alluvial flats, and undoubtedly these are the ideal conditions for a stand. But to-day it has been found that even in districts formerly regarded as too cold or as too dry for lucerne, good stands can be obtained which will yield one to two cuts of hay in a fair season before being turned over to grazing for the rest of the year.

In average wheat country, provided the land is not too clayey and is of sufficient depth to permit the plant to form a deep-rooting system, lucerne is one of the best and most drought resistant fodder crops that can be grown. In districts with cold winters and short summers it is giving very satisfactory results as a combined hay and grazing proposition, especially on better class country, while on the poorer class land under similar conditions lucerne is excellent for grazing purposes.

Limitations to a Profitable Stand.—There are two conditions which limit a stand of lucerne and the growth to be obtained from it. They are as follows:—

(1) Soil that is shallow, with an impervious subsoil close to the surface.

(2) Wet land in cold districts, where the plant gets "wet feet." Plenty of moisture is present under these conditions, but the soil does not warm up, and the plant cannot thrive. Stunted growth results, and although the plant may struggle along for twelve to eighteen months, the root systems become "drowned," and the plants usually die.

As farmers and graziers have learned how well lucerne has done in districts previously thought unsuitable for it, the areas sown in such localities have become very extensive.

On second-class pasture land, lucerne is taking the place of clovers in pasture seed mixtures on account of its drought resistance, deep-rooting habits, and all-round permanence.

Sow Good Seed.—As the price of lucerne seed nowadays is generally over 2s. per lb., growers should insist on getting good value for their money. In practically all States of the Commonwealth seed-testing stations controlled by Government officials are established, and tests are carried out for a nominal fee.

Not only are germination tests necessary, but tests for purity are just as important. Various species of dodder (*Cuscuta* spp.), wire or knot weed (*Polygonum aviculare*), paspalum (*Paspalum dilatatum*), couch grass (*Cynodon dactylon*), fat hen (*Chenopodium album*), and various species of dock (*Rumex* spp.) are all detrimental to lucerne stands, and the seed as well as the land to be planted should be free from them.

In a 20-lb pasture seed mixture it is generally sufficient to include 1 to 2 lb. of lucerne. In sowing lucerne for pasture purposes in wheat districts having a limited rainfall, 3 to 4 lb. of seed are ample to plant per acre.

When and How to Sow.—In most localities autumn sowing is recommended. Only where irrigation is available, and spring and summer weeds are not plentiful, or in very cold localities, should spring sowing be carried out. On large areas the wheat drill is extensively used for planting the seed.

The seed only requires a very light covering, and the scheme generally adopted when planting with the drill is to sow the seed through the grass-seed box, allowing the seed to fall in front of the hoes or discs. If no grass-seed box is on the drill, mix the seed with superphosphate, using 1 cwt. of the manure per acre, and pull the tubes out of the hoes or discs, so that the manure and seed will be broadcasted in front of them. Ideally, the seed should be covered with about a quarter of an inch of soil.

On small areas the seed is generally broadcasted by hand or with a broadcasting machine. When a fine-stemmed hay is required, sow 15 to 16 lb. of seed per acre. A heavy sowing tends to produce crowded plants, thus encouraging the growth of fine stems.—A. and P. Notes, N.S.W. Dept. Agr.

Terrace Cultivation.

A large part of Jamaica consists of steep hillsides, and these are utilised for growing crops. Whenever heavy rains occur there is much washing and often land-slides, while cultivation is made difficult on the steep mountain slope by the difficulty of keeping a foothold; damage is done to crops by the feet in weeding, and by the dirt slipping down. When there is a dry spell the crops are easily affected.

The practice of terracing is never tried, yet in many very old countries, cultivated perhaps for a thousand years back or more, the steep hillsides are usually terraced. What does a terrace mean, and is it an expensive method of cultivation? No, it is cheap to make originally, and cheap to maintain, while wash is prevented, drainage secured, moisture conserved, and fertility improved.

Terracing simply means making platforms across or round a hillside (according to the contour) from 3 to 4 feet broad, and these terraces, which are simply like footpaths, are made by beginning at the bottom of the hill and drawing the earth out with an assam fork or broad hoe.

When once they are made they serve also as footpaths and drains, and all crops are planted along them. Permanent crops, like bananas, coffee, and cocoa, should always be planted on this method when the lands are steep. Bananas on a hillside after a year or so usually only have roots on the upper side, the soil on the lower side is washed away, the plant has only half a grip, has only half a root system, and therefore is able only to get half its proper growth, while it is easily blown over by breeze. Cocoa on a hillside usually gets earth heaped up around the neck, and this is one of the most common and dangerous faults in tree-growing. Trees never thrive well if they are choked with soil at the neck or collar, and being unthrifty this leaves them open to the attacks of insects and diseases generally.

If planted on a platform or terrace they are practically on the level, but with excellent drainage. The same applies to coffee.

No trenches are required with a terrace system of cultivation. The trees thrive as well, if not better, than those on an alluvial flat. In the long run the terrace system of cultivation for steep hillsides is economical and efficient.—"The Journal of the Jamaica Agricultural Society."

Preservation of Fresh Fruits and Vegetables.

In an article in the "Refrigerating World," Professor E. L. Overholser indicates the difficulties to overcome for the preservation of fruits and vegetables during a long period, and describes the experiments he has made in methods of refrigeration to define the technical methods to be followed. His conclusions are as follows:—

1. Strawberries, red raspberries, loganberries, blackberries, cherries, figs, apricots, peaches, currants, and gooseberries, frozen at 10 to 12 degrees Fahr., in water or sugar solutions, or crushed with or without sugar being added, in closed containers, were kept a year without deterioration of colour or flavour.

2. Freezing in water of figs, cherries, and asparagus appeared to provide a means of retaining the surplus of these products during the peak of the season for subsequent use by canners, and thus prolonging the canning season of any one product.

3. Freezing with dry sugar provided a means of retaining quickly perishable fruits for pies, pastries, ices, ice creams, and other soda fountain uses, jams, and preserves.

4. Fruits frozen in 30 to 40 per cent. sugar solutions when removed and utilised in a partially frozen condition were as excellent to eat as fresh dessert fruit, and the texture was pleasing. The sooner they were eaten after removal from the freezing temeprature the better they tasted. It seemed possible that large hotels, restaurants, and the soda fountain trade might profitably utilise such fruits because of their superior fresh flavour, serving them as fresh fruits or in other ways.

5. All frozen fruits, however, tended to soften and break down after removal from storage. While the quality is essentially that of fresh fruits, spoilage upon thawing results more quickly than with either fresh or canned products. It would be necessary to educate the public to handle frozen fruits carefully and to keep the material submerged until it is used or cooked.

6. It is possible that canners might become interested in preparing large cans for large consumers or in smaller cans for a special retail trade. Such material would be ordered, delivered, and handled by the retail trade as is now done with ice cream, and served in the frozen condition.

7. With vegetables, hulled fresh peas and asparagus have been frozen in water and subsequently served cooked with the flavour and characteristics of the fresh material. The texture changes effected by the freezing were comparable to those resulting from the cooking.

It is stated that a number of inquiries are being made as to the commercial practicability of this process.

Saline Soils—Causes of Salt Injury.

"Alkali" troubles are as old as irrigation itself. Within recent years much scientific research has been directed towards the solving of the problem, especially in the western States of America, India, and Egypt.

The term "alkali" to designate the condition of a soil brought about by the excessive accumulation of soluble salts is unfortunate. Chemically, alkalies are a very definite class of compounds, which are caustic, and generally have properties opposed to acids, which they neutralise, forming salts. True alkalies never occur in the soil. The term "salt," frequently employed in Australia, is to be preferred, as all the injurious substances occurring in the so-called "alkali" soils are true salts in the strict chemical sense of the word.

OSMOTIC PHENOMENA.

Salts may be harmful in several ways, but the injury due to the phenomenon of osmotic pressure is the most harmful. When a fresh seedling is taken from the soil, its roots, stem, and leaves are crisp and more or less rigid, owing to the fact that they are full of cell sap. If, however, the seedling is thrown on to a hot pavement it will soon lose water and wilt. The same result can be brought about by placing the seedling in a brine solution. A fresh, crisp seedling placed in a solution of salt will soon become flaccid, the cause in both cases being the removal of water from the seedling. When a seedling is growing normally in the soil, the concentration of its cell sap is greater than that of the soil water surrounding its roots, and because of this water tends to pass into the roots, and thus keeps the plant turgid. If, however, the concentration of the water surrounding the roots is greater than that of the cell sap, as is the case in a salt soil, or when a seedling is placed in a solution of brine, water passes out of the plant into the surrounding solution, and the plant wilts. In this case, we say that the osmotic pressure of the solution surrounding the plant is greater than that of the cell sap.

Osmotic pressure may be explained in another way. When any solid, such as salt or sugar, dissolves in water, minute particles, known as molecules, leave the solid to enter the fluid, and the magnitude of the osmotic pressure depends entirely on the number of molecules present, regardless of their kind (whether salt or sugar molecules). The injury of salts due to osmotic pressure is dependent on the magnitude of the pressure, and not on the kinds of salt present.

PLANT POISONS.

Apart from the injury due purely to osmotic phenomena, many salts, such as magnesium salts, are actual plant poisons when present in excessive amounts. Then again, certain salts, such as sodium carbonate (washing soda), although actually not true alkalies in the strict chemical sense of the word, form an alkali when dissolved in water, and thus for all practical purposes may be considered as such. Both a high soil acidity and a high soil alkalinity are poisonous to the plant, but the latter is the more serious. For this reason, therefor, sodium carbonate is very poisonous to plant growth, being, in fact, the most toxic of all commonly occurring salts.

Apart from its effect on the plant, this salt, in common with true alkalies, is very injurious because of its action on the physical condition of the soil. If a little soil is shaken up in water a muddy suspension is obtained; on addition of an acid or salt (such as gypsum) it will be noted that the particles of clay run together, forming little aggregates which soon sink, leaving a clear liquid. It was stated before that the properties of alkalies were opposed to those of acids, and in this respect their action on the soil is no exception, for the addition of an alkali to the clarified liquid will cause the clay particles to again separate, and when shaken the water will become muddy, and the particles will not settle.

In a soil of good tilth, the clay particles are grouped together in aggregates, and the soil is more or less porous, which explains the action of gypsum in the soil, the gypsum causing the clay particles to form aggregates, thus making the soil more open. "Alkalies," such as sodium carbonate, however, have the opposite effect—puddling the soil, causing it to decrease in volume and become almost impervious to water.

Besides having this physical effect, "alkali" dissolves out the organic matter of the soil, giving the soil a black colour; hence, when sodium carbonate is present one observes sunken black depressions almost impervious to water, and absolutely sterile.

Generally speaking, the chief salts present in salt soils are the chlorides, carbonates, bi-carbonates and sulphates of soda, lime, and magnesia.—*Eric S. West, M.Sc., Agr., Research Officer, Commonwealth Citrus Research Station, Griffith (N.S.W.), in the "Agicultural Gazette" of New South Wales.*

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, 1927 AND 1926, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1927.	Jan., 1926.
North Coast.	In.		In.	In.
Atherton	11·51	25	13·27	11·80
Cairns	16·05	44	18·78	21·83
Cardwell	16·70	52	27·13	3·52
Cooktown	14·49	50	9·77	7·25
Herberton	9·45	39	13·42	12·05
Ingham	15·69	34	31·08	2·68
Innisfail	19·98	45	17·01	14·71
Mossman	14·35	13	11·81	12·82
Townsville	11·27	55	18·61	3·71
Central Coast.				
Ayr	11·42	39	16·04	1·42
Bowen	9·95	55	13·46	3·46
Charters Towers ...	5·74	44	5·88	2·64
Mackay	14·61	55	11·00	3·40
Proserpine	16·05	23	17·42	2·21
St. Lawrence ...	9·75	55	9·05	5·48
South Coast.				
Biggenden	5·39	27	8·49	2·93
Bundaberg	9·07	43	25·80	5·53
Brisbane	6·50	76	22·43	3·01
Childers	7·70	31	21·93	2·27
Crohamhurst ...	12·70	35	34·77	9·15
Esk	5·48	39	14·99	7·24
Gayndah	4·69	55	4·64	1·61
Gympie	6·72	56	14·21	2·07
Caboolture	7·47	39	25·76	4·10
Kilkivan	5·53	47	7·58	1·14
Maryborough ...	7·49	54	17·18	4·91

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1927.	Jan., 1926.
South Coast— continued:	In.		In.	In.
Nambour	9·22	30	32·34	10·35
Nanango	4·54	44	10·04	4·43
Rockhampton ...	8·66	39	9·56	3·94
Woodford ...	7·29	39	22·19	7·01
Darling Downs.				
Dalby	3·35	56	4·19	4·41
Emu Vale ...	3·21	30	7·61	3·43
Jimbour	3·71	38	4·14	4·84
Miles	3·79	41	5·96	6·07
Stanthorpe ...	3·61	53	4·91	3·90
Toowoomba ...	4·89	54	13·74	4·84
Warwick	3·56	61	4·40	5·48
Maranoa.				
Roma	3·34	52	3·01	1·70
State Farms, &c.				
Bungeworgorai ...	2·25	12	1·59	1·32
Gatton College ...	4·07	27	9·39	3·21
Gindie	3·91	27	1·61	3·10
Hermitage ...	3·11	20	4·80	6·01
Kairi	7·24	12	*	18·14
Sugar Experiment Station, Mackay	15·22	29	8·32	3·62
Warren	5·46	12	6·91	5·42

* Return not received.

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 1926, 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.

Farm and Garden 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.

In those areas where seasonable rainfall permitted the planting of potatoes, these 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.

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.

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.

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.

1927.	March.		April.		Moonrise. March.	Moonrise. April.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.46	6.24	6.3	a.m. 5.50	2.25	a.m. 4.33
2	5.47	6.23	6.4	5.49	3.32	5.41
3	5.48	6.22	6.4	5.48	4.41	6.48
4	5.48	6.21	6.5	5.47	5.49	7.55
5	5.49	6.20	6.6	5.45	6.57	9.1
6	5.49	6.19	6.6	5.44	8.4	10.7
7	5.50	6.17	6.7	5.43	9.10	11.11
8	5.50	6.16	6.7	5.42	10.16	p.m. 12.8
9	5.51	6.15	6.8	5.41	11.18	1.3
10	5.51	6.14	6.8	5.40	p.m. 12.21	1.52
11	5.52	6.13	6.9	5.39	1.21	2.36
12	5.52	6.12	6.9	5.38	2.16	3.14
13	5.53	6.11	6.10	5.37	3.7	3.48
14	5.54	6.10	6.10	5.36	3.54	4.21
15	5.55	6.9	6.11	5.35	4.34	4.50
16	5.55	6.7	6.11	5.34	5.12	5.21
17	5.56	6.6	6.12	5.33	5.46	5.51
18	5.57	6.5	6.12	5.32	6.17	6.23
19	5.57	6.4	6.13	5.31	6.54	6.58
20	5.58	6.3	6.13	5.30	7.18	7.37
21	5.58	6.2	6.14	5.29	7.50	8.19
22	5.59	6.0	6.14	5.28	8.23	9.9
23	5.59	5.59	6.15	5.27	9.1	10.2
24	6.0	5.58	6.15	5.26	9.38	11.0
25	6.0	5.57	6.16	5.25	10.22	...
26	6.1	5.56	6.16	5.24	11.14	a.m. 12.3
27	6.1	5.55	6.17	5.23	...	1.8
28	6.2	5.53	6.17	5.22	a.m. 12.10	2.12
29	6.2	5.52	6.18	5.22	1.10	3.18
30	6.3	5.51	6.18	5.21	2.17	4.24
31	6.3	5.50	...	...	3.25	...

Phases of the Moon, Occultations, &c.

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

4 March	●	New Moon	5 24 a.m.
10 „	☾	First Quarter	9 20 p.m.
18 „	○	Full Moon	8 24 p.m.
26 „	☽	Last Quarter	9 35 p.m.

Mercury will rise one hour eighteen minutes after, and set forty minutes after the Sun on 1st March. It will be in inferior conjunction with the Sun on the 13th, but instead of a transit across the Sun's face Mercury will be about half of the length of the Southern Cross below it.

Venus will rise one hour forty-six minutes after the Sun on the 1st March, and set one hour twelve minutes after the Sun.

Mars will rise at Warwick at 12.14 p.m. on the 1st and set at 10.36 p.m. It will set at 10.12 p.m. on the 15th.

Jupiter will be on the far path of its orbit almost behind the Sun on the 1st March when its distance from the Earth will be about 576 million miles, and though not directly behind it the intervening luminary will make Jupiter unobservable. It will, however, be visible in the early morning before sunrise, towards the end of the month.

Saturn will rise at 10.58 p.m. at Warwick on 1st March, and at 9.55 p.m. on the 15th.

On 22nd March the Sun will rise almost exactly due east and set nearly due west.

When the Moon rises on the 24th Saturn will be seen to be about three times the Moon's diameter above it, having been occulted about 6 p.m.

2 April	●	New Moon	2 24 p.m.
9 „	☾	First Quarter	10 20 p.m.
17 „	○	Full Moon	1 0 p.m.
25 „	☽	Last Quarter	8 20 a.m.

Venus will be in conjunction with the Moon on the 4th, affording an interesting spectacle low down in the west half-an-hour after sunset.

Mercury will be at its greatest elongation west on the 10th of April.

The occultation of Saturn by the Moon, which will occur before 10 p.m. on the 20th, when both are well situated somewhat north of east, should afford an especially fine spectacle to all observers with or without binoculars.

Mercury will rise one hour fifty-six minutes before the Sun on 1st April, and two hours two minutes before on the 15th.

Venus will set one hour thirty-two minutes after the Sun on the 1st, and set one hour forty-six minutes after it on the 15th.

Mars will set three hours fifty-four minutes after the Sun on 1st April, and three hours fifty-one minutes after it on the 15th.

Jupiter will rise one hour forty-seven minutes before the Sun on the 1st April, and two hours thirty-five minutes before it on the 15th.

Saturn will rise three hours three minutes after sunset on 1st April, and two hours twenty-four minutes after it on the 15th.

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.

GOVERNMENT AGRICULTURAL LABORATORY.

INSTRUCTIONS FOR THE COLLECTION OF SAMPLES, AND SCALE OF FEES.

GENERAL INSTRUCTIONS.

1. All analyses will be carried out in the order in which the samples are received at the Laboratory, with the exception of perishable substances, which will be analysed immediately after arrival.

2. Should any person wish for an immediate analysis, the fee, charged in accordance with the scale of fees below, will be increased by 50 per cent.

3. The samples may be forwarded by parcel post or by rail, carriage paid, to the

Under Secretary for Agriculture and Stock, Brisbane.

In all cases a letter, giving full instructions as to the information required, and enclosing the prescribed fee, must be sent at the same time.

4. Analyses will only be carried out if these instructions are adhered to, and if the samples are taken in accordance with further instructions issued below.

5. The Under Secretary may, under special circumstances, modify the fees charged for analytical work.

SCALE OF FEES FOR ANALYSES.	Public.			Farmers, &c.*		
	£	s.	d.	£	s.	d.
Butter, cheese, margarin, commercial analysis	3	3	0	0	10	6
Butter, cheese, margarin—determination only of boric acid, sulphites, salt, ash, &c., each	0	10	6	0	2	6
Condensed milk, milk powders, commercial analysis ..	3	3	0	0	10	6
Cream and milk—Fat only, by Babcock test	0	5	0	0	2	6
Cream and milk—Fat only, by Gottlieb Rose test ..	1	1	0			
Cream and milk—Commercial analysis	2	2	0	0	5	0
Cream and milk—Test for preservatives, each	0	10	6	0	2	6
Dip concentrates, arsenical dips—Commercial analysis ..	2	2	0			
Dip concentrates, phenolic dips—Commercial analysis ..	2	2	0			
Dip concentrates, mixed arsenical and phenolic dips ..	3	3	0			
Dipping fluids, weed destroyers—Arsenic only	1	1	0	free†		
Fertilisers—Determination only of—						
Fat, lime, nitrogen, nitrate nitrogen, ammonia nitrogen, phosphoric acid water soluble, citrate (soluble and total), potash, each	1	1	0	0	3	0
Degree of fineness	0	10	6	0	3	0
Commercial analysis, including fineness but not fat—						
Blood manure, dried blood	1	11	6	0	3	0
Bone meal, bone dust	2	2	0	0	6	0
Meatworks fertiliser, bone and blood mixtures	2	2	0	0	6	0
Mixed fertilisers, guano, complete	4	4	0	0	10	6
Rock phosphates	2	10	0	0	10	6
Superphosphates	2	2	0	0	6	0
Thomas phosphate, basic slag	2	2	0	0	6	0
Charge for sampling (excluding travelling expenses)	1	1	0			
Foodstuffs, grains, meals, oil cakes—Estimation of—						
Moisture	0	12	6	0	2	6
Crude ash	0	12	6	0	2	6
Crude fibre, crude oil or fat, crude protein, digestible protein, each	1	1	0	0	2	6
Complete commercial analysis	3	3	0	0	10	6
Insecticides, fungicides, &c.—See Pest destroyers.						
Leather—Commercial analysis	3	3	0			

* Reduced fees apply only to such residents in Queensland whose main source of income is from agricultural, pastoral, and horticultural pursuits.

† Dipping fluids are analysed free of charge for the owners of all registered dips.

SCALE OF FEES FOR ANALYSES—*continued.*	Public.			Farmers, &c.*		
	£	s.	d.	£	s.	d.
Leather—Determination of glucose only	1	1	0			
Limestones, marls, quick lime	2	2	0	0	10	6
Meat extract—Commercial analysis	3	3	0			
Parchment papers, butter packing paper	2	2	0	†1	1	0
Pest destroyers—						
Arsenic—Commercial analysis	2	2	0	0	10	6
Arsenic—Determination of arsenic only	1	1	0	free		
Arsenate of lead, arsenate of lime	2	2	0	0	10	6
Bordeaux mixture	1	10	0	0	10	6
Copper acetate, copper sulphate	1	1	0	0	10	6
Cyanide of potassium or sodium	1	1	0	0	10	6
Formalin	1	1	0	0	10	6
Iron Sulphate	1	1	0	0	10	6
Lime-sulphur	2	2	0	0	10	6
Nicotine and nicotine compounds	1	11	6	0	10	6
Paris green	1	10	0	0	10	6
Petroleum or kerosene emulsion, red oil	1	1	0	0	10	6
Phenolic disinfectants, lysols, &c.	2	2	0	0	10	6
Sulphur, flowers of sulphur	2	2	0	0	10	6
Phosphorus pastes	1	1	0	0	10	6
Tobacco dust, tobacco preparations	1	11	6	0	10	6
Preservatives	2	2	0	0	10	6
Rennet	2	2	0	‡1	1	0
Salt—Complete analysis	2	2	0			
Soap—Commercial analysis	3	3	0			
Soils—Estimation of—						
Lime, nitrogen, potash, phosphoric acid, each	1	1	0	0	3	0
Partial analysis	3	3	0	0	10	6
Mechanical analysis	2	2	0			
Complete analysis, including citric soluble and mechanical analysis	5	5	0			
Sugar-cane	2	2	0	free		
Sugars, syrups, molasses	3	3	0			
Tallow, titre test	1	10	0			
Tallow, acidity	0	10	6			
Tanning materials—Estimation of tannins and non-tannins	2	2	0			
Waters—						
Estimation of total solids and chlorine, each	0	10	6			
Partial analysis, for stock and irrigation	1	10	0	0	10	6
Complete analysis	4	4	0			
Wheat—Milling test	2	2	0			
Testing of dairy glassware—						
Milk and cream bottles	0	0	2 each			
Milk and cream pipettes	0	0	3 each			
Dairy thermometers	0	0	6 each			
Special thermometers, lactometers, Brix spindles	0	3	6 each			
Unpacking and repacking Babcock bottles	0	2	0 gross			
Testing N/10, alkali and acid	0	0	6 pint			
Preparing standard iodine solution	0	2	0 pint			

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS.

A rough sketch of the field, paddock, or block of land from which the samples are to be taken should be prepared to accompany the samples. The spots where the samples are taken are marked on this plan, and are numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall, and aspect of land, &c.

† Fee charged to co-operative butter factories.
‡ Fee charged to cheese factories.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two or more parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained. In order to obtain a fair average sample of the soil from a block of land, as nearly as possible equal quantities of soil are collected from various parts of the field.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 in. square are dug in the ground to a depth of 3 ft. The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards, and the holes cleaned out.

Careful note of the appearance of the freshly cut soil of any intermediate layer and of the subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division can only be guessed approximately, and it is best to take the soil uniformly to a depth of 12 in.

With a spade a slice of soil, from 3 to 4 in. thick, down to the beginning of the subsoil or to a depth of 12 in., is now cut off and put on to a clean bag. The same is done with the subsoil, and the slice is staken from where the soil ends (or 12in.) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Take careful note and give description of soils in each hole as numbered and marked on plan. The samples of soil collected on the one bag are thoroughly mixed by breaking up any large clods, and about 5 lb. of the mixed soil are put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected separately on the other bag.

All the samples collected are afterwards placed in a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps.

A short description of the land must accompany the samples and the sketch plan. In the case of cultivated land, state how long the land has been under cultivation, what crops were chiefly grown, results of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ring-barked, if scrub or forest land what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., is of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c.

Only by adhering strictly to these instructions, and by giving minute details, can benefit be derived from the soil analyses.

Special forms of application for "*Advice as to Manurial Treatment of Soil*" have been prepared, and may be obtained from the Under Secretary, Department of Agriculture and Stock.

It is strongly advised to fill up one of these forms in each case when a sample of soil is submitted for analysis.

WATER.

It is best to collect and forward samples of water for analysis in stoppered glass bottles, generally known as Winchester quarts.

The bottles have to be perfectly clean, and stoppers must fit well. Corks should be avoided but if used must be new and well washed with the water before being used for closing the bottle.

When taking waters from taps, pumps, bores, the water must be allowed to run for a while before taking the sample. When taking the water out of a well, pond, or river, the bottle is completely immersed, but care must be taken not to disturb the mud or sediment at the bottom of the water. Before the sample is actually collected, the bottle is rinsed three times with the water, filling each time about one-third full. The bottle is then filled within about 1 in. from the top; the stopper is inserted and securely tied down with a clean piece of linen or calico.

The stopper must not be fastened or luted with sealing-wax, paste, plaster of paris, &c.

State for what purpose the water is to be used, as for irrigation, household purposes, factory use, steam boilers, stock, &c.

Forms of application for "*Analysis of Water*" have been prepared, and may be obtained from the Under Secretary, Department of Agriculture and Stock. Suitable bottles for taking samples of water, both for chemical analysis and for bacteriological examination, may also be obtained on application.

FERTILISERS.

When taking samples of artificial manures from bags, the samples must be taken from different bags and at different places of the bag and not only from the top; or the contents are emptied on a heap and mixed up well, and the samples then taken.

The samples sent for analysis should not weigh less than ½ lb., and not more than 2 lb., and should be contained in a clean, dry bottle (lightning jars are very suitable), or stone jar, or in tins with tightly fitting lids. To each sample must be securely attached a label, giving all the particulars required by the regulations in connection with "*The Fertilisers Act of* 1914" and "*The Fertilisers Act Amendment Act of* 1916."

It is extremely difficult to obtain a fair average sample from a large quantity of a mixed fertiliser. Special precautions have to be taken, and a special sampling tool must be used. Minute instructions to take such samples are being prepared, and the inspectors under the Fertilisers Acts will be instructed in the proper method of procedure.

FOODSTUFFS.

It is always important to obtain good average samples, and this can only be done by carefully taking the samples from different places, mixing well, and taking a portion of the mixture. This method would apply to any dry foodstuffs—as grains of any kind, peas, beans, chaff, pollard, meal, &c. For the analysis of green foods —as green hay, sorghum, silage—it is best to make a mixture of the sample by passing it through a chaffcutter, and by taking an accurately weighed quantity—say, 3 lb. This quantity is then dried in the sun, taking care that nothing is lost, and when dry put in a bag and forwarded for analysis, stating how much of the original green stuff the total amount of the dried material sent represents.

To collect information about value of *green manures*, it is best to plot out exactly 1 square yard in the field covered with the plant, not picking out a position where the growth is very heavy or poor, but about a fair average. Four pegs are driven into the ground at the four corners, and strings stretched between them; with a sharp spade all the plants are cut along the strings, so as to get really the growth of 1 square yard. The plants are all collected and accurately weighed, passed through a chaffcutter, and the sample for analysis taken as above described. In many cases the roots may be also pulled out, weighed separately, and a sample forwarded.

The samples must be accompanied by a description of the crop—when planted, how old when cut, if the land was manured or not, weight of crop per acre or per square yard, and weight of the sample forwarded when in its green state. In the case of green manure it is generally best to take the samples just after flowering, and immediately before ploughing in.

Wheat.—Samples of wheat sent to be tested for their milling qualities, and analysis of flours obtained therefrom, should not weigh less than 2 lb. each, and should be well cleaned and free from weevils. Give full particulars about the locality in which the wheats were grown, and also the weight of the crop in bushels per acre.

Milk and Cream are best preserved for analysis by adding to every 8 oz. of liquid about 5 grains of powdered bichromate of potash, and mixing the sample with the preservative by shaking the bottle.

Should it be desired to have a sample of milk or cream tested for preservatives, a second sample should be sent in its natural state.

The sample bottles should be closed with a well-fitting cork, and placed with the cork downwards in the boxes so that the cream will not collect on the cork but on the bottom of the bottle.

DIPPING FLUIDS.

Special forms for taking and forwarding dipping fluids for analysis may be obtained on application.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Dry Season Insurance.

That the matter of a national drought insurance scheme for the elimination of the drought menace had occupied the attention of the Queensland Government for some time past was stressed by the Acting Premier and Minister for Agriculture and Stock (Mr. W. Forgan Smith) in the course of a recent Press interview. The Minister himself has given the question comprehensive consideration, and discussed it on and off the platform, and he said that he appreciated the fact that if the recent discussion on the need for such a scheme conduced to the development of an enlightened public opinion on the matter, then it would have performed a very useful public service.

Mr. Forgan Smith went on to say that the difficulty had always been that though, in dry weather, the necessity for fodder and water conservation was fully realised by those concerned they were liable in bounteous seasons not to practically apply the lesson which they had previously learnt. It was within the bounds of possibility to provide for a proper system of dry season insurance, but it would require to be on a comprehensive scale. He had come to the conclusion that it would require to be compulsory, at least over a large area. Under the Agricultural Bank Act provision was made for special loan facilities for the erection of silos, for the improvement of water supplies, and for water conservation generally. It was a matter for regret that these facilities had not been taken advantage of to as large an extent as he would have liked.

He intended to have the question again listed for further consideration at the conference of Ministers for Agriculture and Directors of Agriculture which would be held in Adelaide this year.

A Wealth of Goodwill.

"The work of the Queensland Country Women's Association has a human touch about it, and a wealth of goodwill is manifested through its many activities," was the tribute paid by the Mayor of Brisbane (Alderman W. A. Jolly), who presided at the fourth annual meeting of the metropolitan branch of the Country Women's Association recently. The metropolitan branch has a membership numbering 233, and among its sub-committees is one that concerns itself with aiding travellers. Another sub-committee visits the hospital for sick children, and a member supervises the despatch of letters from children in hospital to their mothers in the country. A weekly car ride is conducted for convalescents.

Accommodation for about 440 mothers and children has been found at the metropolitan seaside home at Sandgate, and the demand has been in excess of that available. It is hoped to enlarge the home in the near future.

The association exerts a beneficial influence in many other directions, and all its activities are governed by the principle of selfless service. In moving the adoption of the annual report Archbishop Duhig said he did not know of any organisation stronger than the Country Women's Association. It had members representing every section of the citizens, and had the sympathy of all creeds and citizens in every part of the State. That was a very big advantage. They had some associations that were just sectional, but the Country Women's Association had cast aside all class considerations and had broken down all barriers, hence its enterprise was meeting with wonderful success.

The Commonwealth and Agricultural Research.

A conference of representatives of State Departments of Agriculture, the Universities of each State, and other bodies interested in agriculture (convened by the Council for Scientific and Industrial Research) was held in Melbourne in the course of the month to discuss the participation of the Commonwealth in agricultural research, particularly into the production of new varieties of plants.

It was decided that although much valuable investigation had been made by State Departments, and many new varieties of wheat had been produced, the work should be encouraged and extended to include other farm crops and plant genetics. The investigation of the character of plants and of the genetic factors involved in disease resistance, it was decided, should be a subject of research by the Commonwealth Department. On the other hand, plant-breeding, the application of scientific principles to the improvement of existing varieties, should be investigated by existing organisations. A similar division should be made regarding animal genetics and animal breeding. The establishment of a research station in tropical agriculture was recommended.

Farmers' Parliaments—What is done in South Australia.

The farmers of South Australia have evolved a valuable scheme of educational conferences and local gatherings at which practical working plans and methods of immediate local or seasonal importance are discussed, points of view defined, opinions exchanged and, when they differ, earnestly debated in a friendly way. These assemblies are held under the auspices of the Agricultural Bureau, which is linked with the Department of Agriculture, and of which every little local centre has its branch. In the course of a recent visit to the great Southern wheat State the editor of this Journal had an opportunity of observing the scheme at work, and no one could fail to be impressed by its practical value to working farmers. In addition to monthly branch meetings district conferences are held periodically. Every meeting is made interesting. Set papers on field and stock raising practice and systems of cultivation are read by farmers and are open to general discussion. The value of active association with the bureau is appreciated by country people generally, who maintain a lively interest in its activities. The agenda of a recent conference at Ceduna gives some idea of the scope and usefulness of its work. Papers were read by farmers, who had backed their theories successfully in actual practice, on conservation of water and fodder, stock breeding and raising, the importance of good breeding, and rust in wheat. A "free parliament" followed in which points in field practice, wants, and grievances were discussed unreservedly. At branch meetings the same order is observed, with the result that a bureau meeting is never dull, and never means an evening wasted in futilities.

Women's branches, which correspond largely with the Country Women's Association, have also been formed, at the meetings of which matters of domestic economy and hygiene are intelligently discussed and useful knowledge disseminated. The underlying principle of these women's auxiliaries is plain. On most of the South Australian farms the poultry-yard, the dairy, and the fruit and flower gardens are as much the care of the woman as of the man, and it is realised that to restrict the advantages of the bureau to one sex is to hamper unnecessarily the development of these industries. Help for the country woman, both in respect to the branches of agriculture in which she is particularly interested and to her domestic responsibilities, is the objective of the bureau, and the experience of many years suggests that the Women's Agricultural Bureau performs most valuable service in rural districts. The attendance and interest of young people are also strongly fostered, and they are encouraged to express their opinions freely. The result is that through practice at bureau meetings the farmer is never at a loss to express himself forcefully, fearlessly, clearly, and intelligently on matters affecting his own industry and the welfare of the State, when necessity calls or the occasion demands.

Mastitis—Another Indictment Against the Fly.

At a recent gathering of veterinarians in Wales a virulent type of mastitis was discussed. The type as known in British dairying districts, it was said, is quite a distinctive one, and frequently, on superficial examination, the subject cow's udder hardly seems serious enough to account for the fact that the animal is extremely ill. Little pain, as a rule, is evinced on the handling of the affected part; it is swollen, and somewhat "doughy" to the touch, pitting on pressure. The contents of the sinus are flaccid and soft, and when withdrawn, are most offensive. The condition is most noticeable, according to a writer in a recent issue of "The Veterinary Record," at a time of the year when conditions are most favourable for fly breeding. The disease frequently attains the magnitude of an epidemic, affecting not only active lactating cows but dry cows, and in practically all cases the toxæmia is profound and the prognosis, especially if more than one quarter be affected, grave. Infected animals are a serious source of danger, and infection in concentrated form can be carried direct from them to others by the same medium as was probably the carrier in the first instance. As a result of close observation the common fly is blamed as the carrying cause. Most of us have seen how flies swarm around the orifice of the teat for the drop of milk remaining in the saucer-like little depression at the end of the teat, and it is not hard to understand how infection by the disease-carrying fly may be developed *viâ* the duct upwards. The annointing of the end of each teat with some adhesive disinfectant, such as carbolised vaseline or carbolised zinc ointment, is advised as a precautionary measure. On many dairies in the Old Country each milker is supplied with a small tin of the ointment which he carries in his pocket and, on completion of milking, dabs a little on the end of each teat. This practice has produced gratifying results and has led, when properly carried out, to entire prevention of mastitis and similar ailments.

Stomatitis—Nose and Mouth Affection of Cattle.

Every day inquiries are coming to the Department from stockowners in different parts of the State, but mainly from Southern districts, concerning an affection of the nose and mouth of cattle. In many cases so severe is it that the animals suffering from it are unable to eat. It is marked by exudations of saliva from the mouth. In some dairying districts it has become almost an epidemic. The Chief Inspector of Stock (Major Cory) has supplied the following note on the ailment for the benefit of our readers:—

"'*Stomatitis*' (inflammation of the lining membrane of the mouth).—This affection is due to various causes; but is most commonly seen in this country after wet weather when grasses are abundant, and affected with fungi due to the excessive moisture. Unless affected animals are treated in the early stages serious consequences may follow.

"The treatment recommended is to give the cow ¾ to 1 lb. of Epsom salts, 1 tablespoonful of ground ginger in one quart of cold water. Then the mouth should be washed out several times daily with either of the following washes:—A home remedy is: 1 tablespoonful of salt, ¼ pint vinegar, 1 quart water, well mixed together; but the following is preferable: ½ oz. chlorate of potash, 2 oz. glycerine, 1 pint water."

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations has received the following report (23rd February, 1927) from the Entomologist at Meringa, Mr. E. Jarvis:—

A NEW INSECT PEST OF MAIZE.

An interesting occurrence of the little chrysomelid beetle *Rhyparida morosa* Jac. was brought under my notice on 1st January, when several tiny grubs found to be destroying young maize plants in the Atherton district were submitted to this Experiment Station for identification.

These specimens, which were subsequently reared at our laboratory to the pupal and beetle conditions, proved to be—as was anticipated—the larval stage of one of our well-known cane pests, a small black or bronzy-black beetle about a quarter of an inch long, and of shining, very convex form, which is often found eating shot-holes in cane-leaves, blady grass, &c. Of late years its grubs have proved injurious to young shoots of plant and ratoon cane; being responsible for the local occurrence of "dead-hearts," which, however, are generally distributed more or less erratically over small areas of cane land.

At Atherton, larvæ of this insect were discovered in the soil to the number of a dozen or more around and amongst the roots of maize seedlings about 9 in. high, eating into the basal portion of stems and gnawing the succulent young roots; such damage resembling in appearance that caused by them to tender shoots of cane.

The habits and metamorphosis of *Rhyparida morosa* were first studied by the writer during 1920 (see "Queensland Agricultural Journal," vol. xiii., p. 274). Since that date, however, this pest has attracted attention from canegrowers in certain localities of the Cairns district as being a stem-boring insect of minor importance.

Occasionally these beetles occur in very great numbers over restricted areas of uncultivated forest country, where they can be observed at times resting on the flower-spikes of such grasses as *Andropogon fasciculatum* ("Mackay's Pest"); on leaves of "blady grass"; or more rarely assembled gregariously around the ends of young twigs of species of *Ficus*.

When noticed in considerable numbers on headlands supporting blady grass, &c., collecting the beetles by shaking them by thousands into shallow pans containing a film of kerosene on water is sometimes advisable.

Destroying the Subterranean Grubs of *Rhyparida morosa*.

Upon the first indication of "dead hearts" the grub-infested soil should be treated with paradichlor or carbon bisulphide.

It is quite useless to apply the latter fumigant unless the ground to be treated be free from excess of moisture, since otherwise the fumes being unable to travel between the soil particles will assuredly fail to reach more than a very small percentage of the grubs present. From three to four fine days should be allowed to elapse after heavy rain before commencing to fumigate well-drained volcanic soils.

Combating Grubs of Greyback Cockchafer.

Early in March the grubs of our formidable cane-beetle *Lepidoderma albohirtum* will be found in the second and third instars or stages of development, being at this time of year capable of inflicting their maximum degree of injury to the main roots of cane stools nearing maturity. These grubs may at once be distinguished from each other by the size of the head, which in those of the second instar measures $\frac{1}{4}$ in. in width, while in third-stage grubs the width is $\frac{3}{8}$ths of an inch. Although the size and weight of the body may of course vary considerably during the periods occupied by these instars, the head measurement always remains the same. Growers should make a mental note of these head widths of first, second, and third stage grubs of the greyback cane-beetle—viz., $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{3}{8}$ of an in. respectively.

With regard to control of these grubs, fumigation of infested cane land has been proved to be the best remedy known at present. The most effective fumigants to use for such work have been found to be paradichlorobenzene and carbon bisulphide.

The latter should never be used during wet weather. Application is made with a "Danks Injector," an appliance specially designed for this work, of very similar construction to the well-known Pal Injector used by M. Gastine more than thirty years ago for fumigating vineyards in France and elsewhere to destroy the dreaded "Grape Louse" (*Phylloxera vastatrix* Planch.).

The dosage usually recommended for cane-grubs is about half an ounce of carbon bisulphide applied at intervals of from 12 to 15 in. apart on both sides of the cane rows, and about 3 in. from the centre of the stools.

If using paradichlorobenzene, however, application may be made at any time during fine weather, as this fumigant continues to act effectively during a period of six to eight weeks after injection into the soil; whereas the toxic influence of carbon bisulphide does not last more than about twenty-four hours.

In addition to affording such prolonged fumigation (well calculated to destroy 100 per cent. of the grubs), paradichlorobenzene is insoluble in water, so that should excessive wet chance to immediately follow its application the action of this fumigant is merely retarded for the time being, and again becomes operative directly the surplus moisture in the soil has drained away.

Paradichlorobenzene can be produced from Messrs. Buzacott and Company, Limited, Brisbane, and Australian Co-operative Fertilisers Company, Roma street, Brisbane, in tins holding 32 lb., at a cost of 1s. 1d. per lb., while carbon bisulphide is obtainable from Taylor and Ellott, Limited, of 154 Charlotte street, Brisbane, in metal drums containing about 60 lb.

Experiments against the Giant Termite Continued.

During a recent visit to the Burdekin district last December, a few thousand living specimens of the notorious "white ant" (*Mastotermes darwiniensis* Frogg.) were collected by Mr. J. H. Buzacott (Assistant to Entomologist), and brought back to our laboratory at Meringa to be used for experimental purposes.

These insects, which consisted almost entirely of workers, were placed in suitable cages, containing pieces of cane stick to provide food and moisture, and up to the present (11th February) have lived inside these canes for fifty days.

Details of the various poison-baits tested need not be given here, it being sufficient to state that the simplest, cheapest, and most effective was found to be sodium arsenite.

The following brief summary of experiments with this poison carried out by Mr. Buzacott will be of interest to canegrowers:—

> "19th January, 1927.—Six cages were half-filled with soil and twenty termites placed in each. Three of these cages were furnished with pieces of split cane, and served as controls. The other three had pieces of cane soaked in a saturated solution of sodium arsenite placed in them. On 20th January, the termites in the three treated cages were all dead, whereas those in the controls lived for some days."

This experiment was confirmed a few days later by using 140 termites confined in seven cages, when we found that sections of cane soaked in a 10 per cent. solution of sodium arsenite gave similar results to those mentioned above.

Effects of Calcium Cyanide upon the Eggs of Cane-beetle.

Laboratory experiments conducted during last January (1927) demonstrated the efficiency of calcium cyanide as a fumigant for destroying the eggs of *Lepidoderma albohirtum* Waterh.

Eggs of this cane-beetle were buried a few days after deposition in cages containing moist earth, which was then injected with ten-grain doses of the flaked form, placed about 2 in. above where the eggs were lying.

Twenty-four hours later they were removed and laid on damp soil in Petrie dishes, in order that subsequent developments might be easily noted. Those taken from control cages increased in size from day to day, remaining throughout the experiment of a creamy-white colour, and finally at the end of a fortnight producing grubs; while all the eggs that had been subjected to fumigation failed to develop, turned brown in a few days and became mouldy-looking, thus giving a mortality of 100 per cent. as a direct result of this treatment.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has made available the following report (24th February, 1927) of the Southern Assistant Entomologist, Mr. R. W. Mungomery:—

Identity of Cane-beetle (*Lepidiota trichosterna* Lea).

Considerable confusion has arisen concerning the identity of one of our Southern Scarabæid beetles whose larvæ have been found damaging sugar-cane, and, up to the present, it has been referred to under the name of *Lepidiota grata* Blkb. In Bulletin No. 16, page 55, *L. grata* is described as coming from Gin Gin, and mention is also made of specimens of cane-grubs having been received from that district which in general appearance resembled those of *L. rothei*: . . . "the anal path being bordered by a slightly convex row of 12-15 setæ on either side meeting across the path . . . In view of the close resemblance of adult grata to that of rothei, it would seem perfectly feasible to connect the grubs from Gin Gin with the former species." Thus these grubs have gone under the name of *L. grata*, and it is evident that those grubs which at that time were injuring cane, were identical with the ones now perpetrating the greater portion of the damage in Gin Gin.

However, I am indebted to Mr. E. Jarvis for bringing under my notice that *L. grata* was a misnomer for our Southern species, and it is probable that this beetle does not occur at all in the Bundaberg district. Mr. Jarvis forwarded specimens of *Lepidiota No. 215*, taken in the Gordonvale district, to the British Museum for identification, and he was advised that that species was *Lepidiota grata* Blkb., and he further adds, "Accepting the British Museum identification, therefore, it is evident that the grubs in your district (Bundaberg) thought to be those of grata are not that species at all, but the larvæ of an undetermined Melolonthid."

During the past year these grubs have been reared through to the beetle stage, and Mr. A. M. Lea, coleopterist of the South Australian Museum, has kindly identified specimens forwarded to him as *Lepidiota trichosterna* Lea, this beetle being originally described in the "Proceedings of the Linnean Society, New South Wales," 1924, page 309, the type specimen from Gin Gin.

Thus *Lepidiota trichosterna* Lea becomes one of our serious Southern cane pests, doing noticeable damage at South Kalkie, Burnett, and Elliott Heads, Avoca, Gin Gin, and at Goodwood, and the habits of the insect which have at various times been described in previously monthly reports by the writer, under the name of *L. grata*, should be taken as referring solely to the species *Lepidiota trichosterna*, and not to *Lepidiota No. 215.*

Effect of Weather Conditions on Cane-grubs.

Phenomenal rainfall during the months of December, 1926, and January, 1927, in which period from 45 to 50 in. of rain fell, has had a decided influence on the natural control of several of our soil-frequenting insects. In this manner, as a result of many canefields in parts of the district being partially flooded, grubs have in several cases died through drowning. The precipitation during these months has been particularly heavy and long continued, and in December the rainfall amounted to approximately 20 in. Therefore, when rain ultimately ceased towards the end of that month, the fields were in a thoroughly saturated condition, and this state of affairs was maintained until the 18th January, when heavy rains again commenced to fall and continued almost to the end of January.

The most important falls registered at the Southern Sugar Experiment Station were 3.26 in. on 18th January, 6.20 in. 19th, 4.75 in. 22nd, 4.20 in. 25th, 1.63 in. 28th, and 2.19 in. on 1st February. This had the effect of keeping certain low-lying fields in a water-logged condition for over a fortnight, while parts of other fields were completely submerged during the whole of this period. The result was that many grubs were later found in the soil either dead or in an apparently lifeless condition. Concerning these latter, several of them were placed in drier soil and a few subsequently recovered, and these probably were those that had been submerged for shorter periods, while the remainder that had been submerged for longer periods died through the harsh treatment that they had received at Nature's hand. This mortality was observed to have taken place with third-stage grubs of *P. furfuracea*, and no doubt other species of Scarabæid grubs common in the Bundaberg district suffered a similar fate, and it is most likely that first-stage grubs, which at that time would be just hatching out, would suffer an even greater mortality, and it will be interesting to note during 1927 and 1928 whether grub infestation has materially lessened.

It may not be generally known that the artificial flooding of areas under cultivation for the destruction of white grubs has been in practice in many parts of Hungary since 1888. There it is customary to flood the meadows for periods of about eight days, this being the time required to kill the larvæ of the common European cockchafer (*Melolontha vulgaris L.*).

Weather conditions such as we have lately experienced have been especially advantageous to the destruction of our cane grubs, for during these months of the year grubs are particularly active, and after the first rains would be located near the surface of the soil. Such volumes of water falling in a comparatively short space of time would inundate fields, and the friable nature of the soil would allow the water to permeate through its loose particles and overwhelm the grubs before they had the opportunity to retreat to more impervious strata. Again, respiratory processes would then be at a maximum during summer, so that it would not be long before grubs were rendered inert through asphyxia and eventually died. Such mortality would take place in low or badly-drained fields only, in contrast to hill sides, where the water would quickly run off and the grubs soon recover from their temporary lethargy, therefore, it is doubtful whether places like Childers, Gin Gin, &c., which are characterised by the hilly nature of the fields under cultivation, would enjoy the same benefits that have resulted here from these recent heavy rains.

The Director of the Bureau of Sugar Experiment Stations has received the following reports (22*nd February*, 1927) *from the Assistant to Pathologist, Mr. E. J. F. Wood.*

Mosaic Problem in the Nambour and Beenleigh Districts.

The true aspect of the Mosaic Disease problem in regard to sugar-cane is largely a matter of conjecture in Southern Queensland. When shown the symptoms of the disease most farmers remark, "Yes, but it doesn't seem to have any great effect on the cane, and I haven't got much of it." Therein lies the insidiousness of this disease, for the cane to all appearance is practically healthy except for the characteristic leaf blotches. The crinkled and cankered nature of the stems is not apparent till the cane is cut, and then it is commonly put down to dry weather, wet weather, a touch of frost, or other causes.

Experiments have been carried out to find out if the c.c.s. is lowered by the disease, but the difference would seem insignificant, and some observers have denied its existence. The effect is in the size of the stick, the number of canes per stool and the consequent tonnage per acre. One can see at a glance that this is almost impossible to estimate accurately unless one has a field of 100 per cent. infected and another of the same variety alongside 100 per cent. healthy.

Present Extent of the Disease.

Out of eighty-one farms visited at Beenleigh, twenty-six were found to have Mosaic more or less spread over the farm. Fields of Green Baruma (N.G. 48) were found from 60 per cent. to 100 per cent. infected. The effect on this cane was noticeable to the farmers at cutting time.

At Nambour, many of the farms I visited showed more or less Mosaic. Mosaic Disease has been present in the Nambour district for twenty years or more.

Resistance and Tolerance.

There is a great deal of difference in meaning between these two words, with regard to Mosaic Disease. Q. 813 is highly resistant, and one will only find odd stools infected with Mosaic, even with a susceptible variety growing alongside. But the infected stools hardly grow at all and are a total loss. N.G. 48, on the other hand, grows almost to its normal height, and at times higher than usual, but the cane is cankered and withered looking, and the sticks are thin. This variety is susceptible but tolerant.

Control.

The use of a resistant variety such as Q. 813 is the best means of control, and if this be followed by efficient roguing the disease can be eliminated. Roguing is useless with a susceptible variety, as the disease spreads too rapidly and the process is not economical. Seed selection, has, in previous reports of this Bureau, been stressed and cannot be too much insisted upon.

The Future of the Problem.

The possibilities with which one is confronted are not the brightest. That is unless the farmers realise that Mosaic is a *serious disease*, capable of paralysing the sugar industry. It has terrorised the farmers in Porto Rico, and is now paralysing the industry in Louisiana.

Mr. A. F. Bell tells us that in the latter country they grow cane and corn adjoining each other as a general practice. Brandes and others have conclusively shown that the disease is readily transmitted between the two, and Mr. A. F. Bell gives this custom as the reason for the magnitude of the trouble in Louisiana.

This is precisely the practice among the farmers of the Beenleigh and Nambour districts, and unless some precautions are taken there is no reason why we should not suffer as much as Porto Rico and Louisiana.

Control measures are ready to our hand, for we, unlike Louisiana, have resistant varieties. If farmers can be persuaded to grow these and to get rid of N.G. 48 and Shahjahanpur 10, and, if necessary, such moderately susceptible varieties as D. 1135 and M. 1900 Seedling (by moderately susceptible, I mean those which show 30 to 60 per cent. infection as a general rule, where the disease is prevalent), and to rogue these fields frequently, the disease need never worry us.

The farmers should be urged to cease the practice of growing cane and corn on the same farm, and to keep fields and headlands clean of those grasses which are susceptible to Mosaic, for the corn aphis will transmit the disease to cane and many other grasses, though corn is its favourite host.

The object of this report is to warn farmers that they cannot afford to trifle with this disease, as it spreads rapidly, and has been estimated to cause a 50 per cent. to 70 per cent. loss in fields with 100 per cent. of infection (I quote Mr. A. F. Bell), which would create a deplorable state of affairs.

NAMBOUR AND MARYBOROUGH.

28th February, 1927.

In the Nambour district, Gum remains the biggest problem against which both the farmers and the officers of this department have to strive. It is a pity that so many farmers persist in their preference for D. 1135 despite the known susceptibility of this variety to Gum Disease. The fact that a dry spell has somewhat alleviated the disease last year has made many farmers forget the ravages of the year before. Most farmers will admit that D. 1135 gives a lower c.c.s. than such canes as H.Q. 285 and Q. 813, and that as it ratoons it becomes thinner in the stick, though it stools out as much as ever. Q. 813 gives on the average the same tonnage per acre, with fewer sticks and is far more resistant to disease than D. 1135. Luckily, Fiji Disease has not been found at Nambour. The Department is fighting hard to keep this malady within the Maryborough and Beenleigh areas. If it chanced to be already in the Nambour area, or if canes were surreptitiously introduced from Maryborough, Beenleigh, or the Northern Rivers, and it sprang up, D. 1135 would be wiped out.

Mosaic also affects D. 1135, while Q. 813 resists this and the other diseases. In this latter cane the farmer has a splendid substitute for D. 1135, except on very sandy soil. Here H. 227 or Q. 1098 might well be tried.

No cane can be said to be immune to Fiji, Gum, or Mosaic (except Uba), but with Q. 813 the few odd stools that may become infected can be economically "rogued" and burnt.

The infection, in a badly-infested area, would be about .01 per cent. or less, while with D. 1135 Gum attacks 10 per cent. to 70 per cent., Fiji 10 per cent. to 60 per cent., Mosaic about 30 per cent. in a similar area. Such fields cannot be dealt with. Q. 812 A has been considered identical with Q. 813, but it seems that this remains to be proved. The disease resistance is similar, but the cane seems darker in the stalk and the farmers say that they get a higher density. This obtained in six farms which grow the variety, so that the difference seems real. Farmers intend planting both varieties on a large scale when their identity or otherwise may be proven.

H.Q. 285, known as Early Maturer, is moderately susceptible to Gum and is useless for standover crops. The Rind Fungus (Melanconium sacchari) causes trouble in this cane, but as it is considered as a secondary parasite is probably due to borer infection (Phragmatiphila truncata) or to drought checks. It is a soft, quick-growing cane with a good c.c.s. (15); but cannot be highly recommended.

Badila is too slow in growing in this area, which is unfortunate, although its resistance to disease is much less here than in North Queensland.

The need is arising more and more for efficiently controlled nursery plots in isolated areas, run in conjunction with disease resistance, trials on badly infected farms. This would give each district the benefit of a number of well tried varieties to choose from, and a series of manurial and soil trials could be run for the more successful varieties. Such plots could well be run by farmers and millers in conjunction under the auspices of this Bureau, and would amply repay both parties. Seed selection and roguing could then be efficiently carried out, and disease reduced to a minimum.

In the Maryborough district, a much graver aspect is presented. Fiji disease has actually been seen on twenty farms, and more may be within the infected area. Many farmers are of the opinion that since the disease has not yet caused heavy losses, it may be disregarded. Never was there a greater mistake. The disease seems to have been present for from six to ten years, and if we assume, as we may well do, that it arose in one or two farms, through infected cane brought from Beenleigh or the Northern Rivers, the fact that it has spread to twenty farms, in which it is in almost every field to the extent of 1 or 2 per cent., shows that it is insidiously spreading.

On one farm in this area, I noted a field of M. 1900 Seedling (about ½ of an acre) only about ten healthy stools. Some had not ratooned owing to Fiji Disease, and the rest were hopelessly infected. Unless steps are taken *by the farmers* this sort of thing will become general.

The measures recommended just now are—

(1) The planting of more resistant varieties—Q. 813 and H.Q. 285.

(2) Efficient removal (roguing) of any diseased stools found.

(3) Seed selection. No cane within quarter of a mile of infected areas should be used for seed.

A detailed survey of the infected area is being made and, when finished, the results will be published in conjunction with the information gleaned by Mr. Dormer and myself at Beenleigh.

Mosaic is too prevalent in the Pialba area, and in this connection I must reiterate some advice I am continually giving to the farmers. *Shahjahanpur 10 should be dug out immediately.* It is 100 per cent. infected with Mosaic and distributes it to other varieties. It is a pity to see splendid farms, such as those at Takura, The Mountain, and the Nikenbah-Kawungan area spoiled by an ever-threatening invasion of Mosaic. *Now is the time to strike* before things have gone too far. A field spoiled by the digging out of a few plants is far better than one showing 20 per cent. loss of crop by disease. The Mountain, Pialba, and Takura areas would do well to isolate themselves, stamp out Mosaic and arrange for facilities to interchange plants without drawing from outside. They have all the best varieties growing on rich and poor soils, so a change of variety and soil are easily obtainable. Green manures should be more used in these areas, and in this connection it is most economical to harvest one's own seed. Corn is not a good green manure—it transmits Mosaic. Trials of various plants would well repay the growers. Mauritius bean, cowpea, giant cowpea, Poonah cowpea, and rice bean are recommended for trial, if seed is obtainable.

Cockchafer beetles are causing damage at the Mountain, and wire worms in some farms around Maryborough.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Prepare to Combat Army Caterpillars.

Larvæ of our various species of Army or Grass Worms may suddenly invade cane land this month in more or less formidable numbers, so it is well to be ready to meet any attack that may call for prompt repressive action. A Knapsack spray pump and a few pounds of lead arsenate paste can be obtained at moderate cost, and will not deteriorate through keeping.

When the army chances to assume vast dimensions, deep furrows should be ploughed in front of the line of march taken up by the advancing host of caterpillars. The side of each furrow farthest away from the army should be trimmed with a sharp spade to form a vertical or slightly overhanging face; and holes about 1 ft. square and from 2 to 3 ft. deep dug in the bottom of the trench from 15 to 20 ft. apart. When these holes become filled up with the bodies of caterpillars travelling up and down the furrows trying to escape, a little kerosene is poured upon the struggling mass, which a few minutes later can be shovelled out of the holes to make room for more victims.

Ordinary outbreaks, however, can generally be effectively controlled by spraying the cane leaves with lead arsenate, in such manner as to form a poisoned strip or band of about three cane rows wide immediately in front of the line of advance taken up by the caterpillars. Use 2 lb. of lead arsenate in about 50 gallons of water; taking care to keep the mixture well agitated whilst spraying it over the leaves, in order to ensure and maintain uniform suspension of this arsenical in the water.

Another good remedy is to mix up a poison-bait consisting of 1 lb. of Paris green thoroughly incorporated with 20 lb. of bran, to which is then added 2 lb. of molasses dissolved in a sufficient quantity of water to reduce the bait to a thick crumbling mass.

Sprinkle this mixture in pieces about the size of a walnut among affected cane rows, or in a furrow ploughed just in advance of the approaching caterpillars. This latter remedy applies chiefly to larvæ of such grass worms as *Laphygma exempta*, the so called "Swarming Caterpillar," which traverse the ground between cane rows even during midday in hot sunny weather, going from plant to plant.

Such poison-baits are best applied towards sundown, as they will then keep moist for a longer period and serve to destroy larvæ of *Cirphis unipuncta* and *C. loreyi*, which feed mostly under cover of darkness.

Effect of Cyclone on Weevil Borer.

On land where the cane has been levelled during the recent cyclonic disturbance on those situations liable during normal seasons to borer-infestation, conditions very favourable to the increase of this beetle will have become established. Being naturally a lover of darkness, seclusion, and moist atmospheric surroundings, we may expect trouble on areas on which cane sticks have attained a fair length. Growers should inspect such cane at intervals, and if discovering evidence of this pest having commenced attack on the basal portions of sticks, communicate at once with the Entomologist at Meringa Experiment Station. Tachinid Fly parasites of the borer in question will be released by the Sugar Bureau free of cost on areas affected by this insect, on condition that the grower will agree to leave at least a quarter of an acre of borer-infested cane uncut for these parasites to breed in. This area should be allowed to remain for about three months, and must on no account be burnt.

Advice to Growers.

Farmers desiring additional information regarding the control of these cane-pests are invited to consult the Entomologist at Meringa Laboratory. Postal address —Meringa Private Bag, Cairns.

Concerted action taken at the right time will often go far towards diminishing injuries caused by our more serious cane pests, and whilst not unduly trespassing on the growers activities on the farm would tend to benefit him financially.

ENTOMOLOGIST'S HINTS FOR APRIL.

By EDMUND JARVIS, Entomologist.

Fungus Attacking Cane-grubs.

During this month growers will most likely notice cane-grubs killed by the so-called "Green Muscardine" fungus (*Metarrhizium anisopliæ*), which is often in evidence from March to May, or even in June. When attacked by this vegetable parasite, the body of the grub, instead of decomposing, retains its original shape, and gradually hardening turns at first white and then an olive green colour, the latter condition being the fruiting stage of this fungus consisting of a thin crust formed of chains of spores.

At this stage, being filled with the fungus roots or mycelium, these grubs become mummified, and can be broken into pieces just like dry, mouldy cheese.

The sphere of usefulness of this parasite can be much extended by collecting all such green crusted-looking grubs, breaking them into small pieces, and thoroughly mixing this with about 100 times the quantity of moist, finely-sifted soil, rich in organic matter.

This spore-laden earth should then be sprinkled or sown as thinly as possible in the furrows, when planting any areas of cane land thought likely to become grub-infested.

Bacterial Disease of Grubs.

Be on the watch for dead or dying grubs exhibiting black blotches on the sides or legs. These will probably be affected by bacterial diseases, but unlike those attacked by Green Muscardine fungus, instead of hardening internally remain quite flaccid and soon decompose to a black putrescent mass. Growers discovering evidence of such disease are urged to communicate with the Entomologist at Meringa Laboratory.

How to Combat Weevil-borers.

Watch the growth of cane on river flats or low-lying situations, and if discovering evidence of this pest having commenced to tunnel in the basal portions of cane sticks, make the matter known to the entomologist without delay.

Apply to the Bureau of Sugar Experiment Stations for tachinid fly parasites, which will be released free of cost on areas affected by this formidable insect, on condition that the farmer will agree to leave at least one-quarter of an acre of borer-infested cane uncut for these parasites to breed in. This area should be left standing for fully three months, and must on no account be burnt.

Collecting Cane-grubs.

During ploughing operations collect your grubs when plentiful. Those of the greyback cockchafer will be mostly in the second and third stages (width of head $\frac{3}{8}$ of an inch); while grubs of *Lepidiota frenchi*, our smaller reddish-brown cane-beetles that was seen flying in great numbers last December are mostly in the second instar. All specimens noticed, however, should be picked up, as grubs of the latter insect will damage cane during September to December next, after moulting into the third stage.

It is well to remember that this common-sense method of control is recognised as being beneficial, and practised as a matter of course in other sugar-growing countries.

The value of dried grubs as a fertiliser is about £11 per ton, which is higher than that quoted for European cockchafers.

Such manure contains 10.20 per cent. nitrogen, 1.66 phosphoric acid, 1.73 potash, 0.27 lime, 63.75 proteins, and 4.82 fat.

There is a market in Sydney for dried grubs, which on account of this high percentage of proteins are a valuable food for poultry.

SOUTHERN CANE CROP PROSPECTS.

21st February, 1927.

The Director of Sugar Experiment Stations, who returned to Brisbane recently after a short visit to the Childers, Bundaberg, and Mackay cane districts, states that the trip to Mackay was made in the daylight in order to ascertain the appearance of the country. It may be said that from Brisbane to Mackay the country on each side of the railroad presents a most beautiful appearance, rich, tall grass is to be seen everywhere; all the waterholes are well filled and every creek now running. The difference when contrasted with that of a little over two months ago is amazing. At that time scarcely a blade of grass was to be seen around Rockhampton.

At Childers, a splendid recovery has been made from possibly the worst drought on record. The cane is making tremendous strides, and it is anticipated that excellent crops will be available for the two local mills. One drawback in this district was that a large amount of land was lying ready for planting when the great downpour in January fell. This caused considerable washaways of the red soil on hillsides. However, most of this is being remedied and planting is now proceeding. On the farm of Mr. A. Adie at North Isis, 12 acres of cane per day are being planted with a double machine planter drawn by a tractor. This machinery takes three men to supervise.

At Bundaberg everything is looking particlarly well, the cane is well forward and growing vigorously. Big crops are expected. Tremendous rains were experienced in this centre; in parts of the district as much as 50 inches had fallen in six weeks.

At Mackay, the cane was also well forward, although this district has not had as much rain as has fallen either to the north or to the south. Still, there has been sufficient to be of very great advantage to the cane without the drawback of strong blows or floods. At the present time it is expected that the crop will be an exceedingly good one.

CANE-BEETLES IN THE ISIS DISTRICT.

The Director of Sugar Experiment Stations has received the following report (23rd February, 1927) from the Southern Assistant Entomologist, on recent investigations in connection with cane-beetles in the Isis district:—

Throughout the many years during which experiments in control have been conducted against "white grubs," it has been widely recognised amongst leading economic entomologists, that the hand-collecting of beetles, though primitive, was a measure that was not to be looked on lightly or totally disregarded. In some countries it has been demonstrated that highly beneficial results have followed on such a procedure, and a marked diminution in the pest taken place, whereas previous to the imposition of such preventive measures, the pest was increasing in alarming proportions. In fact, some foreign publications from other sugar producing countries, which from time to time reach us, tell us that the collection of Scarabaeid beetles closely related to our cane-beetles, has proved to be the only adequate control so far evolved in preventing destruction of cane crops by "white grubs." Moreover, the practice is certainly a very natural method and one which readily suggests itself, for by getting at the root of the evil and destroying the egg-laden female beetle, we thus destroy a proportional number of eggs and so prevent the appearance of grubs in cane lands during the following years.

With these facts in mind it is not difficult to understand how the collecting of cane-beetles has come into vogue in Queensland. In several of the Northern sugar centres, including Cairns, Innisfail, Ingham, Ayr, and Mackay, the "greyback" beetle (*L. albohirtum* Water.) has at various times been collected and sold at so much per lb., and this practice is still being continued in many places. In the Isis district, too, beetle collecting has long been the custom, but in this instance the beetle is of a different species, namely, *Pseudoholophylla furfuracea* Burm., being a species of a shining reddish-brown colour, about three-quarters on an in. long, and therefore much smaller than its northern cousin, and in order that my remarks may not be taken to cover too wide a sphere, I wish to make clear that subsequent remarks and findings, unless otherwise stated apply solely to the species *P. furfuracea*. For several years this beetle has held sway in the Isis cane fields and during drier seasons has been a serious limiting factor in cane production on certain properties. The Isis farmers, always a progressive body of men and thoroughly alive to the situation, decided to have the beetles collected and make payment for them. This, together with the payment for grubs, has been the chief form of control practised. At first, payment was made at the rate of 4d. per hundred, a levy for this being made on each ton of cane supplied to the mills, but of later years a special pest rate has been struck by the Isis Shire Council, and payment for beetles made at the rate of 1s. 6d. per quart. Furthermore, in some cases, the managements of certain plantations, in an endeavour to free their lands from pests, have subsidised this payment by a similar amount, for all beetles and grubs caught within their boundaries. Upwards of £100 is spent annually on beetles alone, and it goes to show the sincerity with which the problem was tackled, but it seems unfortunate that the hundreds of pounds, which have been spent in this connection, have been wasted, and the efforts of individual growers proved fruitless, for, in the light of recent investigations, it was seen that such a system of supposed control was entirely inadequate and gives ample justification for the need of present and future scientific research.

Whilst the "greyback" beetles (males and females in about equal proportions) fly to, and feed on the foliage of various trees, chief of which are the figs and Moreton Bay Ash, from which they can be easily collected during the night or early morning, the "furfuracea" beetle has entirely different habits, remaining out of the ground only for a comparatively short time and not being attracted to trees for the purpose of feeding. On the other hand, it is extremely susceptible to the influence of artificial light, and during the flighting season advantage is taken of this peculiarity, and immediately after dusk, from about 7.30 p.m. until 8.30 p.m., beetles are attracted in thousands to light traps. Childers at that time of the year resembles a miniature Chinatown with its array of lanterns, slush lamps, &c., which are usually operated by children. These lights are dotted about in the fields or suspended over tubs of water, into which the beetles fly, and from which they are gathered at intervals.

In a further report ("Queensland Agricultural Journal," March, 1926, p. 206) the writer in a preliminary survey of the Southern cane districts for insect pests commended the action of the Childers growers thus: "It is gratifying to know that growers are fully awake to the seriousness of the depredations of this formidable pest, and through the pest fund of the Isis Shire Council payment at the rate of 1s. and 1s. 6d. per quart for grubs and beetles respectively is being made." Such commendation was made on the assumption that equal proportions of male and female beetles were being captured, and evidently this assumption has been made and accepted by all parties concerned, and has now been proved to be incorrect. Later in the year at the Bundaberg Laboratory, whilst working on the differences in the sexual characters of the male and female beetles from those samples which had been collected at light traps, it occurred to the writer that there was an unduly high proportion of male beetles present, which prompted the theory that the male beetles were extremely susceptible to the influence of artificial light and were attracted thereto, whilst the females were little nor not at all attracted.

Opportunity was afforded during the recent flight in December to further the investigations in this direction, and the theory proved correct and was substantiated under all conditions. Samples of beetles, representative of those brought in to the honorary receivers, were taken in various parts of the district, from the beginning to the latter end of the emergence and the unquestionable preponderance of male over female beetles was fully demonstrated. For the total countings the actual figures were 51 female beetles and 8,380 males, which gives a proportion of less than 1 per cent. females taken, and the control being gained thereby is almost negligible. Thus this system is quite unprofitable, and without, for the present, being able to offer any suggestions for attracting the female beetle, I have no alternative but to recommend the discontinuance of the system of collecting the beetles of the species *P. furfuracea* Burm., and would further recommend that such money, which ordinarily would be spent in the payment for beetles be directed to a fund used for subsidising growers (say on a 50-50 basis) for the purchase of any fumigant such as carbon bisulphide, paradichlor, &c., used by them in the destruction of cane grubs, or other pests, and such fumigant to be approved by the Bureau of Sugar Experiment Stations.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports (26*th February,* 1927):—

BUNDABERG.

On account of the low tonnages of cane per acre being produced in these areas of late years it is advisable to put on record the possible causes of low yields. Poor crops have caused much discussion. Some opinions are founded on ideas and statements which are not borne out by facts. As the result of careful study, inquiry, and a careful analysis of the situation, the writer is of the opinion that the important causes are weather conditions, unsatisfactory cultivation, drainage conditions, lack of local experiment to determine the value of fertilisers, grub and borer infestation, and diseases. While these factors will be discussed briefly separately, it should be kept in mind that the actual crop condition developed as a result of the combination rather than of any single one.

Weather Conditions.—It cannot be truly said there has been a good, well-distributed rainfall since 1917. Falls throughout the several seasons have been desultory and badly timed. Very often planting has been seriously interfered with by surplus moisture, and then the young plant crop checked by an abnormally long interval between the next watering. Too often frost has affected the retarded crop. Even if no other factor whatsoever existed, the farmers could not raise satisfactory crops under such conditions.

Cultivation, Drainage, and Fertilisation.—Under the heading of cultivation could be placed the important matter of fallowing. Lack of this rather than insufficient tillage is having a big effect on productivity. Drainage is necessary on every farm, preferably below the surface, as the soil is given great moisture-preserving properties and a better physical condition generally. Regarding fertilisation, it is improbable that any but a very small percentage of growers have carried out any local experiment in the course of the last ten years. In soils other than typical to those on the Bundaberg Sugar Experiment Station the farmers leave a lot to chance in the application of fertiliser.

Grub and Borer Infestation.—Losses have been caused by these pests, but they in no way seriously account for low tonnages per acre, although there are instances of individual farmers losing heavily.

Diseases.—Various diseases have, for a considerable time, had an influence on sugar production in Southern Queensland, the principal ones being Fiji Disease, Mosaic, Gumming, and Root Rot.

A malady that is causing much financial loss is Foot Rot Disease, a fungus parasite of the Marasmius species. It occurs in practically every cane country, and in many it is the most serious of the cane diseases. Java, the West Indies, Hawaii, and Louisiana have all had Root Rot trouble.

The effect of Root Rot is more striking in a dry year than in a wet one, due to the fact that a plant with even a poor root system can absorb enough moisture from a wet soil to continue growth, but it is unable to do so in a dry soil.

Characteristics of Root Rot vary to a considerable extent. In general, the affected plants grow slowly, often have a yellow colour, and stool poorly in the early part of the season, though in the latter part of the season they may sucker considerably. Usually the lower sheaths of the affected stalks are connected by a white mould or mycelium, though not always.

It is not possible to say what percentage of loss has been caused by weather conditions, soil inferiority, or disease. It is evident, looking at the matter broadly, that the general crop condition is due to the whole complex.

The following are details of work carried out during the month:—

Bundaberg Sub-areas—Oakwood, Maidavale, and Rubyana.

Heavy rains caused a considerable amount of washing on these farms. The cane has responded well since Christmas. A cane grub (*L. frenchi*) is doing a limited amount of damage at Oakwood. Varieties growing well on these areas are H.Q. 285, Q. 813, E.K. 28, and M. 1900. The farmers are advised to try more E.K. 28 than they are at present doing.

Bucca.

The cane looked green and healthy and there should be a fair crop next year if reasonable rains occur. The roads have been extensively damaged by the rain, and some of the growers have suffered through soil losses.

Gin Gin.

This district is making a good recovery. The plant and ratoon cane is rapidly brightening. The countryside is in a thoroughly saturated condition, springs babbling everywhere. Cane varieties making a fine showing are M. 16804, Q. 813, M. 1900 Seedling, N.G. 24, H.Q. 285, and D. 1135. Highly satisfactory results are being obtained with green manures.

The Northern Field Assistant, Mr. A. P. Gibson, reports (22nd *March*, 1927):—

Innisfail.

Following is a table giving the areas harvested and tonnages of cane crushed by each of the four district mills during the 1926 crushing season:—

Mill.	Area Cut.	Tons Cane Crushed.	Week's Crushing.
	Acres.		
Mourilyan	7,624	135,473	25
Goondi	7,500	170,006	26
South Johnstone	9,575	165,442	30
Tully	5,800	148,006	28½
Total	30,499	618,927	..

NOTE.—The Tully mill crushed 16,291 tons from the South Johnstone mill area, and this amount is included in its total.

February was an anxious month, its outstanding weather feature being high winds accompanied by torrential rain. At the beginning it was exceptionally hot; spasmodic and heavy falls of rain were frequently experienced. These were sandwiched by brief intervals of brilliant sunshine. Such growing conditions forced the crop of cane and weeds along at an extraordinary pace. On the afternoon of the 8th February suspicious signs were noted, and the barograph commenced to fall rapidly, thus foretelling a fast approaching change. Local residents heeded the warning and prepared for the worst. The next forty-eight hours the area was severely swept by a high gale and torrential rain, the latter soon deeply inundating the low lands and converting peaceful running creeks and rivers into raging torrents. The wind continued to increase in velocity until about 10 p.m. on the 9th, at which time the barograph had fallen to 29.28, after which it commenced to rise, when the wind gradually decreased in force.

The two months' rainfall record at South Johnstone Sugar Experiment Station, Innisfail, and Tully, is as follows:—

	Station.	Innisfail.	Tully.
	In.	In.	In.
January	21.02	17.01	34.58
February	41.11	45.42	65.65
	62.13	62.43	100.23

On February 10, 11, and 12 Tully registered 52.26 inches.

The Crop.

The 1926 season finished in good time, therefore it was thought that this would have been of great benefit to the subsequent crop, mainly because of the extended period of growth. Such expectations, however, were not fully realised owing to the somewhat scanty rainfall experienced during the latter half of the year. Splendid soaking rains have fallen since, and in consequence the crop, although dirty and neglected in parts, looked really well, and has been growing with amazing speed; so much so that it had every appearance of easily over-shadowing in tonnage the district's previous records. An early estimate of the crop likely to be harvested by the four district mills is given at some 760,000 tons; this, of course, was forecasted prior to the blow. Since the crop has been more or less roughly handled and may probably be reduced by some 60,000 tons. At present, however, it is impossible to estimate the losses likely to occur from the effects of wind and water other than very approximately. Again, March and April officially are the wettest months in these parts, and in consequence during this period this estimated present lost tonnage could easily be regained or increased.

After the Storm.

When the storm had passed away and the inundated lowlands became uncovered, it was found that the combined action of wind and water had occasioned severe destruction to property, roads, and crops. The crop damage roughly may be put down as follows:—By wind: Levelled cane crops, leaves generally tattered and torn, tops and stems more or less twisted, tangled or broken. By water: The finer soil had been washed off many farms, and silt upwards of three inches deposited on the flooded lowlands. Patches of cane twice deeply submerged had been killed or damaged, more so that covered by still water, because of the fact that this contained an enormous quantity of fine earth held in suspension and which when standing, was precipitated, much of the precipitate (mud) lodging in the heart or pores of the leaves, therefore having a smothering effect. Such damaged tops invariably occasion stem sprouting (mainly the top eyes) and this has a great tendency to considerably lower the crop's quality and quantity. Unforeseen losses are yet likely to occur, such as (1) possible c.c.s. reduction; (2) probable higher crop handling costs; (3) increased destruction by pests and fungi which is often brought about by the injured nature of canes. The good done by water perhaps is that it has prevented serious grub injury, also it has severely swept the jumping-off places of the destructive rat, therefore destroying many.

Cultivation.

Excessive and prolonged wetness in conjunction with tangled crops has practically precluded interspace cultivation. Although the crop for the greater part had reached the stage when this work is hardly necessary, nevertheless there is the likelihood of a rapid weed growth taking place in the more recumbent crops, which with possible cultivation could have been controlled. Again the thorough preparation of land for subsequent plantings is being delayed. Fortunately, there was fine weather at the very end of the month, when there was little rain, but much glorious sunshine; a few such days would soon permit the continuance of the most essential field work.

Varieties.

N.G. 15 (Badila)—the admitted all-round favourite variety grown in these parts —is the leader in most Northern fields. This popular variety had weathered the gale and torrential rain better than the small percentage of other varieties grown. The flattened canes speedily recovered, and within a day or two following the storm were upstanding, but that showing stem was bow-shaped and had produced much aerial root.

Leguminous Crop.

A moderate area of Mauritius bean and a lesser quantity of cowpea had been planted. This had germinated most favourably and was looking wonderfully well prior to the wind and rain. Unfortunately, over-much moisture ruined the greater part of this, therefore the planters' loss is great, for not only must it occasion more ploughings, but to this must be added seed losses and the non-restoring to the ground of the necessary humus.

Fertilisers.

The intelligent use of fertiliser and the time of application should be studied more. Little manure had been applied this month; a dressing of sulphate of ammonia was being applied to a field where the grass was quite as high as the cane, this seemed a great waste, for the grass, not the cane, would derive the benefit.

Pests and Diseases.

At present the cane seems wonderfully free from pest destruction. Several patches of grubs were found destroying cane stools prior to the rain. Leaf Scald was abundantly found in parts; H.Q. 426 variety and patches of the Goru family were troubled to a greater degree than N.G. 15. Since the wind this disease is harder to locate owing to the shattered nature of the leaves. Distinctive white or bleached markings, bordered by a watermark red colouration, is largely found in the more matured lower leaves and sheath of Badila, the under part of which sometimes contains much cobweb, and sometimes a fungus. Whether this is the cause of a secondary occurrence I do not know. These markings were first seen in the Babinda area many months ago.

Mill Overhaul.

The essential annual overhaul at all the local mills is now in progress. The extensive alterations and additions being made at the Mourilyan mill are progressing favourably, and should be finished some time in May. This progressive company, for many years past, has been gradually improving its plant; it is quite evident they realise the great importance of having an ever-efficient mill. The industrial dispute at the South Johnstone mill, lasting many weeks, has ended and work resumed on the 21st February. Some 1,850 tons of sugar had not been shipped owing to this trouble. Of this quantity about 400 tons had been loaded on to trucks and were exposed to the heavy rains, consequently it appeared damaged.

The Central Field Assistant, Mr. E. H. Osborn, reports (19*th January,* 1927):—

MACKAY.

When the December report was written, the very dry time then being experienced was causing much anxiety to growers throughout the Mackay district, and the prospects for 1927 were not at all promising. Luckily, however, very good to medium falls of rain were recorded soon after, and, as intense heat was also the order of the day, growing conditions were ideal, resulting in the young plant and earlier-cut ratoons moving along rapidly, but the greatest change for the better seems to have been felt by the late cut and backward ratoons, which soon responded to the welcome change.

Naturally, wood growth has also come along marvellously, and everywhere cultivation work was in full swing.

North Eton.

With only a short time at my disposal only a very few farms were visited, but it was noticed immediately that their share of the recent rainfall had not been sufficient to enable the cane to make its best growth, and upon examining the records it was seen that for last year Mackay registered 35.09 in. as against 25.70 in. for Eton, and for the month of December Mackay read 7.74 in. against 2.93 in. for Eton. In consequence the general growth was decidedly backward of both plant and ratoons, except in some odd places where very good crops were to be seen. One of the best of such was some 43 acres of April-to-July plant cane at Mr. E. Beldan's farm, looking particularly even in height and with a vigorous growth. This cane was made up into 10-ft. beds, and was mainly Q. 813, H.Q. 285, Pompey (7 R. 428), &c.

On an adjoining farm (Mr. J. Kelly's) lime was being used for the first time, and will very probably give satisfactory results upon such land. Here also was noticed some very decent M. 1900 and Q. 813.

Varieties.—Q. 813 planted late in December, 1925, and cut late in September, 1926, yielded 22 tons per acre with an average density of 16 c.c.s., whilst M. 1900, planted in April in the same paddock, near Hill End (north side), gave 26 tons per acre for the same c.c.s. Q. 813 and H.Q. 426 (Clark's Seedling) also gave very high density upon the northern side of the river at Dumbleton. (7 R. 428) Pompey in most cases gave only medium returns for density, but fair tonnages. E.K. 28 is gradually becoming more popular, in fact, so much so, that 17-acres of July-planted cane was observed upon the Eimeo road. This land had been ploughed three times with rotary plough attached to a Fordson tractor and once with a disc plough.

N.G. 15 (Badila), upon some of the river flats, was showing really good growth, and will now be assured of good tonnage.

Diseases and Pests.—Red Rot is still doing damage to M. 1900 and Black Innis in several parts of the Farleigh area. The latter cane is so partial to Rot and Mosaic that growers should be extremely careful about planting same.

Mosaic was noticed in second ratoon (Innis) at The Leap; the owner of same mentioned that Red Rot also was doing damage to this variety there.

In a farm adjacent to the Farleigh mill Mosaic was seen in the following canes:—

Malagache—second ratoons, bad.
7 R. 428—first ratoons, bad.
Imperial Standover—ratoons, very bad.
H.Q. 458—in young ratoons, very bad.
Innis—Plant exceptionally bad, and upon a neighbouring farm it was seen in Malagache, Badila, and Cheribon ratoons, and Malagache plant. Upon another nearby farm it was noticed slightly in D. 1135 ratoons. At North Eton, the disease was noticed in plants Innis and plant 7 R. 428.

With so many chances of infection it certainly is up to the grower to be very careful of seed selection.

Pests.—Rats at a Farleigh farm and beetles flying about, generally after the rain, were noticed in several places.

This year's prospects for a heavy crop are so far very promising; for while last year's rainfall only amounted to 35.09 in., January of this year has accounted for 11 in., spread over twenty-one wet days. February, to date, is represented by 6.81 in. for eleven wet days, and the prospects for further good falls seem well assured.

As this rain has been accompanied by great heat and mugginess, the crops have come away wonderfully, especially early plant and the earlier cut ratoons.

Grass and weeds are, of course, growing luxuriantly too, for there has been no chance of keeping them down during the very wet weather.

Farmers are now anxiously awaiting a little fine weather, otherwise the possibility of any early planting is very remote.

Cane Disease.—In last month's report mention was made of the prevalence of Mosaic on several farms in the vicinity of Farleigh mill. Since then another adjoining farm was also found to be heavily infested, as Mosaic was noticed throughout the some 50 odd acres under crop, plant and ratoons being alike infected. In fact, one block of plant cane carrying a fairly good growth otherwise, showed eighteen stools diseased in 100 counted; and this counting was taken haphazardly.

The canes grown were Black Innis, Malagache, Clark's Seedling, Pompey, E.K. 1, Cheribon, D. 109, and Shahjahanpur No. 10 (old ratoons).

Incidentally, wherever the writer has found No. 10 growing he has also found Mosaic. In common with many of the Farleigh farms this property contains some broken country hard to cultivate successfully, and carrying very heavy crops of grass (Blady and Guinea), and forming ideal conditions for the spread of Mosaic.

With such heavy infection, until new and clean seed is obtained elsewhere, losses are bound to increase every year. Mosaic being such an insidious disease is capable of causing enormous losses, and, as already mentioned, can only be fought with clean seed beds, seed selection, and eradication of all diseased stools. In the present phase of the sugar industry this is absolutely necessary, for surely it is more payable to grow a smaller, clean area with good density and tonnage than a larger one infected with disease, and consequentially lower in density and tonnage—moreover with great possibilities of eventually losing the whole crop.

The writer emphasises this continually in some cases with success, but in many cases re-visits a farm where nothing had been done since his former visit in eradicating odd stools of diseased plant cane, despite promises to the contrary given at time of former visit.

Cane Varieties.—For the sake of growers who have not seen a copy of last year's annual report of the Bureau of Sugar Experiment Stations, the portion dealing with crop and analytical results of early and late maturing canes at the Mackay Station is appended.

Summarised, the land after ploughing out had cowpea sown which was ploughed under in March, was ploughed again in May, and ploughed and subsoiled in June, whilst the final ploughing was early in August, and the cane planted about the third week in August.

Fertilisers used consisted of—

100 lb. sulphate of ammonia per acre,
100 lb. nitrate of soda per acre,
75 lb. sulphate of potash per acre, and
300 lb. meatworks fertiliser

when the cane was about two months' old; and a top dressing of the following was used in December, *i.e.*—

50 lb. sulphate of ammonia per acre,
50 lb. nitrate of soda per acre.

The above mixture was used on both plant and ratoon (first).

Early Maturing Canes.

Variety.	Plant 13 months old.		First Ratoons. 10½ months old.		Averages for Two Crops.	
	Tons per acre.	C.C.S.	Tons per acre.	C.C.S.	Tons per acre.	C.C.S.
D. 109	45·1	12·92	26·7	14·07	35·9	13·50
H.Q. 285	32.6	15·48	23·9	15·42	28·2	15·45
H.Q. 426 (Clark's Seedling)	46·5	16·33	26·8	18·65	36·6	17·49
E.K. 28	47·7	17·02	28·5	17·79	38·1	17·40
Q. 813	48·4	16·58	31·5	17·12	39·9	16·85

Late Maturing Varieties.

	14½ months old.		11 months old.			
N.F. 24 (Goru) ..	42·2	14·28	23·1	15·17	32·6	14·22
M. 1900	41·9	16·60	22·8	16·45	32·3	16·52
7 R. 428 (Pompey) ..	47·3	14·84	36·1	14·23	41·7	14·53
N.G. 15 (Badila) ..	41·8	16·99	30·1	17·13	36·0	17·06
Cheribon	49·3	14·38	31·6	13·87	40·4	14·10

These figures give a striking instance of the value of judicious fertilising.

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.

LIFE HISTORY NOTES ON THE RUTHERGLEN BUG.

By J. HAROLD SMITH, M.Sc., Entomological Branch.

During the last few months of 1926, a severe outbreak of the Rutherglen bug (*Nysius* sp.*) occurred in Southern Queensland, in which a variety of crops were, in some cases, almost totally destroyed. The adults (Plate 65; figs. 7 and 8) were very prevalent at the time, and circumstances seemed opportune to enquire into the reproduction and development of the pest. Accordingly on receipt of instructions from the Chief Entomologist (Mr. Veitch) to this effect, field and laboratory observations were commenced in October and continued until December, by which time the pest had almost disappeared. The following notes are a summary of the information obtained up till now. They will, it is hoped, be supplemented as opportunities arise for further work.

REPRODUCTION.

Choice of Site for Egg-laying.

Eggs (Plate 64; fig. 1) of the Rutherglen bug have been detected on two weeds of the order Compositæ—namely, *Gnaphalium purpureum* (cudweed), and *Sonchus oleraceus* (sow-thistle), found in the neighbourhood of crops infested by the adults. The first of these, *G. purpureum*, appears the more important during the season of its growth, but at certain times of the year it is absent from many habitats. When this occurs other weeds of a similar kind, in addition to *S. oleraceus*, may serve as possible alternatives. In addition to the two plants mentioned, eggs have been noted on *Imperata arundinacea* (blady grass), and, as typical first and second instars have been collected on the flower heads of *Agaratum conyzoides* (Compositæ), it may be inferred that these had developed from eggs laid on this plant.

Under certain experimental conditions the behaviour of the bugs furnished further evidence in favour of the view that the female shows some discrimination in the choice of a site to place her eggs. If allowed access to complete plants of *G. purpureum*, mature flower heads of *S. oleraceus*, and compact cotton wool, by far the greater number of eggs were laid in the first. On omitting *G. purpureum* from the series, *S. oleraceus* was almost neglected, the eggs being deposited in the cotton wool. These observations suggest that, if available, plants which possess a fine down, such as occurs on *G. purpureum*, will be utilised for egg-laying in preference to others of a less suitable nature lacking this quality.

* The insect dealt with in this paper is the species that is generally referred to in Queensland as the Rutherglen bug. There is, however, some doubt as to its specific identity, and in order to remove any uncertainty on that point specimens have been forwarded to England for examination by taxonomic specialists. Recent references to the control of this pest can be found in the November and December, 1926, issues of the "Queensland Agricultural Journal," on pages 385 and 511 respectively.—R.V.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

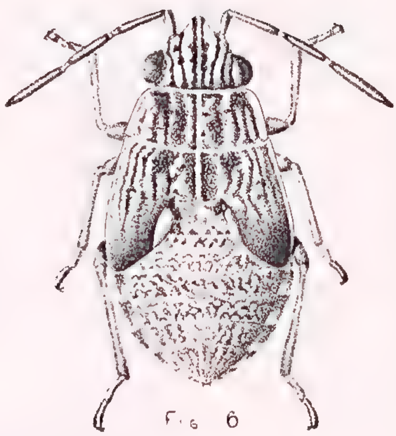

Fig. 6

PLATE 64.

(*For Description of Plate, see page* 295).

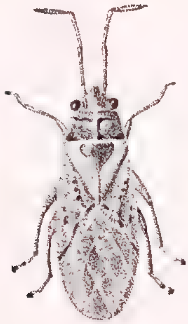

Fig: 7

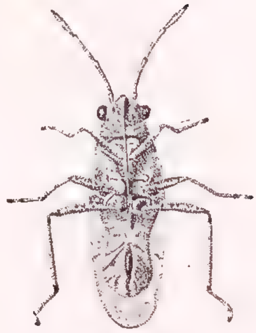

Fig 7a

Fig 7b

Fig 7c

Fig. 7d

Fig 8

Fig 8a.

Fig. 8b

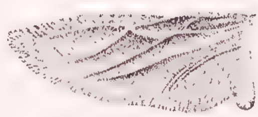

Fig 8c.

Plate 65.

(*For Description of Plate, see page 295*).

Position and Arrangement of the Eggs.

Normally the oviposition site is on some part of the inflorescence, and, as the arrangement of the eggs and their disposition on the plant vary with the plant chosen, it is necessary to discuss each case separately.

Gnaphalium purpureum.—In this plant the inflorescences are axillary in position and clustered together in the form of a compact spike. The whole plant is more or less covered with fine down, but in certain parts, notably the concealed bases of the terminal inflorescences and the inner edges of the leaf bases, the soft covering may attain a considerable thickness and possess a loosely-woven texture. Eggs may be laid in this down wherever it occurs on the plant, but the majority are deposited where the covering is thickest. The depth to which the eggs are inserted is apparently determined by the thickness of the down or, should this be exceptionally dense, by the length of the ovipositor; hence they are rarely superficial in position. Though the eggs are usually laid singly, two or three may occasionally be closely apposed to form an irregular bundle, the eggs in which may be separated without much difficulty. On no occasion during laboratory work have eggs been located on the pappus of this plant.

Sonchus oleraceus.—The fine down characteristic of *G. purpureum* is almost absent on this plant, and the pappus of the mature flower heads is used instead for egg-laying. The eggs are formed into compact bundles which taper at either end, and contain from two to seven eggs. These bundles are attached to the lower half of the pappus, and a number of its silk-like threads may be wound together to ensure stability. As in the case of the rarer bundles found on *G. purpureum,* the adhesion between individual eggs is slight.

Imperata arundinacea.—On the few occasions that eggs have been found on this grass, they have been attached singly to the feathery awns of the seeds in the mature panicle.

Methods Adopted to Observe Egg-laying in Captivity.

Before a definite procedure was decided upon for breeding work, a good deal of experimenting was necessary to determine the most suitable food plant for observational purposes. *G. purpureum* was rejected on account of the inaccessibility of any eggs laid on the plant, and *S. oleraceus* was finally utilised, so treated by the removal of mature flower heads that it was unsuitable for oviposition. Under these conditions the bugs laid all their eggs in the only available site—viz., the cotton-wool stopper to the receptacle in which they were kept. By this means the bugs were maintained on a suitable diet and at the same time compelled to lay their eggs in a medium which allowed the exact determination of the number of eggs laid, the habit of laying, and other details of oviposition.

Females reared in the laboratory, and hence virgin, were mated with males also bred out under observation. Each pair was isolated as soon as possible after emerging from the final instar and placed in a wide tube some 5 inches in depth, the mouth of which was plugged with cotton-wool. Leaves and immature flower heads of *S. oleraceus* were used as food, but when the latter were unobtainable, and material in which the floral contents were visible was substituted, the floral parts were cut off. The bugs behaved quite normally in confinement, retaining their usual vigour and reproducing without apparent restraint. Feeding and examination of the cotton-wool were made part of a daily routine, the dual operation being carried out systematically from 9 a.m. onwards. A period of approximately twenty-four hours would, therefore, elapse between consecutive examinations of any single pair of bugs.

Mating.

The male places himself alongside the female more or less violently, and while facing in the same direction makes attachment. Thus secured he swings slowly round until facing away from his mate. If disturbed shortly after uniting, the sexes readily separate, but if they have been in copulation for some time the union is much more secure. The duration of copulation is variable, sometimes momentary, sometimes extending over a number of hours.

The female is typically polyandrous, and the male polygamous.

The Act of Egg-laying.

Females have been observed on a number of occasions depositing eggs in the down of *G. purpureum* and in cotton-wool. In the case of the former it is difficult to follow the details of the process, and hence the following notes were compiled during oviposition in cotton-wool.

The female, about to lay eggs, moves over the potential site for some time prior to inserting the ovipositor into the compact mass of cotton-wool. Having raised the ovipositor from its resting groove until at right angles to the body, the bug plunges it into the fibrous mass to a depth of about one-tenth of an inch. In this position the abdomen is flexed downwards, exposing the pale upper surface beneath the outstretched wings. Usually the bug stands firm, forelegs upright, mid and hind pairs extended backwards, but sometimes the first two pairs may leave the surface, the bug being supported by the ovipositor and the hind pair of legs. The deposition of the egg is a momentary operation, and after partial withdrawal the ovipositor is thrust back into the neighbourhood of the egg already laid and a second placed close to the first. During the passage of the egg the bug is motionless. Subsequent examination showed that a number of eggs—one to fifteen—may be laid within a diameter of one-eighth of an inch without the complete withdrawal of the ovipositor. If during a single period of egg-laying the bug passes from one part of the cotton-wool to another, the ovipositor is carried loosely, not being returned to its resting position until egg-laying for the time being is suspended.

Females have been observed laying between the hours of 9 a.m. and 5 p.m., but only a small proportion of those under observation chose that period of the day for oviposition.

Period of Reproduction and Number of Eggs Laid.

To elucidate information under this heading, two series of mated bugs were kept under observation. Information regarding the first is summarised in Table I., and that dealing with the second series in Table II. The conclusions deducible from each series will be discussed separately.

Series I.—Six pairs are included here, mated between 22nd November and 1st December inclusive. The climatic conditions during the greater part of their reproductive period were comparatively uniform, fine sunny days being the rule. Odd thunderstorms were experienced, but these did not effect any noticeable change in the egg-laying of the bugs.

Between mating and reproduction a period of from four to nine days elapsed, during which the sexes were intermittently in copula. Having commenced to lay, the number of eggs increased until the daily maximum was reached. This maximum ranged from twenty-four to forty-five eggs per day in the individual records. This period of active oviposition continued for a short time and then diminished, and was in some cases succeeded by a second (vide Table I.; cases G 1 and G 3) and even a third (vide Table I.; case G 1), while in others it was followed by spasmodic egg-laying (vide Table I.; cases G 2, G 5, and G 6). In those cases where a rhythm is apparent, the periods last approximately a week, and successive stages have a diminishing daily maximum. The interval between any two periods may (vide Table I.; case G 3), or may not (vide Table I.; case G 1), be characterised by a complete absence of egglaying. The total reproductive period ranged from thirteen to twenty-five days, and the number of eggs per female from 134 to 435.

Observation was continued for some time after egg-laying had ceased, but usually the death of either one or both individuals ensued within a few days of the cessation of oviposition.

Series II.—This series consisted of eighteen pairs mated between 6th December and 13th December. Shortly after mating the first pair, the weather, previously unsettled, definitely broke, and sultry wet weather coincided with the oviposition of the bugs under observation. The insects lacked their usual active habits and appeared sexually indicisive with slight inclination to copulate. This disposition of the bugs found evident expression in tardy and irregular egg-laying in most instances.

Traces of the rythmic mode of oviposition are suggested in the records for cases I 2, I 5, and I 8 (Table II.), but each of these is less significant than those cited in the first series. Egg-laying proceeded irregularly in many cases and the total number of eggs deposited per female proved to be much smaller than in Series I. The period of reproduction varied from one to fifteen days and the total number of eggs per female from 3 to 200.

DEVELOPMENT.

Methods of Studying Development in Captivity.

In studying this aspect of the life history of the Rutherglen bug, two suucessive generations were reared, the nymphs (Plate 64; figs. 2 to 6) being confined in wide tubes identical with those described previously in connection with the work on reproduction. *G. purpureum* was supplied to the first brood as food, but the available supply of this weed was exhausted when the second was commenced. Leaves and immature flower heads of *S. oleraceus* proved an efficient substitute, if such flower heads were first lacerated to provide a ready flow of sap.

Two distinct systems of recording were used in observing the essential facts of development. These may conveniently be explained as group recording and individual recording of the various stages.

Group Recording.—A convenient number of bugs is segregated as soon as the nymphs emerge from the eggs. On commencing to moult into the second instar a period of two or three days may elapse before all have changed. As the second instars appear those emerging on any one day are kept separate and their subsequent development followed. Thus the initial batch of first instars divides into two or three smaller lots at the first moult and each of these in turn subdivides at the second. In this manner the original group splits up as development proceeds and the changes may be recorded somewhat on the style of a genealogical tree.

Individual Recording.—Single specimens are observed throughout the whole period of their development. It is not practicable to handle as many specimens by this system of recording as in the former, but it ensures accuracy if the successive instars are not readily separable on structural characters. In the case of the Rutherglen bug the several stages are quite distinct, and the relative merits of either system of recording do not, therefore, require further discussion.

Data for the first generation were arranged on the group recording system, individual records being kept for the later brood.

Nature of Development and Duration of Stages.

The Rutherglen bug belongs to the family Lygæidæ of the order Hemiptera. The nymph passes through five instars in the course of its development, maturing at the fifth moult. The most marked changes in structure are to be seen in the fourth and fifth instars, when the wing rudiments become visible. The duration of each stage in development will be considered separately.

Incubation Period of Egg.—Some 296 eggs laid in the laboratory were used in the determination of the incubation period. The data summarised in Table III. show that the embryonic period at this time of the year (October and November) is six days, most of the eggs hatching in that period. The high percentages of failures must not be regarded as entirely due to embryonic mishaps and other natural causes. The incubation period was determined prior to the elaboration of the technique previously described in connection with egg-laying in captivity and the eggs used were extricated from the fine down of *G. purpureum.* The difficulties attending their removal from this plant were probably responsible for a higher percentage of losses than would have been the case if oviposition had taken place in the cotton-wool used for this purpose at a later date.

Duration of the First Instar (vide Table IV).—In both generations the greatest number of individuals moulting on any one day passed into the second instar after five days. In many cases, however, a longer or shorter interval was taken, the extremes being three days the minimum, and eight days the maximum. Occasional specimens may insert an additional instar between the typical first and second.

Duration of Second Instar (vide Table IV.).—The records of both generations roughly correspond in showing that the usual period for this stage in the development of the bug is three or four days. Most specimens moulted before four days had elapsed but a few persisted for a longer time.

Duration of Third Instar (vide Table IV.).—Here alone of all the nymphal data, a disparity is evident in the records for the duration of an instar. The group records for the first generation indicate that the greatest number of individuals moulting on any one day passed into the fourth nymphal stage after three days, whereas the second brood required four days. A range from two to nine days in the duration of this instar is recorded but the specimen requiring the higher limit was doubtless a pathological variant, as death ensued shortly after it moulted into the fourth instar.

Duration of Fourth Instar (vide Table IV.).—The usual period is three or four days but some specimens require a longer or shorter period than this. Isolated bugs introduced an extra instar here, but no corresponding change in structure could be associated with it.

Duration of Fifth Instar (vide Table IV.).—Five days is the normal period taken by this, the final nymph, from which, on moulting, the adult bug emerges.

In a number of instances the development of the bug was completed in four instars instead of the usual five. Two individuals in the first generation and five in the second were noted as behaving in this manner. During the third nymphal stage all these specimens developed wing pads and other structural characters, typical of the fourth instar, without an intervening moult.

Total Period of Development.

In Table V., the total period required to complete the post-embryonic development of the bugs, *i.e.,* the time from the hatching of the eggs to the emergence of the adults, is set out. The data are arranged according to the sex of the adult. In both sexes the greatest number of individuals for any particular interval are seen to complete their development in twenty days. Adding to this representative period the six days in which the eggs incubate it is clear that the total period of development, embryonic and post-embryonic, is approximately four weeks. This conclusion seems true of both the generations reared.

Description of Moult.

The integument of the thorax ruptures in two directions, medianly in the longitudinal axis, and anteriorly, in the transverse axis, the two ruptures forming a T-shaped rent. After the bug has forced its way out of the nymphal skin, the exuvium is left behind, intact save for the actual fissure through which the bug has passed. Mishaps during the change are of rare occurrence, but occasionally the emerging nymph is unable to rid itself completely of the cast skin. An interval of some hours elapses after the moult before the typical markings of the instar are distinct, and during the early part of this period the nymph is more or less quiescent.

Proportion of the Sexes.

Field catches of the Rutherglen bug at an early stage in this work showed a preponderance of males. In the laboratory 81 adults were reared, and 45 of this number were males, this sex having a dominance of 25 per cent. over the female.

Habits of the Instars.

These records are collated from data secured both in field and laboratory studies and concern chiefly the feeding habits of the instars.

First Instar.—Immediately on hatching this instar is active, but if food is available close at hand, shows little disposition to wander. Thus bugs which have recently hatched from eggs *in situ* on *G. purpureum* burrow amongst the soft down within a very limited range. If reared on the lacerated flower heads of *S. oleraceus* the bugs remain quiescent just as long as the food is fresh and the sap oozes freely from the injured plant tissue. Should the quality of the food prove unsuitable this instar is active and quite capable of seeking out fresh supples.

Bugs hatched in the laboratory apart from any host plant may occasionally pass into the second nymphal stage without feeding. This is, however, exceptional.

Second Instar.—No essential differences in habit of the first two instars have been recorded. The second instar is more active than the first, better able to locate a suitable food supply, and can pass from plant to plant in search of it without difficulty. The early instars are very sensitive to unsuitable food, and attempts to rear the bug on the leaves of *S. oleraceus* were almost total failures, though if supplied with semi-mature flower heads of the same plant, development was normal.

Third Instar.—Bugs in this stage, while partial to the floral parts of the plants on which they were reared, could, in the third and subsequent instars, be maintained on the stems and leaves only of *S. oleraceus*, provided that such were fresh and succulent.

In the field, bugs of the third, fourth, and fifth stages have been found roaming over the surface of the soil, frequently sheltering around the base of various plants other than those on which their early life is passed. At this stage they appear partial to the squat, spreading pigweed, *Portulacca oleracea* (Portulaceæ), on which plant the later instars have been observed in large numbers.

Fourth and Fifth Instars.—No significant change in habit from the third instar has been noted. They show a greater resistance to adverse conditions than earlier forms.

The gregarious habits characteristic of some bugs appear to be absent in all the nymphal instars of this species.

Injury to the Plant.

The actual damage to cultivated plants in all cases observed was entirely the work of the adults, the development of the bug being apparently completed on weeds before the invasion of the crop took place. Practically all cultivated plants are subject to attack in some degree, but as direct observation has been restricted to three—potato, beetroot, and citrus—discussion will be confined to these. The severity of the injury depends on several factors, the habit of growth of the plant, the accessibility of its commercially valuable products, and its development at the time of attack. It seems necessary, therefore, to describe the specific injury to the three crops on which observations have been made.

Potatoes.—The removal of the sap from the leaves which succeeds the initial act of piercing cause a pronounced wilt, and ultimately death to the parts of the plant attacked. Terminal shoots usually suffer first, but on the exhaustion of these the bugs attack the older parts of the plant and ultimately the whole may be killed outright. If the onset of large scale infestation takes place during the early stages of the plant development, *i.e.*, prior to setting of tubers, the plant resources are used to renew losses in foliage attributable to the bug. Lateral shoots open out only to be attacked by the bug, and finally, while the plant may retain some vestige of life, the quantity of tubers developed is small. Should tuber formation have commenced prior to the attack attaining economic dimensions the case is somewhat different. Fresh foliage is only sparingly produced, the food reserves of the plant being diverted to the as yet immature tubers. The development finally reached by these is determined by the further life of the plant. In many cases noted the final crop comprised the normal number of tubers, but these were of little value for, apart from a certain quantity of seed size, the bulk were too small to be marketable.

Beetroot.—The feeding habits of bugs found on this plant are such that any wilting observed is not the aftermath of suction from the leaf surface, but follows a concerted attack on the leaf base by large numbers of bugs located at the head of the semi-formed root. The final effect is similar to that noted in the previous crop, the affected leaves ceasing to function and plant development being retarded. A certain portion of the crop may be marketable, its dimensions being determined by the severity of the infestation, the development reached before its commencement, and the period of its duration. In crops of this vegetable, the distribution of the bug appears a trifle sporadic, plants in a small area being overrun with the bugs while others a few yards away appear comparatively free. The same phenomenon was prevalent in lesser degree where potatoes were suffering.

Citrus.—The sucking habit is exercised on both foliage and the young newly-set fruit. As the latter is the potential marketable fruit, the injury is most important when the bugs are present in sufficient numbers to penetrate and repenetrate the fruits. In one orchard the young fruits without exception showed, on examination, evidence of repeated puncturing, and from the openings so formed the sap oozed out steadily. Frequently numbers of these punctures in close proximity to one another had calloused over, leaving an unsightly blemish which would probably persist in the mature fruit. This united attack on the fruit was the serious feature in the case under observation and, in comparison, that on the leaves was negligible. The withdrawal of the sap essential to the normal growth of the fruit at such an early stage in its development cannot other than induce an ultimate crop of small fruits, unevenly developed and deficient in juice. Considerations of the duration and severity of the infestation again influence the extent of the final loss.

SUMMARY.

1. A severe outbreak of the Rutherglen bug occurred in Southern Queensland during 1926, and the reproduction and development of this pest were studied in the Brisbane district from October to December of that year.

2. Egg-laying may occur on weeds in the vicinity of infested crops. *Gnaphalium purpureum* (cudweed) is apparently the plant most frequently used for oviposition during this season, but others, especially

Sonchus oleraceus (sow thistle) may serve as alternatives. The actual site of the eggs and their arrangement varies with the plant on which they are laid, and the more important of these are discussed.

3. The details of copulation and egg-laying are recorded. Two series of bugs were observed during reproduction in captivity, and it is shown that the period of reproduction may extend over twenty-six days. The maximum number of eggs laid per female was 435. The daily progress of oviposition is discussed.

4. Two successive generations of the bugs have been reared and from the data obtained it is seen that the total period of development at this time of the year is approximately four weeks. There are five nymphal stages, the duration of each of which is recorded. The habits of the instars are described.

5. Observations have been made on three infested crops—potato, beet, and citrus. A description of the characteristic injury to each is given.

6. An exact description of the several stages in development and tables summarising laboratory data are given as appendices.

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DESCRIPTION OF PLATES.

Plate 64.

Fig. 1.—Egg x 18.

Fig. 2.—1st nymphal stage x 20.

Fig. 3.—2nd nymphal stage x 20.

Fig. 4.—3rd nymphal stage x 20.

Fig. 5.—4th nymphal stage x 20.

Fig. 6.—5th nymphal stage x 20.

Plate 65.

Fig. 7.—Adult female, dorsal view x 6.

Fig. 7*a*.—Adult female, ventral view x 6.

Fig. 7*b*.—Adult, head and mouth parts, lateral view x 6.

Fig. 7*c*.—Forewing, female x 12.

Fig. 7*d*.—Hindwing, female x 12.

Fig. 8.—Adult male, dorsal view x 6.

Fig. 8*a*.—Adult male, ventral view x 6.

Fig. 8*b*.—Forewing, male x 12.

Fig. 8*c*.—Hindwing, male x 12.

APPENDIX I.

Description of Stages.

During the breeding work large numbers of each instar were available for examination. The following descriptions were made from representative specimens shortly after moulting, as soon as the typical pattern and colours were distinct. As usual in bug instars, the range of colour variation was large, though the pattern of the markings appeared somewhat stable. Variations noted were usually due to differences in the intensity of the colour in individual cases. The measurements given here are those usual in the stage to which they refer, but as deviations in size from the normal are frequent they must not be interpreted too rigidly.

EGG (Plate 64; Fig. 1).

Length 1 mm.; maximum diameter .25 mm.

Shape, elongate oval, slightly allantoid; *colour,* first day creamy white, second and third days creamy white with bright red spots, sixth and seventh days dark fuchsia, iridescent; *armature,* tuberculate at micropylar end; *emergence,* latero-terminal viâ a broad fissure, embryonic membranes remain attached to the armature as a fan-shaped appendage, one-third length of collapsed egg.

FIRST INSTAR (Plate 64; Fig. 2).

Length .75 mm.; maximum width .3 mm. Shape roughly rectangular.

Head: Large triangular, one-quarter length of body; colour amber with indistinct brown symmetrical longitudinal stripes dorsally. *Eyes:* Ruby, prominent at the base angles of the head; facets few and large. *Antennæ:* Four segmented, with proximal tubercle dark brown; two-thirds length of body; segment 1 translucent, sparsely pubescent; segments 2 and 3 subequal, each longer than first, amber distally, sparsely pubescent; segment 4 elongate oval, equals 2 plus 3 in length, pale brown to pink in colour, densely pubescent. *Rostrum:* Four segmented, three-quarters length of body; segment 1 short, stout, especially at junction to head, few stout hairs at point of insertion, labrum elongate; segment 2 long, twice length of first, fulvous; segment 3 slightly shorter than second, fuscous; segment 4 elongate, tapering distally, dark brown, longer than second.

Thorax: Prothorax and mesothorax dark brown dorsally, save a pale intersegmental longitudinal median streak; metathorax fulvous, save antero-lateral corners dark brown; lateral edge milk white; coxal region pale, rest of ventral surface brown. *Limbs*: Coxæ large, conical, translucent; trochanters small, translucent; femora stout, first and second pairs dusky, hind pair brown, sparsely pubescent; tibia translucent with stout hairs; tarsi densely pubescent, two segmented, with stout paired claws, paired capitate pulvilli and two stout median hairs.

Abdomen: Seven visible segments dorsally; colour fulvous with a mosaic of reds in each segment, sometimes asymmetrical but usually concentrated in three conspicuous dots, two antero-lateral, one postero-median; distinctly ledged. *Anal ring:* Sclerites almost black. *Odoriferous glands* open on fifth visible segment dorsally; evaporating area ill defined.

SECOND INSTAR (Plate 64; Fig. 3).

Length 1.25 mm.; maximum width .5 mm.

Head: Triangular; dorsal ground colour fulvous, with three pairs of symmetrical stripes, ruddy brown in colour, almost parallel to the margin of the eye-socket. *Eyes:* Ruby, socket ledged. *Antennæ:* Four segmented, socket projecting from side of head; segment 1 short, stout, sparsely pubescent; segments 2 and 3 subequal, each longer than first, sparsely pubescent; segment 4 large, elongate oval, equals segments 2 plus 3, dull brown, densely pubescent. *Rostrum:* Four segmented, reaching just beyond the hind coxæ; segment 1 stout, dark brown, labrum elongate, sparsely pubescent; segments 2 and 3 subequal, elongate, pale brown, sparsely pubescent; segment 4 elongate, tapering distally, dark glossy brown, slightly longer than segment 2.

Thorax: Segments of approximately equal thickness but widen out posteriorly; prothorax and mesothorax with lateral dark brown bands merging into a median fulvous area; a pale longitudinal dorsal stripe extends medianly over the thorax; antero-dorsal corners of metathorax dark brown, the rest of the segment consisting of a transverse arch, fulvous with uniformly spaced red dots; ventrally the thorax is irregularly dull brown in colour. *Limbs:* Coxæ large, conical, translucent;

trochanters small, translucent, sparsely pubescent; femora stout, hind pair dusky, pubescent at proximal end; tibia broadens distally, stout hairs especially at apex; tarsi, approximately equal to tibia, two segmented, with paired claws, paired pulvilli and paired hairs between the claws.

Abdomen: Eight visible segments dorsally; colour fulvous with ornate red markings, usually emphasised laterally. *Odoriferous glands* open on dorsal hind margin of 4th and 5th apparent segments; evaporating areas pale. *Anal ring:* Sclerites dark, with projecting hairs.

THIRD INSTAR (Plate 64; Fig. 4).

Length 1.5 mm.; maximum width .75 mm.

Head: Triangular; dorsal markings as in Instar II., longitudinal stripes sepia brown throughout length; hind margin dark brown, ventral surface dull-red with lateral pale stripes merging into the milk-white band to the eye-socket. *Eyes:* Prominent, deep red. *Antennæ:* Four segmented, with joints pale; tubercle pale but distinct; segment 1 short, stout, and dark, sparsely pubescent; segments 2 and 3 subequal, longer than first, dusky, sparsely pubescent; segment 4 elongate oval, almost equal to segments 2 plus 3 in length, dull brown, densely pubescent. *Rostrum:* Four segmented, reaching the hind coxæ; segments approximately equal in length; labrum extends to hind margin of head; a few stout hairs at the insertion to the head; segment 1 dark brown, labrum almost black; segment 2 fuscous, longer than first; segment 3 fuscous same length as second; segment 4 stout proximally, tapering distally, almost black, equal in length to second.

Thorax: Segments structurally distinct; dorsally dull brown with lateral edges milk-white; pale median stripe distinct; antero-ventral margin of prothorax milk-white; irregular dark brown markings round the acetabular region. *Limbs:* Coxæ large, conical, translucent; trochanters small, translucent; femora dark, stout, and sparsely pubescent; tibia translucent, with stout hairs, especially distally; tarsi two-jointed with paired claws and paired capitate pulvilli.

Abdomen: Eight or nine segments visible dorsally, each with a symmetrical mosaic of red markings on a fulvous ground colour. *Odoriferous glands* open dorsally on hind margins of segments 4 and 5; evaporating areas pale. *Anal ring* with sclerites almost black, setiferous.

FOURTH INSTAR (Plate 64; Fig. 5).

Length 1.75 mm.; maximum width .85 mm.

Head: Triangular with sepia brown dorsal stripes as in previous instars, but broader and less regular in outline; ventral surface uniformly deep red with pale lateral stripes which join the milk-white band to the eye-sockets. *Eyes:* Prominent, reddish-brown; sockets ledged. *Antennæ:* Four segmented; tubercle pale distinct; segment 1 dark, stout; segments 2 and 3 dusky, subequal in length, each larger than first, slightly pubescent; segment 4, elongate oval, dark brown often glossy, densely pubescent. *Rostrum:* Four segmented, segments approximately equal, just reaching hind coxæ; insertion to head surrounded by pale ring and fringed with a few stout hairs; segment 1 stout, almost black with labrum distinct; segments 2 and 3 dark, fuscous; segment 4 elongate oval, tapering distally, dark brown.

Thorax: Prothorax broad, divided into two parts by a transverse dark band, anterior enclosed dorsally by lateral extensions of posterior portion; irregular longitudinal bands dark brown, anterior ventral margin milk-white; mesothorax with wing buds present, hind margins almost black, longitudinal bands of prothorax continuous into proximal part of wing pads, a pale "M" often fills the inter-alar space; metathorax small and indistinct between the mesothoracic wing pads, pads small within the mesothoracic pair, dark with a distinct spot; thorax bordered with a milk-white lateral fringe, ventral surface dull-brown. *Limbs:* Coxæ, large, conical, translucent; trochanters small, pale, fulvous; femora dark brown save distal end pale, sparsely pubescent; tibia pale fulvous, with scattered stout hairs especially at distal end; tarsi two-jointed with stout paired claws and paired pulvilli.

Abdomen: Eight or nine apparent segments dorsally, each with a mosaic of reds on the fulvous ground colour. *Odoriferous glands* open dorsally on apparent segments 4 and 5; evaporating areas pale. *Anal ring* termino-ventral with adjacent sclerites dull-black.

FIFTH INSTAR (Plate 64; Fig. 6).

Length 2.25 mm.; maximum width 1.25 mm.

Head: Triangular; dorsal stripes as in fourth instar, broad and irregular; ventral surface dull brown with lateral pale streaks merging into the pale white band to the eye-sockets. *Eyes:* Prominent, dull brown; socket ledged, glossy black. *Antennæ*: Four segmented, joints pale, tubercle distinct; segment 1 short, stout, fuscous, slightly pubescent; segments 2 and 3 subequal, longer than first, fuscous, sparsely pubescent segment 4 large, two-thirds length of segments 2 plus 3, elongate oval, dark brown, densely pubescent. *Rostrum:* Four segmented, with a pale ring around the point of insertion which is fringed with a few stout hairs; segment 1 stout, reaching hind margin of head, dark brown, save labrum almost black; segment 2 longer than first, fuscous; segments 3 and 4 dark glossy brown, third short, ultimo equal to 2 in length tapering to a blunt point; rostrum reaches hind coxæ.

Thorax: Prothorax divisible into three parts by transverse dark bands, anterior two enclosed by lateral extensions of the third; dorsal markings dull brown, irregular; mesothorax with prominent wing pads, striped proximally, glossy black at hind margins, inter-alar space filled with a dull brown circular area; metathorax with wing buds partly visible within the mesothoracic pair, wing pads show as dull white with a median dark blotch. *Limbs:* Coxæ large conical, translucent; trochanters small, dark brown; femora fuscous save distal end pale, sparcely pubescent; tibia pale brown with stout hairs distally; tarsi two-jointed with paired claws densely pubescent.

Abdomen: Eight or nine segments visible dorsally, each with a mosaic of reds on a fulvous background. *Odoriferous glands* open dorsally on hind margins of segments 4 and 5, evaporating areas extensive. *Anal ring* with sclerites dull black.

IMAGO ♀ (Plate 65; Fig. 7).

Length 4.5 mm.

Head: Jet black, densely pubescent except at hind margin. *Eyes* prominent at base angles of head, black; ocelli paired, wide apart, ruby red in colour. *Antennæ:* Four segmented, length approximately 2 mm., socket paler than rest of head; tubercle distinct, dark glossy brown; segment 1 short stout fuscous, darkening distally, densely pubescent; segment 2, length two and a-half times the first, uniformly fuscous, pubescent; segment 3, length twice the first fuscous, pubescent; segment 4 elongate oval, equal to third in length, uniformly fuscous, densely pubescent. *Rostrum:* Four segmented, reaching just beyond the hind coxæ, marginal hairs at the point of insertion; segment 1 fuscous reaching ventral hind margin of the head, labrum elongate; segment 2 elongate, darker than the first; segment 3 plus 4 equal segment 2 in length; ultimo tapering, almost black in colour.

Thorax: Prothorax large, uniformly punctate and densely pubescent; an irregular transverse band, finely tuberculate divides prothorax into two parts; antero-ventral margin milk white; mesothorax with scutellum densely pubescent. *Wings:* Forewing, clavus dull brown distally; corium divided into three parts by a forked vein, the outer arm of which may or may not reach the margin of the membrane; membrane with irregular longitudinal veins and an inner forked vein. Hind wing membraneous with irregular venation consisting usually of a double fork along the costal margin and indistinct anal veins; anal lobe large. *Limbs:* Coxal plates milk white; coxæ large, conical, smoky, pubescent; trochanters small, translucent; femora stout, fulvous with irregular brown blotches, pubescent; tibia elongate, fulvous and pubescent; tarsi three segmented, segments 1 and 3 deep brown in colour, segment 2 fulvous, all densely pubescent, claws stout, paired pulvilli. *Odoriferous glands* paired open on the metasternum, evaporating areas large and pale.

Abdomen: Seven apparent segments ventrally, the last four modified to form a groove for the ovipositor; colour fulvous, never black; densely pubescent.

IMAGO ♂ (Plate 65; Fig. 8).

Length 3.5 mm.

The description of the opposite sex will serve for the male also with the following qualifications:—

Limbs: Femora darker though still spotted, hind pair almost uniformly dark.

Abdomen: Eight apparent segments ventrally, the third much broader than the rest; segmental arrangement normal without modification. Median depression on ventral side of segment 8. Colour jet black, not fulvous as in the female.

Table I.

OVIPOSITION DATA—SERIES I.

Serial Number of Mated Bugs.	Date of Mating.	Number of Eggs Laid on Date Indicated.																												Total Number of Eggs.	Period of Oviposition in Days.
		November.					December.																								
		26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
G 1 ..	22-11-26	18	10	25	35	32	36	7	9	14	26	22	8	3	19	14	9	8	0	0	5	..	..	..	..	..	..	..	..	301	20
G 2 ..	22-11-26	..	..	9	18	24	21	9	6	0	0	4	2	5	0	0	2	1	0	10	2	2	4	1	8	0	0	6	..	134	25
G 3 ..	23-11-26	..	..	11	45	33	31	27	29	27	28	24	0	6	34	30	23	28	32	14	12	1	0	..	..	..	..	..	..	435	19
G 4 ..	23-11-26	..	..	12	25	24	21	24	27	23	25	35	29	17	14	5	0	..	..	..	..	..	..	..	..	..	..	..	..	281	13
G 5 ..	29-11-26	..	..	..	..	..	..	..	10	20	18	24	34	0	3	8	0	1	5	13	0	0	6	2	5	0	0	..	..	149	17
G 6 ..	1-12-26	..	..	..	..	..	..	..	..	..	10	20	29	24	21	25	23	29	12	25	16	0	0	0	12	11	0	0	2	259	19

Total reproductive period, 13 to 25 days. Total number of eggs per female, 134-435.

Table II.

OVIPOSITION DATA—SERIES II.

Serial Number of Mated Bugs.	Date of Mating.	Number of Eggs Laid on Date Indicated.																Total Number of Eggs.	Period of Oviposition in Days.
		December.																	
		10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th		
I 1	6–12–26	..	..	5	1	0	0	0	0	0	0	0	..	..	..	..	..	6	2
I 2	7–12–26	..	..	29	32	35	13	0	15	19	12	14	0	0	0	0	0	169	9
I 3	7–12–26	..	27	32	14	0	..	..	..	..	..	..	..	..	..	..	..	73	3
I 4	7–12–26	7	0	27	51	3	0	0	5	4	9	14	0	0	0	7	0	127	15
I 5	7–12–26	..	23	19	21	24	11	0	2	10	16	28	16	22	8	0	0	200	13
I 6	7–12–26	..	10	4	0	0	0	2	2	3	4	6	0	0	0	..	..	31	10
I 7	8–12–26	..	..	9	11	6	0	..	..	..	..	..	..	..	..	..	..	26	3
I 8	8–12–26	..	..	31	35	19	24	14	3	3	3	23	4	2	0	..	..	161	11
I 9	8–12–26	..	..	..	..	..	2	2	2	2	0	2	..	..	..	..	..	10	6
I 10	9–12–26	..	..	..	..	..	..	..	..	3	0	0	4	0	0	..	..	7	4
I 11	9–12–26	..	..	..	..	..	..	..	..	3	0	0	0	0	..	..	..	3	1
I 12	10–12–26	..	..	9	16	31	8	10	13	6	11	15	8	24	3	0	..	154	12
I 13	10–12–26	..	..	..	4	0	0	2	12	4	10	12	0	0	0	..	..	44	8
I 14	11–12–26	..	..	..	..	16	0	0	0	0	0	6	2	11	..	..	..	35	9
I 15	11–12–26	..	..	..	..	..	..	..	8	6	24	25	10	13	4	0	..	90	7
I 16	13–12–26	..	..	..	..	..	..	2	0	2	2	0	..	..	..	..	..	6	4
I 17	13–12–26	..	..	..	..	..	5	6	3	1	7	20	12	10	6	0	..	70	9
I 18	13–12–26	..	..	..	..	..	..	..	..	..	..	..	7	0	1	0	..	8	3

Total reproductive period, 1 to 15 days. Total number of eggs per female, 3 to 200.

Table III.

INCUBATION PERIOD OF EGGS.

Date of Oviposition.	Number of Eggs Laid.	Number of Eggs Hatching in 4 days.	Number of Eggs Hatching in 5 days.	Number of Eggs Hatching in 6 days.	Number of Eggs Hatching in 7 days.	Number of Eggs Hatching in 8 days.	Number of Eggs failing to Hatch.
25–10–26	16	..	1	1	10	2	2
26–10–26	28	..	..	18	7	..	3
27–10–26	38	..	2	25	8	..	3
28–10–26	43	..	2	24	7	3	7
29–10–26	55	..	2	38	5	..	10
30–10–26	28	1	2	18	4	..	3
31–10–26	47	..	2	31	3	2	9
1–11–26	38	..	3	15	11	2	7
2–11–26	3	..	..	2	..	..	1
Totals ..	296	1	14	172	55	9	45

Normal Incubation Period, 6 days.

Table IV.

DURATION OF INSTARS.

Instar.	Duration of Instar in Days.	1	2	3	4	5	6	7	8	9
I.	Number of Specimens—									
	Generation 1	..	..	12	5	35	16	9	..	..
	Generation 2	..	..	5	11	18	9	2	1	..
	Total	..	..	17	16	53	25	11	1	..
	Normal Duration, 5 days.									
II.	Number of Specimens—									
	Generation 1	1	8	22	11	9	5	4	1	1
	Generation 2	1	7	15	14	2	1	2	1	..
	Total	2	15	37	25	11	6	6	2	1
	Normal Duration, 3 or 4 days.									
III.	Number of Specimens—									
	Generation 1	..	11	20	9	7	5	1	0	1
	Generation 2	..	1	8	20	8	2	1	..	..
	Total	..	12	28	29	15	7	2	0	1
	Normal Duration, 3 or 4 days.									
IV.	Number of Specimens—									
	Generation 1	3	5	14	15	8	3	..	..	..
	Generation 2	..	3	10	17	2	..	..	..	..
	Total	3	8	24	32	10	3	..	..	..
	Normal Duration, 3 or 4 days.									
V.	Number of Specimens—									
	Generation 1	..	..	6	8	24	6	1	..	..
	Generation 2	..	..	..	5	22	1	..	..	..
	Total	..	..	6	13	46	7	1	..	..
	Normal Duration, 5 days.									

Summary.

Normal Duration of First Instar, 5 days.
Normal Duration of Second Instar, 3 or 4 days.
Normal Duration of Third Instar, 3 or 4 days.
Normal Duration of Fourth Instar, 3 or 4 days.
Normal Duration of Fifth Instar, 5 days.

Table V.—TOTAL PERIOD OF POST EMBRYONIC DEVELOPMENT.

Brood.	Number of Bugs Requiring the Period Indicated. ♀ Days.								♂ Days.										
	18	19	20	21	22	23	24	25	17	18	19	20	21	22	23	24	25	26	27
Generation 1	..	2	10	5	2	1	1	..	1	4	1	5	2	2	1	4	1	2	1
Generation 2	1	..	7	1	3	2	..	1	..	..	6	7	7	..	..	..	1	..	..
Aggregates	1	2	17	6	5	3	1	1	1	4	7	12	9	2	1	4	2	2	1

Normal Duration of Post Embryonic Development in both sexes, 20 or 21 days.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

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

Divisions and Stations.	Average Rainfall. Feb.	Average Rainfall. No. of Years' Records.	Total Rainfall. Feb., 1927.	Total Rainfall. Feb., 1926.
North Coast.	In.		In.	In.
Atherton	9·19	25	21·42	3·71
Cairns	15·00	44	37·38	3·78
Cardwell	16·86	52	38·13	7·16
Cooktown	13·19	50	15·19	3·42
Herberton	7·42	39	17·53	2·27
Ingham	15·43	34	36·27	16·80
Innisfail	21·96	45	45·42	8·51
Mossman	15·09	13	26·56	4·94
Townsville	11·41	55	20·02	13·91
Central Coast.				
Ayr	8·91	39	14·74	8·11
Bowen	8·84	55	7·09	12·20
Charters Towers ...	4·57	44	3·41	2·04
Mackay	11·49	55	8·47	4·05
Proserpine	11·80	23	9·55	8·20
St. Lawrence ...	7·86	55	4·13	1·01
South Coast.				
Biggenden	3·87	27	2·90	0·26
Bundaberg	6·08	43	4·29	1·41
Brisbane	6·18	76	5·37	1·18
Childers	5·94	31	5·12	0·32
Crohamhurst ...	12·53	35	4·25	0·26
Esk	5·26	39	5·17	0·76
Gayndah	4·19	55	3·58	0·31
Gympie	6·54	56	3·38	0·69
Caboolture	7·33	39	3·51	0·24
Kilkivan	4·88	47	6·17	
Maryborough ...	6·41	54	6·13	0·53

Divisions and Stations.	Average Rainfall. Feb.	Average Rainfall. No. of Years' Records.	Total Rainfall. Feb., 1927.	Total Rainfall. Feb., 1926.
South Coast—continued:	In.		In.	In.
Nambour	8·73	30	8·72	0·82
Nanango	4·17	44	2·44	1·10
Rockhampton ...	7·26	39	3·67	2·34
Woodford	8·49	39	2·76	0·01
Darling Downs.				
Dalby	2·81	56	3·59	0·12
Emu Vale... ...	2·31	30	2·25	
Jimbour	2·74	38	1·87	0·06
Miles	2·70	41	3·30	1·11
Stanthorpe ...	3·24	53	1·38	1·40
Toowoomba ...	4·26	54	4·06	1·85
Warwick	3·07	61	1·67	0·20
Maranoa.				
Roma	3·10	52	1·74	0·66
State Farms, &c.				
Bungeworgorai ...	2·68	12	1·71	0·98
Gatton College ...	3·16	27	2·43	0·55
Gindie	3·03	27	1·68	0·68
Hermitage ...	2·29	20	2·15	0·40
Kairi	8·51	12	22·76	3·39
Sugar Experiment Station, Mackay	10·31	29	7·68	3·89
Warren	3·93	12	4·81	0·80

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February, 1927, and for the same period of 1926, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

CANE GROWERS' CONFERENCE.

FIRST ANNUAL GATHERING AT MACKAY.

OPENING ADDRESS BY THE ACTING PREMIER.

PARLIAMENT OF THE SUGAR INDUSTRY—THE WORLD'S SUGAR POSITION—SURPLUS PRODUCTION—EMBARGO RENEWAL—UTILISATION OF BY-PRODUCTS—ASSIGNMENTS FOR CANE CULTIVATION.

"In the course of the past year further important advances have been made in the Government policy of agricultural organisation. The Primary Producers' Organisation and Marketing Act is a culmination of the desire of the Government to see rural activities established on a sound basis. . . . That Act has placed the organisation of Agriculture on a purely commodity basis, with each branch of the industry in possession of purely local autonomy.

"The stability of the sugar industry is founded entirely on the securing of a renewal of the embargo against the importation of sugar grown by coloured labour overseas. For this reason, whatever the decisions of the conference may be, I hope that there will be no diminution on the part of the producers of that unity of purpose by which the industry as a whole has benefited."

—Mr. W. Forgan Smith,
Acting Premier and Minister for Agriculture and Stock.

The first annual Cane Growers' Conference convened by the Queensland Cane Growers' Council commenced in the Town Hall, Mackay, at 10 a.m. on Wednesday 23rd March, 1927. Delegates from each mill in Queensland were in attendance, and Mr. George Johnson (Chairman of the Cane Growers' Council) occupied the chair. Mr. Johnson briefly welcomed the delegates and expressed his appreciation of the presence of the Acting Premier (Mr. W. Forgan Smith). He had much pleasure in calling on Mr. Forgan Smith to officially open the Conference.

SPEECH BY MR. FORGAN SMITH.

Mr. Smith, who was received with applause, said that it afforded him much pleasure to be there that morning to officiate at the opening of the first Conference of cane growers convened by the Queensland Cane Growers' Council under the provisions of the Primary Producers' Organisation and Marketing Act, which was placed on the statute-book during the last session of Parliament. It would be remembered that the Conference held in Mackay in January of last year had been convened by him as President of the Council of Agriculture under the old Primary Producers' Organisation Acts. In the course of the past year, further important advances had been made in the Government policy of agricultural organisation. The Primary Producers' Organisation and Marketing Act was the culminating factor of the Government's desire to see rural activities established on a sound basis, so that the countryside, as rural society, may enjoy the opportunities and amenities which are the moral right of a nation's citizens. That Act had placed the organisation of agriculture on a purely commodity basis with each industry having purely local autonomy; in other words, each section of farmers had complete control of its own industry. The Council of Agriculture under the new Act was composed of representatives elected by the various commodity or pool boards, and was the executive body to deal with matters of general concern to the producers. He felt satisfied that the new form of organisation would accomplish good work.

The Northern Cyclone and Floods.

Continuing, the Acting Premier said that he desired to express his personal sympathy—and also that of the Government—with those who suffered bereavement and other material losses during the recent cyclone and the floods that followed in its train in the North. Unfortunately, those within the tropical zone were subject to those visitations, and it was only when one had the unhappy experience of the results which attend such disturbances could the distress and loss which were left in their path be realised. He remembered the sufferings which many went through in the Mackay district in 1918, when this district had one of these disturbances, and it was with personal knowledge that his sympathy was extended to those who had suffered in the recent cyclone in the Far North.. The repetition of storms and hurricanes, followed as they generally are by serious floods, is the worst enemy of the North; and unfortunately it is a form of destructiveness which admits of little safeguard. With the knowledge of the privations and loss which are occasioned in such times, one cannot but be struck with admiration for the fortitude and courage with which people meet these situations—a characteristic typical of the Australian people. "The reinstatement of the sufferers is a duty which is national in its appeal," said Mr. Smith, "and I am pleased that the efforts that are being made in this respect are meeting with a good response. The Government has given consideration to the question of assisting those whose farms and property suffered to enable them to re-condition and rehabilitate, and I am in touch with the associated banks and other financial institutions on this subject. It is needless, I think, for me to say that the Government is sympathetic, and I am hopeful that, with the collaboration of the associated banks, ways and means will be devised to meet the difficulties in this respect."

Annual Parliament of Sugar Industry.

Proceeding, Mr. Smith said that the present Conference could be described as the Annual Parliament of the Sugar Industry, attended, as it was, by delegates from all the mill areas in Queensland to deal with matters affecting their interests. The history of the industry over the past decade was very interesting, and indicated some very important developments. The principle of collectivism had been endorsed; and that policy, he thought, stood to-day. The industry at the present time was faced with certain very important and vital problems. The question of the best method of dealing with over-production had been agitating the minds of those in the industry, but owing to the drought conditions prevailing last year and the recent disastrous cyclonic disturbance in the North, it was likely that the problem would not be so acute this year.

Review of World's Sugar Position.

In addition, a recent review of the world's sugar position indicated that "the estimates for the coming year show a marked decrease in the world's sugar production for the first time in several years, the estimated decrease amounting to 1,167,810 tons." The same review also makes the following comments:—"On the other hand the consumption of sugar during the past year has shown healthy increases in all sections. In the United States, the largest sugar-consuming country in the world, the increase is estimated at approximately 250,000 tons, which is slightly above 4 per cent. over the previous year. In Europe also the consumption is increasing gradually. With the marked increase in consumption in the principal sugar-consuming countries of the world and the large decrease in the estimate of the coming crop, together with the fact that stocks during the year have been gradually decreasing until at the close of the year they are approximately on a normal basis in relation to the demands of the world, prospects for the coming year are markedly improved, with prices at the close of this year showing a stability and tendency to rise. A more even balance between production and consumption as now in view will result in a stabilisation of the sugar industry and produce returns which should be remunerative to all engaged in the industry.

Over-Production—The Importance of Retaining a United Front.

Referring to the matter of over-production, Mr. Smith said that various schemes had been suggested as a means of dealing with this question in Australia, but it was not his province to refer to the merits or demerits of those schemes at that juncture. Suffice it to say that whatever might be the decisions of the Conference, it was most essential that delegates should keep the important principle in view that the interests of the whole were always greater than those of the unit, and that which was for the benefit of all must in the last analysis be for the benefit of the individual. By means of organisation in the past, and by means of the various enactments of the State and the Commonwealth Governments, they had been enabled to present a united front and state a united policy for the benefit of the industry as a whole. The necessity for the preservation of that unity was never more important than at the present time. A brief retrospect of the industry over the past decade indicated the progress that had been made since the passage of the Sugar Acquisition Act in 1915, under which the Queensland Government acquired the whole of the output of raw sugar at a fixed price, and also since the subsequent agreements between the Commonwealth and State Governments, culminating with the existing embargo against the importation of sugar grown by coloured labour overseas.

Renewal of the Embargo.

"The tenure of the existing embargo expires in August, 1928, but the harvesting of the coming season's crop will be the last to be affected by it," the Acting Premier continued, "consequently the importance of preserving that unity which had characterised the industry during the past ten years cannot be over-estimated. The stability of the industry is founded entirely on the securing of a renewal of the embargo, and for this reason, whatever might be the decisions of the Conference. I hope that there will be no diminution on the part of the producers of that unity of purpose by which the industry as a whole has benefited. A complement to the renewal of the embargo is the question of efficiency in the industry, both in the field and in the mill. No doubt, due largely to the work of the Sugar Experimental Stations and to other activities, much had been accomplished in that direction, as was evidenced by the fact that for 1925, on the average, 7.55 tons of cane were required to make one ton of sugar as compared with 8.51 tons of cane, on the average, for the same purpose in 1914. But it is important that there should be no relaxation of the efforts that have already been made. The granting of any embargo carries with it an obligation on the part of the producers and those engaged in an industry to supply a product to the requirements of the people of Australia, subject, of course, to a reasonable standard of efficiency, and in this connection it is necessary to exhaust every effort to secure those standards of efficiency which will obtain the greatest results from the utilisation of the by-products."

UTILISATION OF BY-PRODUCTS.

Power Alcohol.

Dealing with the manufacture of power alcohol, Mr. Smith said that the inauguration of the first distillery for the manufacture of power alcohol in Australia, which took place at Sarina on 17th February last, marked an important epoch in the history of the Australian sugar industry. At the present time Australia was practically dependent on outside resources for her supplies of lighter oils for use in internal combustion engines. There was no question but that the internal combustion engines had come to stay. Modern engineering skill had brought those engines to such a state of perfection that their reliability was now never doubted. We saw increasing uses for them in transport, tractors for cultivation, pumps for irrigation, and use in almost every phase of modern civilisation and industry. Four years ago importations of petrol into the Commonwealth amounted to between 35,000,000 and 40,000,000 gallons. Two years ago there were 80,000,000 gallons, and this year there will be over 100,000,000 gallons, of petrol imported into the Commonwealth.

Although Australia was, so far as was known, deficient in natural oil fuels, she had the advantage over many other countries in possessing the necessary elements for the production of raw materials which could be used for the manufacture of alcohol. The Sarina distillery would utilise what in the past has been to a large extent a waste product—namely, molasses supplemented by cassava.

The entire molasses yield from the 1925-26 crop would produce not more than 7,200,000 gallons of 95 per cent. alcohol, or about 8 per cent. of present total requirements. The new industry at Sarina would be the first in the world to supply alcohol fuel in large quantities entirely for motor purposes, and he understood that it was the company's intention to produce 1,000,000 gallons per annum. These figures indicated the wide field offering for the development of the manufacture of industrial or power alcohol. If the Plane Creek experiment were successful, he understood that the company proposed establishing other distilleries in Queensland in the near future, so that it would be possible from now on to eliminate the waste that had hitherto taken place with regard to our molasses, and to give this by-product of the sugar industry a definite commercial value. In addition it would enable us to divert to Australian producers and workmen a proportion of the very large amount that is annually paid to foreign oil companies. "It is not difficult to visualise the immense opening for these activities in assisting to supply the home market with one of the prime necessities of industry and transport," added the Acting Premier, "and there is also the importance as a national question of being independent of outside sources for our supplies in this respect."

By-Products of Megass.

Proceeding, Mr. Smith said that the steps that were contemplated to utilise the crushed fibre of the sugar-cane in supplying Australia's shortage of soft woods was also another expression of the desire to eliminate waste in the industry, and the fact that in 1925 this State imported 12,000,000 feet of foreign softwoods to meet its requirements was an indication of the possibilities in this regard. These new manufactures arising out of the sugar industry, national as they were in their aspects, were such as to the more forcibly indicate the claims that the basic industry—that of canegrowing—was a national one. At the present time no other agricultural industry in Australia employed so much manual labour, and as its allied manufacturing enterprises were naturally developed, there would be an immense increase, not only in the number of men employed, but also in the consumption of those commodities produced by the secondary industries of the South. These developments were of much interest to canegrowers, as they certainly tended to stabilise the prime industry—canegrowing—as the basis of such productions.

Assignments.

Referring to the question of assignments of cane lands generally, Mr. Smith said that that matter had recently received a good deal of consideration by the Central Sugar Cane Prices Board. Up to and including 1917, local boards were constituted in each year since the inception of the Act. In the notice of constitution all lands owned by canegrowers who were supplying cane to a particular mill in each of the years 1915 and 1916 were assigned to that mill. The notice covers land owned by such growers not necessarily under cultivation for cane; the land may even be now in its virgin state. In view of this and other anomalies the Board had decided to send an officer into each district who, in collaboration with the millowner and the grower concerned, would collect information which would enable it to determine the area for which each grower was entitled to assignment. It was hoped that this investigation would be the means of dealing equitably with a question which has caused considerable anxiety to many canegrowers.

Conclusion.

In conclusion, the Acting Premier said that it was not his purpose to go through the various items on the agenda paper, nor at that stage to express an opinion. He took it that delegates would deal with such matters, and that subsequently the recommendations of the Conference would be submitted to the Government for consideration. As Minister for Agriculture, and as President of the Council of Agriculture, and on behalf of the Queensland Cane Growers' Council, he welcomed them sincerely to the Conference, and expressed the hope that their deliberations would be a great success. He trusted that their decisions would result in increased prosperity and benefit to the industry as a whole, and he had much pleasure in declaring the Conference officially opened.

BIRD SCARES.

The Manager of the Home Hill State Farm, Mr. C. G. Munro, writes:—Two different bird scares were tried here recently. The first was a kerosene tin slung by a piece of No. 8 fencing wire through the ends. On the outside of the tin oblong pieces of tin 12 in. by 6 in. were soldered from corner to corner diagonally, on each of the four sides. A vane 14 in. by 6 in. was fastened above the tin on the wires that connected with the central shaft through the centre. The lower end of this vane was placed sufficiently high to allow the tin and its sails to revolve beneath the vane by wind pressure; a few light pieces of wood put inside the tin caused suffient noise to attract notice. This contraption was suspended from the end of a long sapling set in the soil with a good lean and strutted by two forks to keep its base sufficiently firm to withstand windage on the revolving "scare." Parrots and cockies gave this thing a wide berth.

Another device, also composed of kerosene tin, was fitted with two tin wings from its corners and a tail to keep it in the wind. This suspended from a leaning sapling also frightened the birds, who probably mistook it for a new kind of hawk. The frequent flashes of reflected sunlight from the moving and plunging scare made even the crows look upon it with black suspicion. Whether that frame of mind will continue remains to be proved on future crops.

OBITUARY.

COLONEL THE HON. A. J. THYNNE.

END OF A DISTINGUISHED PUBLIC CAREER.

A notable and busy life was ended on Sunday, 27th February, with the death, at his residence, Highgate Hill, Brisbane, of Colonel the Hon. Andrew Joseph Thynne, at the age of seventy-nine years. For more than half a century he had been connected with the legal, educational, political, and social life of the State. Sometime Minister for Agriculture and Stock, he influenced largely the progress of the primary industries in Queensland. Despite the burden of years he continued to manifest interest in public affairs, as Chancellor of the University of Queensland and otherwise, almost to the last.

Plate 66.—The Late Colonel the Hon, A. J. Thynne.

He was one of those who, in Carlylean phrase, cannot but be in earnest; whom nature herself has appointed to be sincere.

A Man of Action.

Irish by birth, and a true Queenslander, in that he was at all times in his long and useful life actuated by the most thorough regard for the well-being of this State and the advancement of its people, the late Colonel Andrew Joseph Thynne was undoubtedly one of the "grand old men" of law and politics in this country. Always a cultured and considerate gentleman, his innate qualities of dignity, kindness, and candour won him the affection of his many friends and the respect of the community he served so well. In no sense of the term was he a man of words. He invariably preferred action—action, wherever possible, of the most unostentatious kind.

Early Days.

The late Colonel Thynne was born at Ballinagrave House, County Clare, Ireland, on 30th October, 1847, and was the son of the late Edward Thynne. He received the foundation of his education in his home county, chiefly at the Christian Brothers' School at Ennistymon, and at the hands of a private tutor. Later, he attended Queen's College, Galway, where he carried off a classical scholarship. He arrived in Queensland with his parents as a young man in 1864, and obtained a position in the civil service as a clerk. The prospects as an employee of the Government did not, however, accord with his ambitions, and he resigned after a little while in order to take up the study of law, securing admission in 1873 as a solicitor. In 1882 he was appointed to the Legislative Council, and such was his ability as a legislator that he was repeatedly chosen for Ministerial honours. He was Minister for Justice and Attorney-General in the McIlwraith and Morehead Ministries of 1888 and 1890, and was a Minister without portfolio in the McIlwraith-Nelson Government of 1893. Under the Premiership of Sir Hugh Nelson, he was made Postmaster-General, and occupied that important post from 1894 until 1897. He was also Secretary for Agriculture from 1896 until 1898. Prior to his becoming Minister for Agriculture, the portfolios of Lands and Agriculture had been combined.

The first Minister for Lands and Agriculture was the late Mr. Henry Jordan, who was appointed on the 30th August, 1887. He was succeeded as Minister for Lands and Agriculture by Mr. C. B. Dutton, Mr. M. Hume Black, Mr. A. S. Cowley, and then Mr. A. H. Barlow, who was Mr. Thynne's immediate predecessor. He held office from the 6th May, 1896, to the 2nd March, 1898.

Founder of the "Queensland Agricultural Journal."

To Mr. Thynne may be given the credit of organising the Department of Agriculture and Stock, and for the immediate establishment of many of the present activities of the Department, including the creation of the Agricultural College, State Farms, the "Queensland Agricultural Journal," and the institution of Agricultural Conferences on a State basis. He also had passed the first Diseases in Stock Act and the first Diseases in Plants Act. The two travelling dairies were started prior to Mr. Thynne's term of office. They were really instituted by Mr. Black in 1889, Mr. Baron Jones being the manager of No. 1, and Mr. John Mahon the manager of No. 2.

Queensland was represented by him at a number of momentous conferences, notably the Federation Conference at Sydney in 1891, the Colonial Conference in Canada in 1894, the Postal Conference at Hobart in 1895, and the Pacific Cable Conferences of 1895-6.

Influence on Education.

A consistent advocate for better and increased educational facilities for the people, Colonel Thynne ranged himself on the side of those who were agitating for a Queensland University. He recognised, as did other thoughtful men in the community, that such an institution was necessary to the State if its citizens were to be fitted for leadership, and, accordingly, he did his best to influence public and official opinion in this direction. It was a fitting tribute both to his services and his qualifications that he should have been appointed to the first University Senate, in April, 1910. When the second Senate was elected in 1916, he was elected Vice-Chancellor, and was re-elected to that position year after year until 1926, when he became Chancellor. He gave to the post the fruits of his long experience of men and affairs, his culture, and his love for work, and it is no exaggeration to say that he has left an indelible impression upon the institution. He did not, however, confine himself to academical affairs. His energy and public spirit found an additional outlet, at various times, as president of the Queensland Ambulance Brigade, president of the Boy Scouts' Association, president of the Chamber of

Agriculture, president of the Law Association, and chairman of the Board of Technical Education.

The late Colonel Thynne ardently advocated a sound mind in a sound body. Hence his fondness for combining healthy outdoor life with mental training. He first became associated with the military forces as far back as 1867, and on two occasions won the Queen's prize at rifle matches, thereby proving himself an uncommonly good shot. Rifle shooting was one of his chief recreations, but he also exercised himself as quietly with bowls, as well as busying himself with gardening pursuits. His mind he constantly cultivated, and he did all he could to broaden the mental outlook.

His patriotism found a special outlet when he became chairman of the Recruiting Committee, in which capacity he did such untiring, good work.

In his time, therefore, the late Colonel Thynne was a fine lawyer, a far-sighted politician, an ardent educationalist, a firm patriot, a loyal soldier, and, above all, a good citizen. He will long be remembered for his unselfish services to Queensland, and his many lovable personal qualities will ever be cherished by those who were proud to acknowledge him as a friend.

A Record of Great Public Service.

"As a citizen the late Mr. Thynne measured up to the highest standard. Beginning life without the prestige of wealth or great influence, he rose steadily in his profession and in the esteem of his fellow-men. In him were united keen intellect and dignified bearing that enabled him to adorn whatever he touched."

In those words His Grace, the Right Rev. Dr. Duhig, Archbishop of Brisbane, in the course of an eloquent panegyric at the solemn requiem mass in St. Stephen's Cathedral on the following day, and which preceded the State funeral, epitomised the public-spirited career of a great Queenslander, whose death was made the occasion of public mourning.

At the funeral wide-spread sorrow for the passing of a great citizen was manifested during the passage of the cortege from the cathedral through the streets of the city to the South Brisbane Cemetery, where the scene was a most impressive one. There were gathered representatives of every section of the community, including His Excellency the Lieutenant-Governor, Hon. William Lennon; the Premier, Hon. W. McCormack; the Deputy Premier and Minister for Agriculture and Stock, Hon. W. Forgan Smith; the Attorney-General, Hon. J. Mullan; the Minister for Public Instruction, Hon. T. Wilson; and the Minister for Public Works, Hon. M. J. Kirwan, and the Chief Justice, Hon. J. Blair. The Speaker and Members of the Legislature, the Vice-Chancellor and Senate and Faculties of the Queensland University, the Judiciary, State and Federal Public Services, Naval and Military Forces, Foreign Consular bodies, City Council, Public bodies and National societies, Professions and Commerce, and the University Union were all specially represented.

After the recitation of the burial service by His Grace Archbishop Duhig, the Vice-Chancellor of the University Senate (Dr. W. N. Robertson) said that they had gathered to pay their last respects to a great man. The University of Queensland owed a great deal to him. He had done great work for all its departments, but they were particularly grateful to him for his great work in the Department of Agriculture. His was also no small influence in the establishment of a Faculty of Agriculture within the Queensland University. Dr. Robertson said that it was not for him to discourse at any length on the merits of so great a man, whose accomplishments were patent to all. Colonel Thynne had been a shining example of service to the community, and a man of self-sacrifice. They could follow his great example, and their country would be a great one.

TRIBUTES.

Many tributes were paid to Mr. Thynne's life, character, worth, great public service, and lasting influence on the welfare of the State by representative citizens, of which the following were expressive of the general feeling of regret and sense of great public loss.

The Premier's Tribute.

"The death of Colonel Thynne," said Mr. McCormack, "removes a citizen who, as well as being a leader in his own profession, was for a very long period closely associated with the government of this State.

"Latterly his public life was, in the main, devoted to the Queensland University, with which institution he had associated himself from its foundation, and in the advancement of that institution, and of education generally, he took an extraordinary interest.

"The Queensland Ambulance service also owes a great deal of its splendid tradition and efficiency to the untiring zeal and devotion to duty of Colonel Thynne.

"In view of his distinguished career as a citizen of this State, and his splendid service as a public man, the Government considers it fitting that his remains should be accorded a State funeral."

Tribute from the Acting Premier.

A high tribute of appreciation was paid to the memory of the late Colonel Thynne, a former Minister for Agriculture, by the Acting Premier and present Minister for Agriculture and Stock (Hon. W. Forgan Smith).

Mr. Forgan Smith said that he had read with regret of the passing of Colonel A. J. Thynne, who was, without doubt, one of Queensland's great citizens. In his long public career he had been associated with many activities which were calculated to promote the progress of the State. A former Minister for Agriculture in this State, he laid down the basis of an organisation which had been built upon as the State developed. The late Mr. Thynne had set out in a very clear and concise manner what he considered should be the functions of a State Department of Agriculture, and when he (Mr. Forgan Smith) took charge of the department he had read that document with great interest.

Mr. Forgan Smith added that he had been associated with Colonel Thynne on the State Executive of the Queensland Ambulance Transport Brigade, of which Colonel Thynne had been president since its inception. His work in setting up that body was a great success, and the benefits which the organisation had conferred on Queensland owed much to his untiring energy and organising ability. His work in the sphere of education and in the development of a better and more adequate system within the State had also borne fruit, and his appointment as Chancellor of the University of Queensland was a fitting recognition of the services he had rendered that cause.

The Chief Justice's Tribute.

The Chief Justice (Hon. J. W. Blair) paid a glowing tribute to the memory of the late Colonel Thynne in the Supreme Court. "I have learned," he said, "with the deepest regret of the passing of Colonel Thynne. The deceased was a solicitor of this Court of long and honourable standing, a citizen with a career of long and distinguished service to the State, a Cabinet Minister, a Minister of Justice, and the head of our profession. We shall miss him, and my brothers and I tender the deepest sympathy to his widow and family."

'POSSUM POISONING—MENACE TO STOCK OWNERS.

According to the Southern Press, serious complaints concerning the poisoning of valuable stock by preparations left in places accessible to sheep and cattle for the purpose of illegally poisoning opossums are being made by pastoralists and farmers who lately have suffered severely from losses arising from this cause. For some time, it is reported, it has been the practice of unscrupulous persons to lay poisoned baits for opossums on farm and pastoral properties, a method of destruction prohibited by law. The hunting of opossums in the usual manner is permitted only under strict conditions, but by reason of the high prices which can be obtained for skins many persons without licenses, it is said, have lately adopted the practice of poisoning. The dead opossums are recovered by trappers, and according to country residents, are disposed of to buyers visiting rural districts in motor-cars under cover of darkness. It is believed that these buyers are able to dispose of the skins and evade detection by the authorities by concealing the skins in bundles of rabbit skins. Baits lying upon the ground which are not taken by opossums are picked up by sheep and cattle and in some districts heavy losses of stock which have eaten the baits have been reported from time to time. Farmers say that although heavy penalties have been provided for infringements of the law they are far from satisfied with its administration, and consider that more effective steps should be taken to prevent what constitutes not only a defiance of the regulations, but a serious menace to stock owners.

BREEDS OF PIGS.

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

THE MIDDLE YORKSHIRE

(also referred to as the Middle White).

There are several breeds of pigs suited to the climatic conditions and environment of Queensland—the Berkshire, the Tamworth, the Poland-China, the Middle Yorkshire, and the more recently introduced types, the Duroc-Jersey, the Gloucester Old Spot, and the Large Black.

There are also, of course, several crossbred types obtained as a result of mating two of these pure breeds together, such as the Tamworth and the Berkshire.

To the young farmer who sets out with the idea of securing foundation stock for his future herd, several important points must therefore be kept in mind. Some of these might be dealt with as follows:—

First, he must consider his own fancy, for most men interested in pig-breeding have a fancy for one breed or another.

Secondly, consideration must be given to the public taste. This is a very important point, as the public represent the buyers, and in order to secure top market rates we must aim at giving the buyer exactly what he requires.

Thirdly, he should not forget the live stock market demands. Some markets call for one type, some for another. The markets of the South call for a much heavier supply of light and medium weight porkers than the Queensland markets. Their types differ, too; thus in Victoria the most popular types are the Berkshire and the Large and Middle Yorkshires, or a cross between these breeds. These types being admirably adapted for the production of pork pigs and for the comparatively light bacon pigs, for which there is nowadays such a persistent demand, they suit the Southern markets rather better than the North. It is for this reason that types like the Berkshire, Tamworth, Poland-China, and Duroc-Jersey are more popular in Queensland than the famous Old Yorkshire, of which breed we have but one type in Queensland now, popularly known as the Middle White or the Middle Yorkshire. The Gloucester Old Spot is becoming more popular every year, and doubtless the Large Black will also find a place in the market as time goes on.

Origin of the Middle Yorkshire.

As far back as the year 1852, Joseph Tuley, a noted breeder of his day, exhibited at the English live stock shows a number of excellent quality white pigs. These were called Large Yorkshires, and were much admired. It was found that they were not altogether satisfactory, however, for they were inclined to grow too large, and were, as a result, very coarse; so eventually a smaller type became more popular, and these were known as Small Yorkshires. These, after a wonderful run of popularity, also failed to "fill the bill," and thus it came about that as a result of continued crossing and careful selection another type was fixed, to which the title of Middle Yorkshires, Middle Whites, or Mid-Yorks was given. These have now, particularly in Australia, outgrown both the others in point of popularity with both pork-buyers and bacon-curers. Tuley was in reality one of the founders of this type, and he spent many years striving to make his favourites more perfect, both from a show as well as from a utility standpoint. Thus we have in the Middle York the medium between the short chubby nose and body of the Small Yorkshire and the rather elongated fine snout of the larger type. The short, broad face and the general symmetrical appearance of this breed make them a very attractive as well as a very useful type.

It is usually considered that the short chubby type of pig is much earlier maturing than those carrying a longer, pointed, and less-dished snout, and a more lengthy, fleshy body. This is one of the reasons why the Middle Yorkshire is so very popular as a pork pig. In England the breeders still have the three distinct types of Yorkshires—the Large York (essentially a bacon pig, and for crossing for bacon production), the Middle York (a dual purpose animal suitable for either pork or bacon), and the Small York, which is distinctly a small, fancy trade porker suited only for Christmas or Easter markets. There are no Small Yorkshires in Australia; they are distinctly unsuitable for our climate, and we have no demand for the class they represent; they are also fast disappearing among British and Continental herds.

Of Large Yorkshires we have only a few, though this is a type for which there is a certain demand "down South." The Middle Yorkshire we have in limited numbers, and they are also a popular, attractive type, both in Great Britain and in

PLATE 67 (Fig. 1).—A FIRST PRIZE MIDDLE YORKSHIRE SOW WITH LITTER, SYDNEY SHOW.

Ralph Joyce's "Kyabram Beauty" 2465. The litter is sired by "Coleraine" 2234, who won the Progeny Group Prize, Royal Show, Melbourne, 1922. This litter was line-bred. The sow only had the seven pigs, but made an exceptionally good job rearing them. The small black stain on the backs of the suckers are sale (paint) marks only. An exceptionally well-developed lot. Typical rent-payers of an up-to-date type.

Plate 68 (Fig. 2).

Three special qualifications to be noted in the selection of brood sows: Prolificacy, docility, and heavy milking capacity. They are all characteristics of the Middle Yorkshire Sow in this picture.

other countries. In the United States of America the Mid York is classed as a secondary breed; they do not suit their conditions as well as some of their own white breeds, the Chester White, the Victorias, &c. They have therefore not been taken up very much by our "Yankee" friends, who prefer a "Made in America" breed.

One of the English writers (Harris, on the Pig) says of the Middle Yorks:—"They are perhaps the most useful and most popular of all the white breeds, as they unite in a striking degree the good qualities of the Large and the Small Yorkshires, and fortunately do not possess many of the inferior qualities of either of its progenitors.

"As a bacon pig, the type under review is well developed, and the lengthy sides enable it to produce more lean meat or meat of a 'streaky' nature. For the production of an ideal bacon pig they should be crossed with one of the other breeds, a large breed for preference (this for the English market). For porkers the best results are obtained by mating the Middle Yorkshire sow with the Berkshire or Poland-China boar."

In the pure-bred state the Mid York makes a very useful porker, particularly if well cared for and kept in clean sties or yards well protected from the sun. They should be well washed and cleaned up before sent in to market if best prices are to be obtained. In the Southern markets they compare more than favourably with the Berkshires, &c. In general they resemble the Berkshire very much; they vie with the latter breed for first place as a medium type, but must give way to the Poland-Chinas, Berkshires, and perhaps Duroc-Jerseys in districts subject to the extreme heat of summer, as the white pigs are more suited to the temperate parts of the State than to the tropical coastal districts. The Yorkshires cannot stand "sun baking," as their skin is ruined when once badly scalded or sunburnt. As an all-round farm pig for the cooler climates the Middle Yorks are a very fine type, noted for quick growth, early maturity, good feeding qualities, even proportion of fat and lean, with a comparatively light percentage of offal when slaughtered.

Several points worth careful note emphasised by British breeders are as follows:—

(1) They are of a size, shape, and flesh that are desirable for the pork-buyer or bacon-curer's use.

(2) They have a hardy, vigorous constitution and a good coat of hair (if special attention is given to selecting a suitable type), which protects the skin.

(3) They have been spoken of as the gentlest race of pigs in existence, easily handled at all times, and kept in bounds with ordinary fences. They are also quiet and contented.

(4) They feed well and fatten quickly at any age.

(5) They are very prolific. Generally speaking, they are the most prolific and prepotent type we have. The young pigs are mostly even in colour and vary but little in shape. They are true to type and their form, when matured, may be determined by inspecting the sire and dam. They are considerably more prolific than the Small Yorks. Like all white types, they occasionally show blue or very dark spots on their pinkish skin.

Both pork-buyer and bacon-curer agree that the "Yorks," when well fed and cared for, produce a large amount of tasty, nutritious flesh with a minimum of light bone and offal. The flesh is evenly distributed; the sum of good qualities is higher than in most breeds. There is fully 10 per cent. or more difference in the meat value of a good well-developed Yorkshire as against the common or mongrel pig, of which, unfortunately, we still have a percentage. The latter types are usually deficient in vigour, constitution, and quality of flesh, whilst they are characteristically always hungry and squealing for more food.

Special Attention in Selecting Middle Yorkshires.

Special attention should be given in selecting boars and sows of this type in Queensland to ensure securing animals well provided with a thick coat of fine, silky hair, free from coarseness and black hairs. The very soft-skinned light-haired types are quite unsuitable here. See also that they come from types noted for prolificacy. The Yorkshire sow is noted as an excellent mother, giving a good flow of rich milk.

In the Mid York the ham should be more fully developed than in most breeds. It has a great length at the rump, and the tail is usually well set up; the lengthy back, which may be slightly arched, carries a good depth of flesh, and this, connecting with the ham by a strong thick loin, induces a strong development of flesh in this most valuable cut.

Plate 69 (Fig. 3).—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."

Pigs of this quality are not difficult to handle for they have become accustomed to other food in addition to the mother's milk before weaning. Note their even development, splendid quality, and rapid growth. The Middle Yorkshire is noted for prolificacy, docility, and early maturity.

Other Characteristics.

The shoulders should be well set, deep and wide, allowing for the development of a roomy capacious chest, which is a very necessary feature. The neck should taper slightly towards the head. This is particularly noticeable in the female. The jowl is light, running well into the neck. The Yorks do not carry the heavy jowl and short thick neck characteristic of some types of the Poland-China. The snout is short and dished, the muzzle broad and full, ears inclined to be large, though some types have short pricked ears. In the Middle Yorks the legs are usually well developed. This is a weakness in many strains of the larger type. The belly and flanks are deep and full fleshed, and the udders well developed. The sows are prolific, litters ranging from nine to thirteen being by no means uncommon. The "York" boar is usually a very sure stock-getter, and is both active and prepotent.

PLATE 70 (Fig. 4).—THE RESERVE CHAMPION MIDDLE YORKSHIRE SOW AT THE ROYAL AGRICULTURAL SHOW, MELBOURNE, VICTORIA, SEPTEMBER, 1926. MR. J. H. THORBURN'S "OATLANDS ENID," 2740.

A typical representative of the Middle Yorkshire breed. 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 milk.

The Yorkshire's Greatest Fault.

Unfortunately, the Yorkshire pigs possess the one great fault—they cannot stand the rougher conditions characteristic of many of our pig farms. They sun scald badly, and do not present the attractive appearance of other types that do not suffer so much from this defect. There is but one way to overcome this fault; the utmost care should be given in the first instance to selecting thick-haired types, and to providing abundant shade and shelter for the pigs at all times. Given these conditions, with improved methods of feeding and handling, there is no reason why the York should not prove a satisfactory type.

Breeders of this Type.

The late Mr. W. J. Warburton, who for many years prior to his death was a breeder and fancier of the Middle Yorkshire, his experience of them being that they were equal to the best in all other breeds if given anything like a decent chance, while they were superior to the general average farm pig from the standpoint of the pork and bacon producer. His famous Northgate stud (now, unfortunately, entirely dispersed) had a splendid reputation for the quality of its White pigs—the stud was represented by liberal entries at Sydney and Brisbane shows for well nigh thirty years. In recent years, however, there has been a very considerable falling-off in the demand for stud pigs of the Yorkshire type, this particularly so in Queensland, hence breeders have reduced stocks or have disposed of their White studs, until at the present time there are but one or two registered breeders of these pigs with stock for sale.

Introductions of Middle Yorkshires during the past year or two include half a dozen very fine boars and sows donated to the Queensland Pig Club scheme by that well-known Victorian breeder, Mr. Ralph Joyce, who also supplied a yearling boar

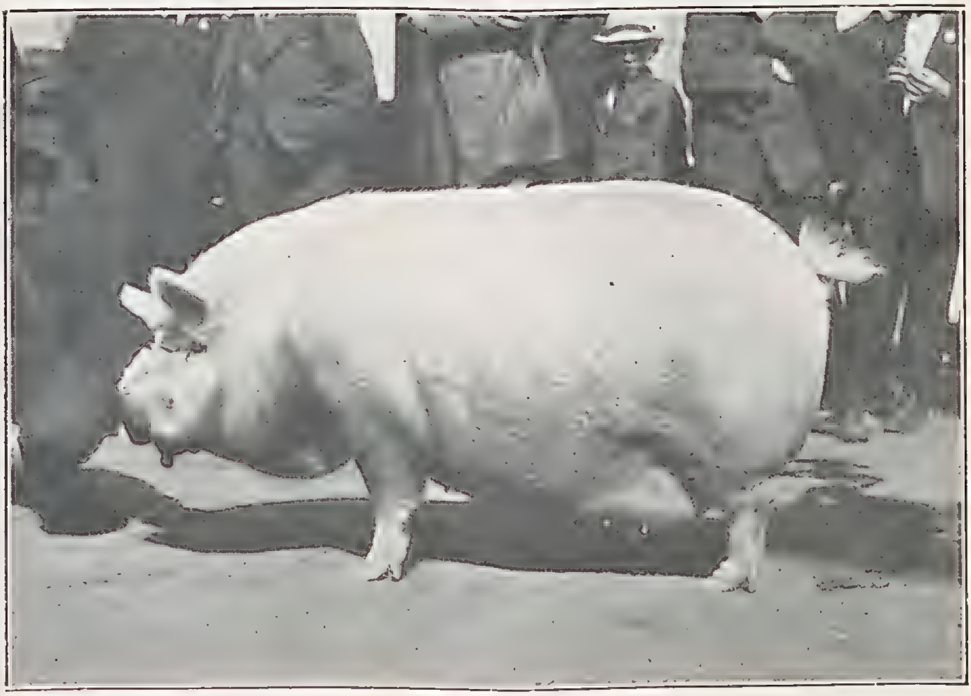

Plate 71. (Fig 5).—A Typical Middle Yorkshire Sow

She won First Prize with litter at foot, Sydney Show. Property of Mr. J. Winterbottom, Mascot, New South Wales. Note her great depth and compactness. A young sow with a capacity to produce litters freely, regularly, and abundantly.

to the Colonial Sugar Refining Company's Macknade mill, in North Queensland, and a yearling boar donated to the Salvation Army Farm Home for Boys at Riverview, Queensland.

The Queensland Agricultural High School and College, Gatton (*i.e.*, the Gatton College) were for many years also breeders of Yorkshire pigs, but they dispersed their stud and do not now breed White pigs at all.

The Salvation Army Farm Home for Boys at Riverview have also recently introduced several breeding sows and one or two young boars of this old world type with the objective of establishing a Middle Yorkshire stud, and offering for sale selected boars and sows of varying ages. One young boar was recently sent North to the Atherton Tableland to Yungaburra, to an enthusiast there—Mr. P. C. McCarthy.

There are, of course, many farmers who have the Yorkshire strain in their herds, in fact one sees quite a number of White pigs as one travels. The bacon pig buyers do not appear to have any objection to these pigs, provided they are otherwise normal and free from sun scald or its effects. The White pigs referred to are mostly the progeny of Yorkshire boars from Berkshire or grade sows, or *vice versâ*, for, as stated above, there are very few pedigreed Middle Yorkshires in Queensland.

The following report is an extract from the publication "British Pigs for Profit," published by the National Pig Breeders' Association of England. It gives some interesting information in regard to this breed, as viewed from the standpoint of the British breeder and exhibitor:—

"The popularity of the Middle White pig is due in no small measure to its value as a general purpose animal. It is one of the few breeds which can satisfy the requirements of both the pork butcher and the bacon-curer, and it enjoys equally with the Large White and Tamworth breeds all the advantages inherent to long registration. There is no doubt that part of the success of the breed has been due to its adoption by breeders who will ever rank as the pioneers of a sound pig-breeding policy and practice in England. It is safe to say that the uniformity in type which now prevails is not excelled by any other breed. Moreover, so long as the elimination of

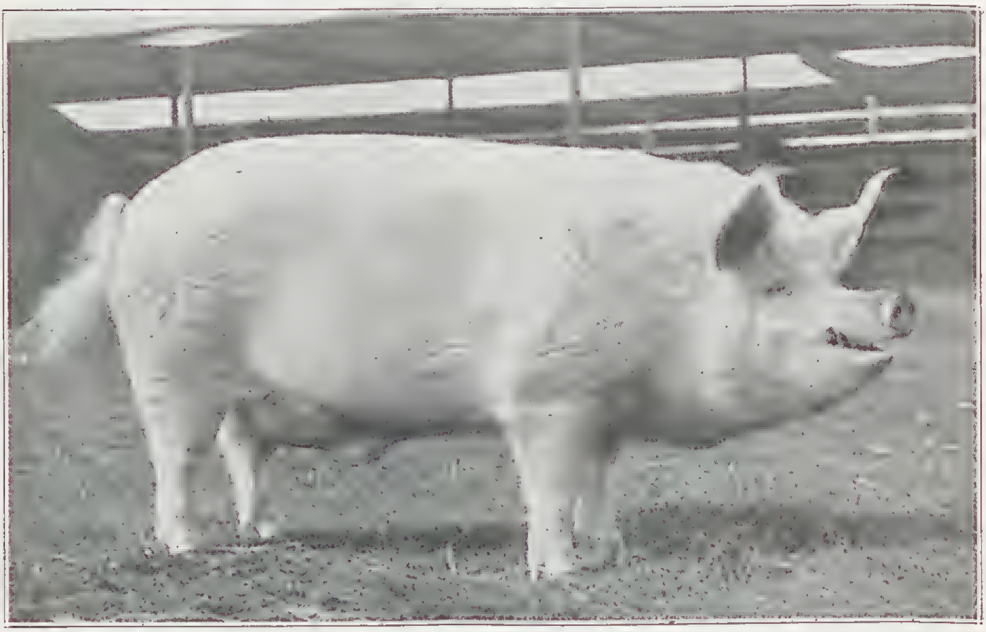

PLATE 72 (Fig. 6).—A TYPICAL LARGE WHITE BOAR OF THE LATEST ENGLISH TYPE.

Note his length, depth, and strength, the comparatively thick coat of fine silky hair, and the strength and boldness of character. Boars of this description are prepotent, active and vigorous withal, masculine in bearing and gait.

This photograph of a typical Large Yorkshire Boar is inserted to show the difference in type and conformation between the short-headed, thick-set Middle Yorkshire and the long-nosed, lengthy, deep-bodied Large Yorkshire.

undesirable qualities is pursued with the judgment and energy exhibited by the owners of the leading herds, the Middle White pig is destined to enjoy a progressive prosperity.

"UNRIVALLED FOR PORK PRODUCTION.

"Although the Middle White has been referred to as a pig that is suited to every requirement, it probably excels all breeds for the production of pork. The table of average weights, prepared after most careful investigation for the guidance of those who study the all-important question of weight-for-age, serves to indicate how rapidly the breed puts on flesh.

"It will be appreciated that when crossed to a Large White boar the progeny of a Middle White sow may be expected to grow to greater weights at the various ages quoted, because both practice and science has demonstrated that the first-cross pig excels in weight production.

"The successes of the Middle White pig at the London Smithfield Fat Stock Show indicate its ability to put on flesh. The champion single pig of the show in 1920 and 1922 was a pure-bred Middle White, the former scaling 367 lb. at eight and a-half months, representing a daily gain from birth of over 1½ lb."

Since then Middle Whites have won on several occasions in competition with other British herds. There can be no doubt but that the quality of the meat produced by Yorkshire pigs is good, while its ham is well developed and of excellent texture and flavour, the flesh carrying well down into the hock. No better description has been attached to any animal than has "the poor man's friend" to the Middle White. Every pound of food consumed is utilised to the best advantage, and the proportion of loss from live weight to dead weight is, according to the National Pig Breeders' Association's report, remarkably small.

ESTIMATED WEIGHTS OF MIDDLE WHITE PIGS AT VARYING AGES, AS PUBLISHED BY THE NATIONAL PIG BREEDERS' ASSOCIATION OF ENGLAND.

Age.	Average weight.	Specially fed.
	lb.	lb.
8 weeks	30	40
3 months	52	65
4 "	78	96
6 "	130	150
7 "	158	180
8 "	186	210
9 "	216	240
12 "	306	330
18 "	466	490
2 years	586	620

Period.	Class.	Number of Animals in Class during Period.	Average Age.		Average Live Weight.	
			months.	days.	cwt.	lb.
1907-11	Porkers not exceeding 100 lb. live weight	46	3	25	0	82
1902-11	Not above nine months	120	8	14	2	83
	Above nine, not above twelve months	104	11	13	3	63
	Single pigs not above twelve months	28	11	1	3	53
1919-21	Porkers not exceeding 100 lb.	30	4	2	0	92
	Not above six months	32	5	16	1	47
	Above six, not above nine months	47	8	15	2	49
	Single pigs not above nine months	15	8	13	2	40
1924	Two pigs under six months	28	0	183	1	92
	Two pigs under nine months	24	0	264	2	101
	Single pig, under nine months	13	0	265	3	7

Fecundity of the Breed.

Further extracts from "British Pigs for Profit" relate to the fecundity of the Middle Yorkshire breed:—

"The breed, like the Large White, is noted for prolificacy, and it is doubtful whether any other breed can surpass the Middle White in this direction. Without suggesting that it is necessary for a sow to have so many pigs in a litter, cases are frequently being reported of seventeen and eighteen being born, while twelve to fourteen is normal. The Middle White sow is a wonderfully docile mother and an exceptionally good milker; and these points are of vital importance to the feeder for the pork market.

"The fecundity of a sow must not only be judged by the number of pigs she produces, but also by the number which she rears. Time is lost—and time represents money—if a sow only produces a few pigs at farrowing time. Hence the Middle White, being naturally a prolific breeder, may be expected to yield more profit than most types.

"On one English farm where eighty breeding sows are kept and all records are accurately tabulated, the average number of pigs reared is no less than 22.4 per sow per annum—*i.e.*, 11.2 pigs twice a year. It may also be noted that one of the sows which produced seventeen pigs in a litter reared thirteen of them so satisfactorily that two were exhibited at several leading agricultural shows and obtained numerous prizes before attaining the age of six months.

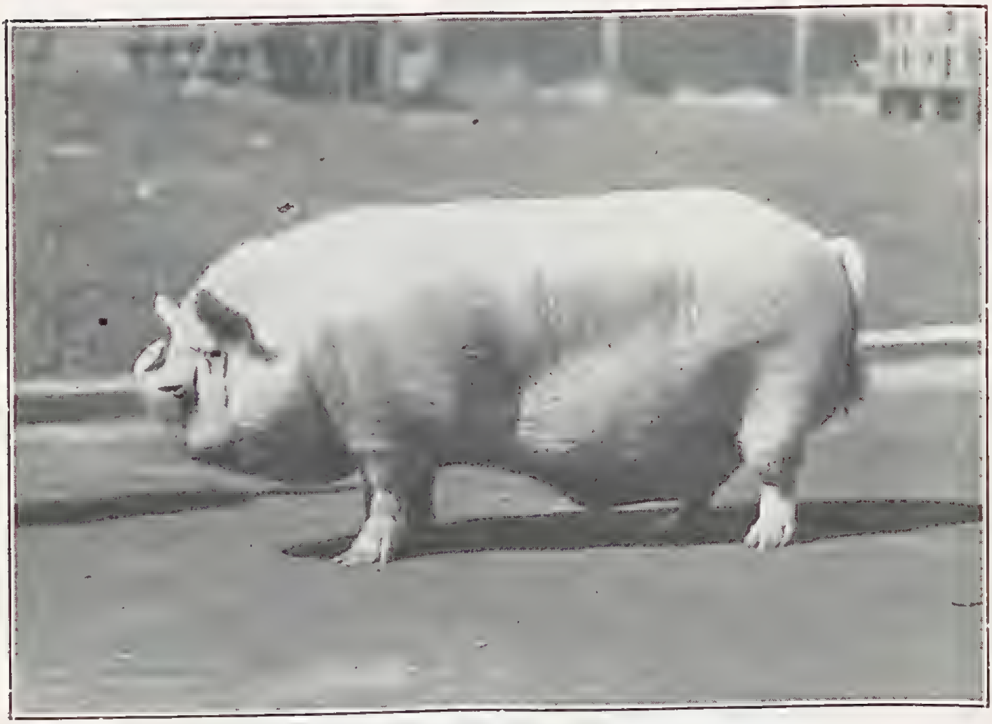

PLATE 73 (FIG. 7).—THE MIDDLE YORKSHIRE.

A popular type for the production of porkers and light bacon pigs. The Yorkshire Boar crossed with Berkshire Sows gives excellent results. Note this boar's conformation, type, and quality.

"THE HARDY AND THRIFTY PIG.

"Being of hardy disposition the Middle White is especially suitable to those farmers who have not elaborate sties, but who let their pigs 'roam wild.' Many breeders run their sows out by day, both in winter and summer. As a grazier, it is especially notable, and its confirmation, especially as revealed in comparative heart girth, indicates a good constitution.

"Throughout the cold, wet winters Middle White pigs may be seen running out in the fields. They have a natural disposition to put on flesh, and it is probable that this characteristic is one of the reasons why they have become so popular all over the world.

"The sound, vigorous constitution of the Middle Yorkshire is imparted to its progeny to a remarkable degree, no matter whether pure or crossed.

"Some of the principal objects which English breeders of Middle White pigs have had in mind since they established registration are to produce and improve animals which will thrive under all conditions, amass weight in return for a low consumption of food, produce and rear large litters, and, never forgetful of the commercial end of every pig, take the eye of the butcher at all stages of its life."

Standard of Excellence for Middle Yorkshire Pigs.

The Council of the Australian Stud Pig Breeders' Society have adopted the following:—

Colour—White, freedom from blue spots.
Hair—Long, plentiful, and silky.
Head—Short and light, wide between ears and eyes; face slightly dished.
Ears—Medium, carried erect; slightly inclined forward, fringed with fine hair.
Shoulders—Well sloped backwards and free from coarseness.
Chest—Wide and well let down.
Neck—Medium length, evenly set on shoulders; jowl full and not heavy.
Back—Long and straight; sides deep, ribs well sprung.
Loin—Broad and not drooping.
Belly—Full, thick, with at least twelve teats.
Flank—Thick and well let down.
Hams—Broad, full, and meaty to hocks.
Tail—Set on high, and not coarse.
Legs—Short, straight, and strong; feet firm and strong, hoofs nearly erect.
Action—Free, clean, and not rolling in hindquarters.

QUEENSLAND SHOW DATES.

The Queensland Chamber of Agricultural Societies has forwarded the following schedule of show dates for 1927:—

April.
Goondiwindi, 5th and 6th.
Beaudesert, 6th and 7th.
Dalby, 7th and 8th.
Chinchilla, 12th and 13th.
Sydney Royal, 11th to 20th.
Herberton, 18th and 19th.
Allora, 21st and 22nd.
Nanango, 21st and 22nd.
Kingaroy, 28th and 29th.
Oakey, 29th.

May.
Kalbar, 2nd.
Taroom, 2nd to 4th.
Charleville, 4th and 5th.
Wondai, 5th and 6th.
Toogoolawah, 6th and 7th.
Blackall, 10th to 12th.
Mitchell, 11th and 12th.
Boonah, 11th and 12th.
Murgon, 12th and 13th.
Roma, 17th and 18th.
Ipswich, 18th to 20th.
Kilkivan, 18th and 19th.
Springsure, 18th and 19th.
Wallumbilla, 24th to 26th.
Maryborough, 24th to 26th.
Emerald, 25th and 26th.
Buderim Mountain, 28th.
Childers, 28th to 31st.

June.
Marburg, 2nd and 3rd.
Gin Gin, 2nd to 4th.
Brookfield, 3rd.
Bundaberg, 8th to 10th.
Wowan, 8th and 9th.
Woombye, 15th and 16th.
Gladstone, 15th and 16th.
Lowood, 17th and 18th.
Rockhampton, 22nd to 25th.
Maleny, 23rd and 24th.
Wellington Point, 25th.
Gatton, 29th and 30th.
Kilcoy, 29th and 30th.
Biggenden, 30th June and 1st July.

July.
Townsville, 5th to 7th.
Woodford, 7th and 8th.
Caboolture, 14th and 15th.
Esk, 15th and 16th.
Charters Towers, 15th and 16th.
Ayr, 22nd and 23rd
Ithaca, 23rd.
Rosewood, 21st to 23rd.
Laidley, 27th and 28th.
Bowen, 27th and 28th.
Nambour, 27th and 28th.

August.
Redcliffe, 5th and 6th.
Royal National, 8th to 13th.
Crow's Nest, 24th and 25th.
Coorparoo, 27th.
Maroochydore, 27th.

September.
Imbil, 7th and 8th.
Gympie, 14th and 15th.
Beenleigh, 15th and 16th.
Stephens, 17th.
Pomona, 21st and 22nd.
Rocklea, 24th.
Nundah, 30th Sept. and 1st Oct.

October.
Kenilworth, 6th.

DAIRY FODDER PLOTS.

By A. E. GIBSON, Instructor in Agriculture, and C. S. CLYDESDALE, Assistant Instructor in Agriculture.

The subjoined notes have already appeared in the "Journal," and are reprinted in response to numerous requests from our readers in several districts in the State. They are of particular interest and value at the present time.—Ed.

The majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimbah Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the Summer months.

No fertilisers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.—At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and later on, in March, was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

PLATE 74.—PRINCE WHEAT AND VETCHES AT MR. A. HULSE'S FARM, YANDINA.

PLATE 75. PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

The plot at Nindooimbah was fallowed during the Summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.—The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of Winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disced" in, the cereals being sown on the disced surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early-maturing varieties.

Description and Varieties on North Coast.—The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 ft. in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 ft. at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 ft. high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 ft. in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 ft. in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 ft. 6 in. in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 ft. in height.

Plots at Nindooimbah.—Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

Skinless and Cape Barley.—During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

Ruakura and Algerian Oats.—The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.—Owing to its early-maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 ft. in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.
Barley was sown at the rate of 50 lb. per acre.
Oats was sown at the rate of 40 lb. per acre.
Rye was sown at the rate of 60 lb. per acre.
Field peas was sown at the rate of 30 lb. per acre.
Vetches was sown at the rate of 20 lb. per acre.

PLATE 76.—PATRIOT WHEAT AND FIELD PEAS AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

PLATE 77.—KUDZU VINE (FODDER PLANT), AT MR. H. M. McMARTIN'S FARM, PULLEN VALE.

RESULTS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stephens, Nindooimbah.			
	T.	C.	Q.	LB.	T.	C.	Q.	LB.	T.	C.	Q.	LB.
Prince wheat and peas	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas	12	3	0	9	10	16	0	8	13	10	0	10 (two cuttings)
Cape barley and vetches	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yield generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

PLOTS AT TOOGOOLAWAH.

For some years the Department of Agriculture has endeavoured to interest dairymen and stockowners generally in the matter of fodder provision for their herds during those periods when, by reason of the lack of succulence in the natural pastures, yields from their herds have been considerably lessened, and, in some cases, even reduced within measurable distance of vanishing point.

The practice of arranging with interested farmers to carry out trials designed and supervised by officers of the Department, has met with a good deal of success. The results to date have clearly shown that by early and careful preparation, heavy returns are readily available of rich, succulent, milk-producing fodders, and that a continuity of this class of food can in normal seasons be kept up to tide milch cows over periods during which their productivity is affected by the gradual depression, induced in each animal's system, by being called upon to make use of rough grasses of low nutritive value, at a time when weather conditions were at their worst.

Ocular evidence has shown that improved milk supplies and a correspondingly improved return from the factory is inducement enough for other neighbouring farmers to profit by the example of the one who first adopted the system of growing crops regularly, for his dairy stock—actually, on a farm, an inexpensive method of maintaining an income.

In the present crop trials carried out on Mr. T. Coleman's property at Toogoolawah, no fertilisers of any kind were used. The plots were situated on well-prepared alluvial soil near Cressbrook Creek, which had been under cultivation for a number of years.

The plots were sown on 31st March, 1925, and were harvested for yield-computing purposes on 30th July, 1925, consequently each yield submitted represents four months' growth of fodder, and judged on this basis may be considered as highly satisfactory.

A more vigorous growth was noticeable in the case of Florence wheat and peas or tares and the Skinless barley with a similar mixture, both of which were well out in ear and rapidly maturing; rye had made a dense growth in both instances, but only a few heads were to be seen, and probably a further three or four weeks would be required to bring it to a similar state of maturity to that obtained by the Florence wheat at date of harvesting. The following yields were recorded:—

	Per acre. Tons.	cwt.	qr.	lb.
Florence wheat and peas	7	14	1	4
Cape barley and peas	9	11	1	0
Skinless barley and peas	10	15	1	0
Rye and peas	8	10	1	12
Algerian oats and peas	8	3	3	20
Canary seed and peas	11	8	0	24
Florence wheat and tares	7	4	2	16
Cape barley and tares	9	0	0	0
Skinless barley and tares	11	1	3	4
Rye and tares	12	13	3	20
Algerian oats and tares	10	15	1	12
Canary seed and tares	8	10	1	12

PLATE 78.

FLORENCE WHEAT AND TARES. Yield—7 tons 4 cwt. 2 qrs. 16 lb. per acre.

In view of the fact that some of the plots might be regarded as too immature for the purpose of obtaining the maximum yield, further weighings for comparative purposes were made on the 24th August, with the following resul's:—

	Per acre. Tons.	cwt.	qr.	lb.
Algerian oats and peas	11	9	3	12
Rye and peas	8	13	2	8
Canary seed and peas	7	17	2	0
Algerian oats and tares	13	19	2	6
Rye and tares	9	9	2	16
Canary seed and tares	13	14	3	8

When selecting fodders for the test, cognisance was taken of their respective periods of maturity so that a continuity in the supply of green fodder might be kept up. Obviously the grower by using judgment in the matter of arranging for succession sowings should readily be able to maintain his supplies, and in this way ensure a more regular state of productivity in his herd.

Observations made respecting the period of development of the different crops were as follows:—Florence wheat and Dun field peas were ready for use earlier than any other single crop or combination, followed by crops in the order named: Florence wheat and tares, Skinless barley and peas, Cape barley and peas, Skinless barley and tares, Cape barley and tares, Rye and peas, Rye and tares, Algerian oats and peas, Algerian barley and tares, Canary seed and peas, Canary seed and tares.

Observations made indicate that it is advisable when arranging for mixtures of crops to confine the sowing of peas to the early-maturing cereals—Florence wheat, Skinless and Cape barley—as the peas begin to lose weight as they approach maturity.

Plate 79.
Florence Wheat and Dun Field Peas. Yield—7 tons 14 cwt. 1 qr. 4 lb. per acre.

Tares on the other hand have a longer growing period and retain their succulence better than the field peas, consequently they are more suitable for use with Algerian oats, Canary seed, and Rye.

To those dairymen who are interested in maintaining supplies to their respective factories throughout the winter period, the following quantities are recommended for use in connection with the above class of fodders.

Wheat 30 lb., Dun field peas or Black Tares 20 lb.
Barley 40 lb., Dun field peas or Black Tares 20 lb.
Rye 30 lb., Dun field peas or Black Tares 20 lb.
Oats 30 lb., Dun field peas or Black Tares 20 lb.
Canary seed 10 lb., Dun field peas or Black Tares 20 lb.

DRY SEASONS—A COUNTERING FIELD CAMPAIGN.

The loss of national wealth to this State brought about by periods of drought cannot be accurately estimated by figures—but their effects are undoubtedly far-reaching. If action can be taken over certain areas whereby increased production can be brought about, it naturally follows that dry periods are robbed to some extent of their devastating influences and the loss to the State as a whole is decreased. A policy of this kind is naturally educative in its character to all, but when certain sections are dealt with it becomes more particularly of value to those directly interested, and this is increased when illustrations are given for the purpose of proving the policy advocated.

For some time past the Department of Agriculture and Stock has interested itself in increased production of dairy and allied products, and with this object in view has initiated a series of fodder trials in various districts for the purpose of pointing out that if means are adopted for the annual provision of fodder crops for dairy stock and pig raising, the fluctuations which have in the past taken place in the supply of these products will be considerably reduced if not entirely removed.

PLATE 80.

CAPE BARLEY (in shot blade stage) AND DUN FIELD PEAS.

Yield—9 tons 11 cwt. 1 qr. per acre.

During the past few months the losses to dairymen and others, brought about by lessened production resultant of the dry period experienced, amounts to a considerable value, and attention is drawn to the fact that these can be considerably reduced by adopting the policy of careful soil preparation and the sowing of crops calculated to fill the void caused by the absence or decreased supplies of natural grasses and herbage.

It was with such an object that dairy and pig fodder trials were established on the farms of Messrs. F. W. Thiedeke and Peel Caswell, of Beaudesert and Wangalpong respectively, and results obtained so far from portions of these plots

Plate 81.—Peas and Pilot Wheat at Beaudesert.
Weight—10 tons 13 cwt. 2 qr. 19 lb. per acre.

Plate 82.—Peas and Florida Wheat at Beaudesert.
Weight—11 tons 17 cwt. 2 qr. 20 lb. per acre.

PLATE 83.—PILOT WHEAT AND PEAS AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

PLATE 84.—FLORIDA WHEAT AND VETCHES AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

have proved the soundness of the principle involved. Both farmers are capable agriculturists whose methods of cultivation leave little to be desired, and who are fully seized of the importance of fallowing and thoroughly preparing their land prior to seeding operations. The results obtained on the comparatively low rainfall experienced at Wangalpong speak for themselves; and whilst the soil at Beaudesert is of a heavier nature than that met with in parts of the Canungra Valley, the heavier rainfall experienced more than compensated for the difference in soils and their moisture retaining qualities.

The plots were planted on the 9th and 10th June at Mr. Thiedeke's at Beaudesert, whilst those at Mr. Caswell's, at Wangalpong, were planted on the 12th and 14th of June. Rainfall experienced between the 9th June and 23rd September (the date of harvesting) at Mr. Thiedeke's being 3.66 inches, but it must be noted that a fall of 1.06 inches was experienced on 7th June, two days prior to planting. At Mr. Caswell's the rainfall received between the 12th June and 24th September totalled .91, the previous rains to that date being 1.25 inches, registered on 14th and 17th May.

The following weights of green fodder were recorded:—

	Mr. F. W. Thiedeke, Beaudesert.					Mr. P. Caswell, Wangalpong.			
	Tons.	cwt.	qr.	lb.		Tons.	cwt.	qr.	lb.
Florida wheat and peas ..	11	17	2	20	..	7	6	1	22
Florida wheat and tares ..	10	8	3	13	..	7	4	0	5
Pilot wheat and peas ..	10	13	2	19	..	8	5	2	17
Pilot wheat and tares ..	10	4	0	7	..	6	12	0	5
Skinless barley and peas ..	11	8	0	8	..	6	4	3	10
Skinless barley and tares ..	4	16	0	3	..	7	1	2	16
Cape barley and peas ..	6	2	1	21	..	4	18	1	20
Cape barley and tares ..	9	7	1	1	..	4	16	0	3
Rye and peas	5	15	0	27	..	4	16	1	20
Rye and tares	8	0	3	11	..	3	7	0	25

The varieties of wheats used in the trials were Pilot, a Bunge-Florence crossbred, and Florida, a Bobs-Florence crossbred, both of which were raised at Roma State Farm. These varieties made excellent growth, and were remarkably even throughout the trials. At the time of harvesting both varieties were in the flowering stage, averaging 3 feet 6 inches in height.

At Wangalpong both Pilot and Florida showed signs of flag-rust, but at Beaudesert no signs of rust were apparent. This was propably due to local conditions and to the fact that humidity in the Canungra Valley is greater than in the more open areas around Beaudesert.

Cape Barley.—This crop made fair growth and when harvested was in the shot-blade stage—the height averaging 1 foot 9 inches of good healthy growth. From the general appearance of the crop a later cutting will give a heavier yield.

Skinless Barley was a clean and attractive crop, averaging 3 feet in height, which had made a remarkable growth of foliage. When harvested the grain was in the soft dough stage.

Rye.—In each case this crop made rapid growth, and was in the flowering stage when harvested, averaging 3 feet in height. Generally speaking, growth was somewhat on the thin side, and heavier quantities of this cereal should be sown when the season is somewhat advanced, as it was in this particular instance.

Field Peas in all plots made fair average growth of 1 foot 6 inches in height. When harvested they showed signs of wilting, thus reducing the weight per acre that under other conditions would have been recorded.

Vetches, usually rather slow in maturing when compared with peas, made favourable growth.

The pig fodder plots were not sufficiently far advanced in growth on 23rd September to justify their harvesting, consequently this matter was deferred till 24th November, but during this period a further rainfall of 326 points was received and recorded as follows:—25th September, 32 points; 28th September, 166 points; 16th October, 46 points; 25th October, 9 points; 16th November, 73 points; total, 326 points.

As a result increased growth was in evidence compared with that shown on the occasion of the previous visit.

As in the case with the dairy plots, Mr. Caswell had given careful attention to the cultivation of the various fodders, and an entire absence of weed growths was noticeable.

The various yields recorded can be regarded as valuable illustrations of what can be accomplished by careful and systematic cultivation of crops that are suited for purposes of economic pig feeding and can be produced at little cost to the grower.

The following are the yields recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Thousand Headed kale	11	15	3	3
Dwarf Essex rape	6	9	2	16
Yellow Globe mangels	29	8	1	20
Long Red mangels	23	19	2	12
Purple Top Swede turnips	14	18	0	27
Elephant Swede turnips	12	13	3	18
Sugar beet	17	6	2	12
White Belgian carrots	12	13	3	18

The Dwarf Essex rape suffered somewhat from the attacks of Aphis, whilst the foliage of the Swede turnip was subjected to the attentions of the Rutherglen Bug; otherwise the crops were excellent in every respect.

AGRICULTURAL EDUCATION AND RESEARCH—CALIFORNIAN METHODS REVIEWED.

J. W. HOWIE, Queensland Agricultural High School and College.*

Jack London's statement that "The Swiss exhibited great resource in imitating California's lakes and mountains," while a good jest, is in some way an indication of the Californian's opinion of his State. That is the first and most lasting impression one brings away from California. It is undoubtedly a remarkable State—remarkable for its soil, its waterways, its snow-clad sierras, and its climate. Its citizens are out to "tell the world" of its wonders—to boost it in their own phrase. Successful advertising has made California a world-wide tourists' resort and placed Californian products on the dining tables of the Globe. Give the Californians their due—they have succeeded in making good their boasts. Their highways are the show windows of the State. Surfaced in concrete, lined with trees and palms, they are the motorist's paradise, and there are thousands of miles of them. The skyline-boulevard, La Honda, Grade, the coast route from Los Angeles to San Diego, are all roads that are triumphs of engineering; banked on the curves they sweep smoothly over range and plain from San Francisco to Mexico. These roads have been financed by special issues of bonds within the State paying 5 per cent. There is no problem of dual traffic to face. The horse has disappeared, save in some mountain sections, and among the peat flats of the deltas of the San Joaquin and Sacramento Rivers. Concrete is their road material. Asphalt was tried, but under the blistering sun it soon unpleasantly resembled a washboard. A stretch still in existence, near Stockton, would disintegrate a steam roller. Their cities and towns are well planned, with wide streets. Their buildings and homes are well built and painted; though they do disfigure the highway with gigantic and garish advertisements. Town planning and good roads, power, and good lighting are articles of faith. Even the smaller Californian cities give a passable imitation of Broadway at night. Power is cheap; the waterfalls and melted snow of the Sierras provide most of it. The power lines swing down from the mountains across the broad fertile inland valleys. The farmer has a transformer, and steps the 18,000 volts down to a mild enough current to light his home, milk the cow, and turn his separator. The harnessing of some or our sleeping giants in Queensland, in the shape of such falls as the Barron, would benefit extensive rural communities by the supply of similar power.

Irrigation Farming.

The Californian—in fact the American generally—possesses a genius for being organised and drilled—from a "Swat the Fly Campaign" to a presidential election. At once a great strength—witness the successful farming co-operatives; the standardisation and the quality of Californian canned products and dried fruits; and a considerable weakness—the exploitation of the citizen by the "big money" interests, and the ease with which the public can be stampeded on political issues. In certain directions more of this capacity for organised action might be valuable to us here.

* In the course of a recent radio lecture from the Queensland Government Radio Station, 4QG.

The combating of droughts, the fighting of fires in country districts, the dissemination of scientific agricultural information, the control of disease-carrying mosquitoes, are points that occur. In rural fire-fighting in California they have followed the practice of establishing fire districts, raising funds locally to purchase equipment. An outfit costs usually from £800 to £1,000. The larger units are augmented by groups of smaller units and individual plants on the farms. The organisation and equipment have proved satisfactory in controlling grass and grain fires. Drought is a less serious business in a country with good waterways and melting snow, but California has a low rainfall, and water conservation and irrigation have gone hand in hand. It can be dry in the interior valleys. The Imperial Valley, before the Colorado was empanelled, was dry—so dry that one old-timer reckoned they had to carry drinking water to the fish! To-day it is the truck garden of the South. Irrigation farming on the citrus areas of Southern California has brought fruit-growing to as near factory production as is probable with anything so plastic as growing trees. The Sespe Ranch, in Southern California, carries an agricultural chemist and irrigation expert, whose job it is to make moisture determinations throughout their groves, and to recommend the amount of irrigation water to apply. The water is distributed by furrows and basins. A blue print of the grove is kept; every tree is numbered, and records kept of production, diseases, fertilisers applied, &c. The fruit is carted to one of the sheds, graded, sized by machine, packed in standard packages, and railed in iced cars to their representatives in distant towns and cities. The citrus organisation has been explained at length many times in Australia. I would just like to indicate that it is very complete and handles its own distribution through its own selling floors in the chief cities of U.S.A. It numbers 10,700 growers, delivering fruit to 206 local associations, which in turn operate through nineteen district exchanges. One central exchange controls the selling machinery, advertising, &c., and disseminates market information. The whole organisation is run on non-profit lines for the growers' benefit.

Organisation Methods.

The Californians generally have adopted organisation by commodities. There are apple, pear, peach, prune, walnut, citrus, raisin, and avocado growers' associations. Some effort to amalgamate certain of these lines has been attempted lately. Unification of all dried fruits under one distributing agency known as "Sunland Sales" is being mooted—actually a sort of co-operative union of co-operatives. It has met with a good deal of opposition from sections of the growers, for there, as here, there are many who maintain that broker selling and the use of established channels of distribution is a sounder proposition than attempting direct sales. Brokers have capital and trade connections; "let us use them," say this section, "but let the broker be good." The latest move is to have a Commission Dealers' White List drawn up, and the dealers thereon are to sign a contract agreement with the U.S. Department of Agriculture to be honest and faithful, to treat producers and customers with equal fairness, and to conform to U.S. standard trading rules. Certainly a desirable consummation, but not so readily attained in a cold, hard world. Agricultural education and research have attained a very high standard. The whole State is divided into counties, and each county has a resident farm adviser. That official maintains contact with the University of California and the various experiment stations throughout the State. He is able to assist the farmer and fruit-grower very directly with their problems of production, pest control, and marketing.

University Work.

A few of the problems that are being tackled by the University include the production of disease-resistant varieties of peaches, pears, and other fruits; the investigation of the potentialities of tropical fruits, such as avocadoes, mangoes, custard apples, papaws, and passion fruit in the southern parts of the State; the commercial production of the Guayule shrub introduced from Mexico, a shrub which produces up to 17 per cent. of crude rubber. In a country where motor cars reach the astonishing total of one to every 2.9 persons, any home source of rubber is of paramount interest. The canning and dried fruit interests owe much to the University Researches in dehydration and the preparation of fruit products such as pulps, syrups, and essences. The foregoing are a few impressions of rural life in California. California, though a prosperous State, is not an El Dorado, and none would recommend us to indulge in the slavish imitation of their modes of life and merchandising (in some directions we have overdone that already), but undoubtedly we can with profit adopt some phases of Western life to our conditions here. Their trenchant pride in State and town, the community clubs and live chambers of commerce, and the intelligent adaptation of scientific knowledge to farming have made rural life for them vital and interesting. Life in our country districts leaves room for just those characteristics.

MERINO WOOL CLASSING FOR SELECTORS.

By W. G. BROWN, Instructor in Sheep and Wool.

In the classing of small clips, or farmers' lots, it is not necessary to go into very scientific classing, as the main idea for every small man to consider is to class his clip into even lines, and, at the same time, make as few sorts as possible. For buyers prefer long lines to short ones. For instance, a buyer may be able to fill an order with one line of wool. Where this is the case, he gives the manufacturer a more even line by virtue of its being more evenly bred from one type of sheep, showing the same characteristics in regard to the soil, seed, burr, &c. It requires the same treatment in the course of manufacture.

It is unreasonable to expect that a buyer having an order for, say, fifty bales of wool and selecting from different clips, could give the manufacturer the same satisfaction as if he obtained it from one clip.

A buyer will often advance ½d. per lb. to fill his order with one brand.

For the smaller holders of sheep it is much better that he should mark his small clip (in place of branding it combing, clothing, &c.) AAA, AA, A, broken, pieces, locks, &c.

If a wool marked clothing were suitable for a combing order—and the Continental manufacturers comb shorter wools than Bradford—it may cause the buyer to think there was a mistake made. Owing to the relative evenness of quality in merinos, fineness would not play an important part in the classing of this type of wool. It should be classed mainly to length and soundness, yield, and general characteristics —namely, colour, style, vegetable matter, &c.

The Object of Classing.

The object of classing in any clip is to make the class or classes even in quality, length, and condition. Irregularity in classing means that a buyer valuing a sample lot, who sees wool of different values in the same bale, will naturally give preference to the lowest-priced wool he sees in the sample bales. He has no means of learning how much of the inferior wools may be in the bulk from which the samples are drawn. Or, having an order to fill for a particular type, he is likely to pass the unevenly classed wools. Thus competition is lessened, and the result to the owner is a decreased price.

Wool-classing is the separation of the whole fleece, after it has been skirted, into typical grades. These fleeces individually may contain several "sorts," but these are separated by the "wool sorter," a distinct business from that of a "wool classer." This lecture is not dealing with the larger clips, but is addressed to holders of from three to four thousand sheep, who cannot afford the services of a skilled wool classer.

Merino wool holds far fewer difficulties for classification than crossbreds. It is thus much easier for a man to learn how to class his small flock of merinos, than if they were of mixed breeds.

Counts, Quality, and Yield.

In the first place, the "counts" on which "quality" is based have a comparatively small range in a merino flock. These counts in merinos range in Queensland between 60's and 80's, that is 20 counts; not a great deal of the latter being produced. In crossbreds they may range from 26's to 64's, nearly 40 counts. Now, a "count" means:—One hank of spun yarn equals 560 yards in length. Each count equals one hank. Therefore the number of counts multiplied by 560 equals the number of yards of yarn to the pound avoirdupois of wool. Here is an illustration: In a 60's count top, 560 yards of yarn multiplied by 60 (the count) equals 33,600 yards of yarn in 1 lb. of 60's top. This for quality, which means relative fineness. In the second place the question of "yield" comes in. This is governed by the amount of condition (otherwise wool fat and extraneous matters) in the fleece. Besides the wool fat, and other constituents of the yolk, there is sand, seed, and other matters.

"Yield" means the clean secured product of greasy wool. All wools irrespective of quality are bought on their yield of clean wool. The method of determination of yield is illustrated in this example:—A line of wool is estimated by the buyer to yield, say, 48 per cent., the clean value of which is 58d. per lb. Thus the greasy cost will be 48 per cent. yield, multiplied by 58d. per lb. clean scoured and divided by 100, which means that the value of greasy equals about 27⅚d. per lb.

I am calling attention to the meanings of count and yield to emphasise the necessity of classified wool being even in quality (or counts) and (yield) meaning condition, because quality, condition, and length are the chief factors in the valuing of any wool.

The buyer, of course, is skilled in determining in the sample before him both count and yield. This is a matter of training, otherwise he would ruin the manufacturer if he were out even 2 per cent. on a big purchase.

Now this accentuates the value of evenness in the classification by the smaller grower. He may not know counts; he may not know yield; but he should know relatively his light, fine, bright, long fleeces from his dull, short, heavy fleeces, and between the two the fairly fine, fairly light, and decent coloured fleeces.

Thus his classes should be:—Supposing he shears from 3,000 to 4,000 sheep, all merino AAA, lightest, brightest, and longest stapled wools. These fleeces are the cream of his clip and great care should be taken that the class be kept as even as possible. If there be a doubt about a particular fleece, the doubtful one should go into a lower grade. This applies also to the other classes.

AA is fairly light in condition, a good colour, but shorter than the AAA.

A consists of the short-stapled, dull, heavy fleeces. If any matted fleeces be found, they should be cast into another class or broken into the pieces. There will be little of this.

Skirting.

This is a very important part of the work in the shed. If the wool be free from seed he should skirt very brightly. If with seed on flanks and breech, the seedy wool should be skirted off. If very seedy or burry, it is better to take off only the fatty poonts and stained, classing the fleeces as above.

The pieces should be ''sorted'' note the word, into broken or first pieces, and, pieces. The broken contains the brightest, cleanest, and best pieces. The ''pieces'' will take the rest when dags and stains are removed.

Stained wool should be separated and baled or bagged by itself.

Bellies should always be packed separately after the stained wool is removed.

Rams' wool, because it is generally much heavier in condition, class for class, than the flock wools, should always be packed separately.

Picking up.

''Picking up'' is important, in that, if the fleeces are badly thrown on the table, there is apt to be bad skirting—either excessive or too light. The boys who perform this operation should be instructed to take the belly wool as the shearer cuts it off, and after removing the stained wool put it into a receptacle on the shearing board. He should take the fleece when the sheep is finished by each breech with the skin side uppermost, and then when he reaches the table he should throw it out with the breech end nearest to himself. With a little practice anybody can throw a fleece evenly and correctly.

Rolling.

Of late years the operation of wool-rolling has tended to be what we would think in other days ''stommicky.'' There is not the care used to-day generally in rolling the fleeces properly. When the fleece is thrown out the skirting should be carefully done as directed above, and, after the neck wool is thrown in about the third of the total length, the two sides or flanks are folded across, leaving the fleece in a strip about fourteen inches wide. Then the wool roller should start at the breech and roll the fleece up to the neck end, and the result is a ball of wool showing the shoulder wool. The fleeces are then classed and put into the appropriate bins.

Wool Pressing.

The pressing should be so done that a neat square bale is turned out, with no wool showing at the corners. The aim is to have even weights in the finalised bales. The patent fastener is much better to use than the old-fashioned needle and twine. About 320 lb. net is a good average weight for most fleece wool; flocks and belly wool up to 448 lb., pieces about 350 lb.

An important matter, too, is the keeping the floors clean, both on the board and the wool-room. Locks and second cuts lying abut when pieces or fleeces are, as is sometimes unavoidable, placed on the floor, and nothing detracts more in the appearance and value of a fleece covered with locks stained or second cuts.

The foregoing is a fairly comprehensive instruction for the tyro in a wool-shed, at shearing times.

Remember the sorts, whatever they may be, must be even in length, quality, and condition. The skirting must be carefully done. The picking up must be properly learned and used. The broom should be used frequently. If a sheep farmer does these things he will not need to fear the result when the buyer gets his hand on his clip.

COTTON CROP PROSPECTS.

The Cotton Specialist of the Department of Agriculture, Mr. W. G. Wells, returned recently to Brisbane from a tour of inspection of the cotton experiments and the general conditions in the cotton areas along the Gayndah line and up through the Upper Burnett. He was accompanied by Mr. N. E. Goodchild, Senior Field Assistant in charge of the experimental work in the Burnett, and also from Mundubbera onwards by Mr. E. Widdup, assistant to Mr. Goodchild in those areas.

Experimental Work.

The main purpose of the tour was to inspect the several experiments which the abovementioned officers have been conducting in co-operation with cotton-growers in the different districts along this line. These experiments included varietal trials of the more promising varieties which the Department is investigating—thinning and spacing tests, and fertiliser tests. The object of this experimental work is to assist the cotton-growers to learn the application on his own soils of the results of the experiments performed at the Callide Cotton Research Station and of the general observations which have been made on the behaviour of the cotton plant on the main types of soils of the cotton-growing areas. The growers in many cases are assisted in the thinning of the plots, and the general care which has been given is gratifying evidence of the keen interest which the growers have shown in the Department's efforts to help them solve some of the more important problems.

The erratic climatic conditions which have existed during this season have not been conducive to obtaining satisfactory results from many of the experiments, but sufficient data will be obtained to throw light on some of the problems, especially such factors as the spacing of the plants and the height at which to thin them. Satisfactory evidence was seen in many instances on different soil types of the value of early spacing of the plants to distances of approximately 2 feet apart, and it is to be hoped that this custom will become more universal from now on.

A Striking Peculiarity of Plant Growth.

One very striking peculiarity of the plant growth was noted in all districts and on all types of soils. This was the loss of the terminal or growing bud of the main stalk. The explanation of this phenomenon is not clear, but may be due to a combination of insect attack and soil conditions. The worst attacks were experienced on the brown scrub soils overlying grey clayey subsoils. In such instances a very high percentage of the terminals were lost during the excessively heavy rains which occurred during early January. Where the growers continued cultivation so as to aerate the soil, a fair growth of the laterals or vegetative branches, accompanied by a fair crop, developed, but if no cultivation was given the crop after the loss occurred, practically no growth developed, with a consequent loss of crop. It is not believed that this is to be a regular occurrence, as many of the fields where such attacks occurred have borne excellent crops in the past, and it is anticipated that under more favourable soil conditions such can be obtained again.

The Maize Grub.

In some of the districts the Corn Ear Worm (maize grub) had done appreciable damage, especially on the late-planted cotton. In nearly every area, however, there were plots of early-planted cotton which were heavily laden with fully-matured and opening bolls. It was ascertained that such plots had been planted on early and well-prepared seed beds, which had enabled the young plants to go through the severe droughty conditions of last October and November without too serious a check on the development of the fruiting system. When the first rains in December occurred, such crops developed a heavy setting of fruit all over the plant. This load controlled the growth, and resulted in a toughened structure that apparently was not attractive to the Corn Ear Worm.

It was noticed, however, that all early-planted crops were not immune from the attacks of this pest. Where such crops had lost the terminal bud a forced growth of vegetative branches developed, which only bore fruit comparatively late in the season. In reality such plants were nearly like late-planted cotton, and the succulent nature of such growth during the heavy rains of January and February produced a crop of squares and bolls, which in many cases was very attractive to the Corn Ear Worm.

Crops in the Upper Burnett Land Settlement Project.

The best crops, taking the districts as a whole, were observed in the Upper Burnett Land Settlement Scheme, where some 4,000 acres give promise of bearing profitable crops. In the case of early-planted crops which came through the early droughty conditions without too serious a check, exceptionally heavy crops appeared to be the rule. The later planted crops in some cases had lost most of the bottom crop through boll rots caused by the excessive humid conditions and shade in the tall plants, but the middle and top crops gave promise of exceptionally heavy yields, provided the first frosts do not come abnormally early.

Picking operations, provided the sunshiny weather conditions which have existed during the last three seasons in the Upper Burnett at this period of the year are in force, should be commencing by the end of this month and be in full swing by the middle of April. From the appearance of the opened bolls which were observed, and the general size of the nearly matured unopened bolls, the weight of the bolls should be exceptionally heavy this season. The quality of the matured cotton which was seen was of high standard and the fibre was of heavy body. All of these factors should make heavy picking tallies if the cotton opens like it has previously done in the Upper Burnett.

A very gratifying interest in the general condition of the cotton industry was shown in all districts visited. This is in marked contrast to the ideas of many people not directly interested in the cotton industry who seem to think that the cotton industry has failed. In reality it is on a better footing than it has ever been. In the early years of the present revival of the cotton industry, there was an appreciable migration of people from the cities to grow cotton, who in many cases paid exorbitant prices for land, under the impression that remarkable financial returns were to be received from cotton-growing. Unfortunately many wild statements by misinformed individuals as to the methods of cotton-growing, the suitable classes of soil, &c., were circulated. Naturally when non-profitable results, and in many cases complete failures, were experienced by such speculators, and by actual farmers as well, a period of depression set in which checked all expansion, and in some districts nearly eliminated cotton-growing. The men who are growing cotton to-day are generally much better experienced than were a majority of the growers during the first few seasons, and, as a rule, understand the general principles of cotton-growing to a much better degree. In nearly every district there are growers who have made profitable yields every season. These men are having a very decided beneficial effect on their districts, and as their methods become more carefully followed the average yield per acre will show decided increases.

In nearly every district visited the growers were satisfied that, given anything like favourable growing conditions next season, a very good crop could be produced. Everyone realised that this season has been the first since the cotton industry has been revived, that the subsoils have received thorough soaking rains. The effect on the cotton plant next season should be decidedly beneficial. During the past five seasons in nearly every district the amount of moisture in the subsoils has been so low as to necessitate frequent rains in October and November in order that the steady development of the young plants could take place. Fortunately these rains have occurred in many districts in every season, so that good yields have been obtained. The present season has been an exception in this respect, which accounts for most of the failures which have occurred, and also for the loss of the bottom crop in many areas where good top crops are to be obtained. If the growers prepare the seed beds at an early date so as to take advantage of the present soil moistures, it is anticipated that exceedingly heavy yields of cotton will be obtained.

Price Prospects.

Present indications point to very satisfactory prices being obtained for the coming season. These may be slightly less than the top grades have received in the past. It must be remembered that the prices on the world's markets are considerably less than those which have existed in previous seasons. Consequently any prices for this season in Queensland approaching those of past seasons should be taken as encouraging indicators of what may be received when the world's markets get over the effect of the huge crop which was grown in the United States of America this last year. If the prices which appear possible at present are realised for this season's crop, it appears that a decided increase in the acreage of the cotton crop will be planted next season.

MALNUTRITION AMONGST STOCK.

W. G. BROWN, Instructor in Sheep and Wool.

A most interesting report has recently been published by the Empire Marketing Board in Great Britain. In the section devoted to sheep something has been said of deep importance to Queensland. Here is an abridged résumé of this section:—

" Malnutrition amongst Stock.

''Upon the advice of the Committee of Civil Research a grant has been made to further the study of those causes which, in widely separated parts of the Empire, underlie persistent symptoms of malnutrition amongst flocks and herds. Preliminary work by the Committee of Civil Research, including the circulation of a questionnaire to all oversea Governments of the Empire, showed that malnutrition of this type was almost universal in natural pasture lands. Work undertaken at the Rowett Institute, Aberdeen, in connection with sheep in the west of Scotland gave a clue to the solution of the problem, as did also work performed by the Onderstepoort Station, in South Africa. With the encouragement of the Empire Marketing Board, and in some cases with assistance from the grant, research into this problem has already been extended to Kenya, and is in course of extension to Australia, Southern Rhodesia, and, it is hoped, Palestine. As the Imperial Economic Committee lately pointed out, the grass crops of the Empire are as important as its cereal crops. Should research on this problem fulfil its early promise, the value of natural grass crops will have been notably increased throughout the Empire.''

I have seen the questionnaire referred to, and have put in some replies bearing on the subject-matter and will reproduce them.

The Position in Queensland.

The first question asked was, ''Are there in Queensland areas where the death rate of stock, apart from disease, is notably high?''

Yes, there are districts in Queensland where it is difficult to rear lambs. There may be an 80 per cent. drop, but not more than 30 to 40 per cent. reach maturity. Forty or fifty years ago there was no difficulty in rearing lambs in these districts, where to-day wethers are purchased in Western country and only wool is grown. It is evident that this is purely a matter of malnutrition—that is, the grasses do not contain the essential properties they once possessed. The matter is not one of time of year for the lambing; amount of feed in the paddocks; management; for some of the very best managers in Queensland find the same trouble as the beginner. Nor is it a matter of the seasons. Now this is an Empire-wide problem, for, as was said in the above report, ''the grass crops of the Empire are as important as its cereal crops.'' It is especially a Queensland problem, for this State relies more on its grass crop every year than all the others put together. Nobody could give a reason for the failure to rear lambs, until about four years ago when Mr. Brunnich, Agricultural Chemist of the Department of Agriculture and Stock, threw light on the matter.

He called attention in his analyses of Queensland soils to the fact that even in the beginning phosphoric acids were not plentiful in Queensland. He showed, too, that milk, wool, beef, mutton, &c., require a certain proportion of phosphates to produce high-class products.

We know that in some cases grass has been cropped by stock for from sixty to eighty years. The wool, beef, mutton, &c., have been sent away from the holding, and—*here is the crux of the matter*—nothing has been returned to the land.

No wonder that when ewes wean their lambs prematurely the result is premature death to the lambs. The ewes cannot produce the necessary milk owing to lack of phosphates and other minerals.

The land is starved, and in consequence the stock are really starved—that is, they are suffering from malnutrition.

A Western Experience.

I was employed for many years on a Western property running up to two hundred thousand sheep as sheep and wool classer. There were many droughts during the thirty-six years I was connected with the flock, and it was noticeable that of lambs dropped after a drought there was a noticeable percentage of deformed animals, as high in one case as 25 per cent. A few years ago in the same district, after a drought, be it noted, a veterinary officer from the Department of Agriculture and Stock investigated the question of *Osteo Malacia* (in the vernacular, ''Rickets''), and found many cases in a mob of cattle. They were observed to chew the bones of dead animals, showing that they required phosphates in some form or another.

Several years ago, parts of Norway were notorious for ricketty cattle and sheep. A scientific investigation was made. It was found that the worst onset of the disease was when a dry time had been succeeded by a wet season. An outstanding symptom was that the animals chewed bones when they could get them.

A recommendation was made that bone meal and phosphate licks be offered the animals. The evil disappeared. It is not practicable to top-dress our pastures with phosphates excepting on very limited areas, but in another way phosphates may be given back to our pastures, and at the same time these minerals may be given directly to the animal, and thus supply the lack in the grasses for the time being.

I have consulted Mr. Brunnich on the matter of a lick for Western conditions. He advises:—"The best lick for sheep is—40 lb. sterilised bone meal; 40 lb. finely ground phosphates; 20 lb. salt.

"It is not necessary to give too much salt, especially where there are saline bores. It has been proved that less hay or grass is better digested with phosphates than more hay without. The one helps the other, with much better results to the animal."

SOME NOTES ON SHEEP.

BY W. G. BROWN, Instructor in Sheep and Wool.

Dentition in Sheep.

A most important matter in the keeping of sheep is the matter of judging the age of the animals. From the number of inquiries reaching the office concerning the subject, I conclude that a description of animals' mouths from birth to maturity will be useful to those whose knowledge of sheep is small.

It must be remembered that sheep, of the various breeds, differ in the matter of dentition. The merinos, for instance, seldom show their permanent cutting teeth before fourteen or fifteen months old. British breeds may show them at twelve months. In buying sheep, as in all other things which are bought and sold, the old Roman adage, "Caveat emptor" ("Let the buyer beware") applies, and a man who believes that he is buying young animals without knowing that they really are young or old stands a very good chance of making a bad bargain. I know of two particularly hard cases to the buyers, neither of whom understood sheep and consequently were saddled with unsuitable animals.

In the first case, the buyer thought that he was inspecting wethers of from two to three years old. He really bought sheep not less than six years old, and quite 20 per cent. "broken-mouthed."

In the second case the sheep were supposed to be young wethers. They were young enough, for they were certainly not more than five months old, and quite unsuited for the purpose for which they were bought—*i.e.*, fattening quickly for market. Wether lambs was their proper designation. An elementary knowledge of dentition would have saved the buyers from mistake on account of age at least.

At birth, a lamb possesses two central temporary incisors, and at the end of four weeks all the temporary incisors (milk teeth, eight) are up, with three molars or grinders in each of the upper and lower jaws on both sides.

From the age of four weeks to the time of cutting the central permanent incisors, at from twelve to fifteen months, the only changes that occur are in the molars.

At three months the fourth molar is cut, and is a permanent tooth. Six months later another molar, the fifth, is to be seen.

At eighteen months the sixth permanent molar is cut; the third temporary molar, like a shell, covers the top of the permanent tooth, while the first and second permanent molars have pushed off the temporary ones. Thus, a sheep has all its permanent molars at from eighteen months to two years old.

With the incisors, the first two, or central permanent teeth, make their appearance at from twelve months in early, and fifteen months in late dentition. At from eighteen months to twenty-four months, the second pair of permanent incisors are up; at from twenty-seven months to thirty-three months, the third pair are in use; and from thirty-six months to forty-two months, the fourth and last pair of permanent incisors are shown, and the sheep is "full-mouthed" in all breeds at about four years.

After this, it depends upon the class of country, and the early or late maturity of the breed, or to the wear of the teeth, whether the mouth is defective or otherwise. Only experienced sheepmasters can, even approximately, give the age of any particular animal after maturity. In the case of "broken-mouthed" sheep it is wise, if only three or four or fewer teeth are left, to pull them out and leave the animal "gummy." They cannot bite with odd or gapped teeth as well as they can with gums.

Other indications of old age are dependent paunch, sagging of the loins, distended nostrils, deterioration of fleece in quality and quantity, and malformed feet.

Lambing Percentages.

This is an important matter, especially after the serious losses sustained during the drought.

The best and most consistent high-average lambing was on a Western station I know well. Rarely was the percentage under 80, and shortly after the big drought 1900-2, 30,000 ewes gave a drop of 33,000 odd lambs—a record, I believe, for Australian merinos.

The method used on this holding was, in short:—They had general shearing in March. Three months before the general shearing the rams were shorn. At shearing time, when the ewes were being put through the shed, I was asked by the owner, "How many will you shear to-day?" I gave the approximate number I expected to shear. The sheep were counted out on each side of the shed, and held there all day. Two per cent. of rams were put in with them in the counting yards, and left there all night. Next morning at daylight they were driven six or seven miles to a yard on the run and kept there that night. Next morning they were taken to their paddock. About a month later another 1 per cent. of rams was put with the ewes, and the result was as above stated—30,000 ewes, 33,000 lambs. I know this to be true, because I was running the shearing part, and saw the lambs twelve months later. This is no place to discuss the why and wherefore, but it is certain that the process was a physiological application of well-known rules of stock-breeding as applied to sheep.

The Relation of the Merino Country to the Crossbred Country.

As a general principle, the Western country is not a fat-mutton proposition. It is merino. Yet there is, or should be, a connection between the coastal areas in this way. There being only, at most, 4 per cent. of British breeds and their crosses in Queensland, it is most difficult to get a sufficient number of crossbred ewes to use on coastal areas. It is in the coastal areas where fat-lamb raising is not precarious. The coastal areas, too, are not suited to the merino, nor is the pure merino the best mutton or fat-lamb sheep. It is too slow in maturing and too dainty to fatten quickly on coarse feeds.

It would certainly pay sheep holdings where the ewes are cast for any reason, to join Corriedales, Romneys, &c., to them before they leave the station. Their value would be enhanced at least 7s. per head if they were in lamb to British sheep. I would like to say more on this subject, but space is limited.

A question which is worth investigation is: What is the probable waste in condition or value on fat sheep from the station to the butcher?

Little has been done in Queensland in this direction and it is surely important enough. A few trials were made by Mr. J. Wrenford Matthews, Sheep Expert to the New South Wales Government, some years ago. Although it applied in those cases to crossbreds, it will apply to merinos. It showed that there was a wastage of from 6 to 8 per cent. in journeys of forty-four hours and twenty-four hours. Of course, there was a certain amount of this loss due to excretions. There was, however, another test made, when the sheep were not trucked and weighed until they had been fifteen hours in the yards. There was a loss in forty hours' railage of about 6 per cent. This is a question which would pay to investigate, and if necessary, action could be taken to save that 6 per cent. It is probably higher in our case in the summer.

External Parasites.

Are they likely to invade the West?

Undoubtedly. The Nasal Fly, for instance, is now well entrenched. I receive grubs from Cunnamulla, Roma, Longreach, Charleville and other Western centres.

Sheep lice (*Trichodectes Sphanocephalus*) and the "Sucking Louse" (*Linognathous Ovillus*) are spreading, especially the former. They are to be found over one-third of Queensland.

The Sucking Louse, which has only recently shown itself, is a far more serious pest than the ordinary sheep louse, yet is found in the Charleville, Winton, Hughenden, Aramac, and other districts. Dipping in a good arsenical dip will stop this pest in short order. I would advise all sheep men to look well into the matter at shearing time. The wool is ruined and sometimes the sheep die, for these lice suck blood, and the wool contains millions of shining eggs and thousands of lice.

BROADCASTING OF FRUIT PRICES.

Recently a Redland Bay correspondent wrote regarding the broadcasting of fruit prices from the Queensland Government Radio Station, 4QG. His letter was referred to the Director of the Queensland Radio Service, Mr. J. W. Robinson, who replied direct to our correspondent as follows. His remarks are of interest to farmers generally:—

" . . . . I have noted with interest your views regarding a cessation of the broadcasting of fruit prices as supplied by the Committee of Direction.

"I am afraid, however, that you do not realise the exact position which has arisen in connection with the transmission by radio of this matter, and I hasten, therefore, to acquaint you with the full facts of the case.

"In the past, the market reports broadcast by 4QG were supplied by the Council of Agriculture. The Council was given sole and exclusive rights for the supply of all market information to farmers by radio, and paid to the Queensland Radio Service a sum of £1,000 per annum. The duration of the market session conducted by the Council under this arrangement was three-quarters of an hour per day for five days a week. The cost to the Queensland Radio Service for the running and staffing of the station for the market report session alone amounted to, approximately, £2,500 per annum, and the charge made to the Council was not, therefore, an actual charge, but was rather in the form of a subsidy which went a little way towards helping to defray the costs of providing an efficient service to farmers. When the Radio Station was first established, the Council regarded the matter in this light, and in negotiating with the Radio Station offered the £1,000 per annum as a subsidy if the station would allow it to provide a farmers' session.

"Towards the end of last year, the Council signified its intention of discontinuing this subsidy, and my Department was, therefore, compelled to make other arrangements for the supply of market information by radio.

"Realising that fruit prices comprised only portion of the market service, I approached the Committee of Direction and offered to broadcast information supplied by them for the benefit of their clients if the Committee would be prepared to pay a slight sum towards the cost of maintaining the station. The Committee could not see its way clear to make any payment, and I was therefore reluctantly compelled to cease broadcasting the information.

"The cost of running a high-power radio station like 4QG is very high, and it should be definitely understood that in asking the Committee of Direction to pay a certain sum per annum, the object was not exactly *to charge* the Committee, but rather to expect the Committee to contribute at least *a portion* of the necessary expenditure for the provision of information to the people *for whom the Committee exists to cater.*

"Station 4QG is certainly a public utility, but it must be conducted along sound financial lines. In the case of every public utility, those patronising must be prepared to pay costs of maintenance.

"Now that I have explained the facts of the case, I am sure you will realise that the blame does not lie with Station 4QG.

"I would suggest that you communicate with the Committee of Direction urging that the matter is important enough to warrant further consideration being given to it."

SHEEP ON THE FARM.

The editor of this Journal in the course of a recent visit to South Australia had an opportunity, through the courtesy of officers of the Department of Agriculture in that State, of observing the practical work of the South Australian Agricultural Bureau. At each meeting of branches of the Bureau, which is a State-wide organisation officially recognised, members who are practical local farmers submit papers on farm problems and practice for general discussion. At a recent branch meeting a paper was read by Mr. Michael, a well-known sheep man, on the value of sheep on the farm.

No farm, he said, was being put to its best use unless it provided for a flock of sheep. On a mixed farm there was no line that would bring such a good return for the labour expended as would sheep. Sheep were particularly to be recommended on the one-man farm, because of the comparatively little attention they required. Most of the work in connection with sheep could be done during slack periods, whereas in the case of dairy cows or pigs those animals had to be attended to every morning and evening. He maintained that on a farm of from 500 acres to 600 acres, with 250 acres in crop and 150 acres to 200 acres of fallow, a flock of at least 200 ewes could be kept, in addition to a few dairy cows and the horses necessary for working the farm. In the first place, it would be essential for the farm to be well subdivided. Fifty or sixty acre paddocks were large enough. With small paddocks the sheep could be frequently moved about, and thus get the maximum nourishment from the feed. He advised stocking with well-bred merino ewes with large frames. This gave the farmer the opportunity to breed either crossbred or pure merino lambs. If the locality were one where reasonably early feed could be grown, he favoured the crossbred. Fat lambs, which could be marketed in July or August, would invariably bring high prices. He had had good results by using English Leicester rams, having the lambs dropped in February or March, and topping them off for market in July on oats or barley sown on stubble land. If the farmer went in for breeding crossbreds he would have to purchase ewes to maintain his flock, whereas if he kept to the pure merino his own ewe lambs would maintain the flock, and by the use of good rams he would be able to continually improve his flock. In a late district some hand-feeding would be necessary, and with high and increasing land values the hand-feeding of sheep paid handsomely. Mr. Michael considered 1 lb. of good hay chaff and ¼ lb. of oats per sheep per day were sufficient to keep a ewe in good condition, provided feeding was commenced before all the roughage was done and whilst the ewe was still in good condition. In the average season not more than six to eight weeks' feeding would be required. If the farm had been well worked, and was free from wild oats and weeds, it was necessary to sow fodder crops. Barley or oats sown on stubble provided an inexpensive fodder crop. A crop of oats or barley (oats especially) could be grazed until the middle of September, and if left for reaping would return sufficient to pay the expenses incurred and provide fodder for next year's hand-feeding. Pea crops were giving good results in many districts. If the ewes were lambing during the hand-feeding period it was advisable to keep them in small paddocks (the smaller the better) until the lambs were about ten days old, because there was a danger of a ewe racing to the feeding trough and leaving the lamb behind. He had worked out in the following table what he considered to be the income which could be expected from an established flock of 200 ewes by a farmer breeding merinos. He had taken the lambing time as April and May, and selling the lambs in November, with the exception of 50 ewe lambs reserved to maintain the flock:—

INCOME.

	£	s.	d.
Wool—			
200 ewes at 12s. 6d. per head	125	0	0
50 ewe hoggets at 12s. 6d. per head	31	5	0
5 rams at 15s. per head	3	15	0
150 lambs at 4s. per head	30	0	0
Sheep sold—			
50 4½-year ewes at 17s. 6d. per head	43	15	0
100 lambs at 15s. per head	75	0	0
Total income	£308	15	0

EXPENSES.

	£	s.	d.
Shearing 400 ewes and lambs and 5 rams at £2 per 100	8	4	0
60 days' hand-feeding at 1 lb. chaff and ¼ lb. oats per day for 250 sheep—			
7 tons hay chaff at £3 per ton	21	0	0
100 bushels oats at 3s. per bushel	15	0	0
Purchase of 1 ram	7	7	0
Total expenses	51	11	0
Net income	257	4	0

THE VALUE OF POSTMORTEM EXAMINATION IN DETECTING DISEASES AND DISORDERS IN POULTRY.

By P. RUMBALL, Instructor in Poultry Raising.

It is well at the outset to point out that the writer does not recommend as a general practice the treatment of poultry for sickness. At the same time, it is of considerable advantage to the general breeder to have a working knowledge of diseases to enable him to prevent or combat the outbreaks.

There are many diseases which cannot with any degree of certainty be correctly diagnosed while the bird is still alive. By most breeders dead birds are either burnt or buried immediately they are found, and the early evidence of possibly a serious outbreak of troubles is lost.

The practice of burning or burying dead bodies is not discounted by the above remarks, but all diseases of a bacterial or highly contagious nature have a small beginning, many spreading per medium of the droppings, and the fact of having burnt or buried a diseased bird has not eliminated the possibility of further losses, but it has withheld information which if it had been available may have been responsible for earlier measures being taken for the prevention of further trouble.

Apart from actual diseased conditions being disclosed, there is the more or less physical aspect to be considered, such as the general conditions of the internal organs due to feeding, and also as a means of definitely determining to what extent internal parasites are present.

There are many methods of making a postmortem examination, but the system outlined in this article is both simple and effective. Even by examination it will be somewhat difficult to make a definite pronouncement as to the cause of death, but all poultry keepers should have by actual experience in dressing healthy stock a fair knowledge of what healthy organs are like, and by the constant examination of birds that die on their farms become more efficient.

The lines suggested to open a bird are—first with a sharp knife slit the skin between the legs and abdominal walls; this allows the hip joint to be easily dislocated, the legs bent at right angles causing the bird to lay fairly firmly upon its back as shown in Fig. 1. Then with a pair of scissors cut the skin from leg to leg, bearing around in a circular fashion, getting as close to the vent as possible. Next tear the skin off right up to the head as in Fig. 2. This removes all the feathers, and in opening abdomen particles of feathers are not obstructing examination.

Fig. 3 shows the bird with the breastbone completely removed, exposing the internal organs in their natural position. This is done by cutting around the abdominal wall as close to the back as possible and right through the bones. To do this work a good pair of curved scissors having a ball point are an advantage, but failing these the work can be performed with ordinary scissors or a pair of tin snips such as most poultry breeders possess.

EXPLANATION OF FIG. 4.

1, Esophagus; 2, crop; 3, proventriculus or stomach; 4, gizzard; 5, duodenum; 6, intestines; 7, cæca; 8, cloaca; 9, vent; 10, egg in oviduct; 11, oviduct; 12, kidney; 13, ovary; 14, lung; 15, heart; 16, trachea; 17, liver; 18, spleen; 19, gall; 20, developed egg yolk.

Having the internal organs exposed, the next stage is to commence on their examination. In their present position the liver is the most prominent organ, and an organ of considerable importance. It is this organ which prepares the bile, one of the principal digestive juices, and it also assists in some of the necessary chemical changes of the blood. It contains many blood vessels, and is particularly subject to the attacks of parasites, which are carried there per medium of the blood stream.

Among the principal abnormalities found in this organ is its enlargement. This enlargement may be due to many infectious diseases, such as tuberculosis, fowl cholera, hepatitis, &c., and in these cases the liver is generally of a spotted appearance, due to dead tissue; but possibly the greatest cause of liver enlargement is due to the lack of exercise combined with improper feeding, or from the feeding of mouldy or putrifying foods. The excessive feeding of protein foods is merely indicated by a blueish grey streakiness; while yellow streakiness is generally an indication of a fatty condition which frequently results in internal hemorrhage. The latter trouble is frequently met with in heavy breed varieties of poultry which are confined and fed on stimulating foods. They are by nature lazy or inactive, thereby laying on surplus condition.

To proceed with the examination sever the gizzard from the proventriculus. The gizzard and intestines are then easily separated from their attachment and readily drawn out for examination. The chief thing to look for in the intestines is

PLATE 85 (Fig. 1).—FIRST STAGE OF POSTMORTEM.

Plate 86 (Fig. 2).—Second Stage in Making Postmortem.

inflammation. This inflammation may be due to worms of all descriptions, the feeding of mouldy or putrifying foods, foods containing excessive quantities of fibrous matter (especially when fed to young chickens), poisons and infectious bacterial diseases. However, in Queensland, most losses by diseases of a bacterial nature occur among young chickens. This is undoubtedly due to the confined conditions under which they are reared. The cæca when distended and filled with pus and particles of blood indicate bacterial trouble, while if trouble is caused through feeding fibrous or poisonous foods blood only is generally present. Worms of various species will be found in the cæca, intestines, gizzard, proventriculus, and crop, causing inflammation of the various parts if infestation is severe, consequently heavy losses.

The gizzard acting as a grinding organ breaks down grain and hard foods, preparing them for the digestive juices. If grit is not supplied to assist in the grinding process indigestion is likely to occur. This organ is subject to attacks of a special class of worm, the presence of which is only known by postmortem. Following up the digestive track the proventriculus or glandular stomach is met. The walls of the organ are of considerable thickness and its capacity slight, being fed gradually by the crop. In the walls of this organ are glands which secrete juices for the digestion of the albumenoids. This organ is subject to inflammation, due to improper digestion of food. If the gizzard is not functioning as rapidly as it should, due to the lack of grit or presence of worms, the stomach becomes unduly distended, and the contents being retained too long cause an irritation. Impure drinking water, ingestion of too large a quantity of food, inferior and improper foods, and similar substance would also be responsible for trouble. The crop, acting as a reservoir, as it were, for foods, is subject to the irritating effect of incorrect feeding, which causes a catarrhal condition or inflammation. The withholding of water, food, or grit for some considerable time induces the bird to gorge, with the consequence of the crop becoming distended and the muscular coat partially paralysed. The crop is also subject to impaction, due to the bird swallowing long grass, feathers, &c., but postmortem is not essential to diagnose this trouble.

The spleen lies to the right of the proventriculus and gizzard. Its colour is reddish brown, and in form is generally rounded. This organ in common with the liver is liable to infection with tuberculosis.

The reproductive organs of the hen consist of an ovary where the ovums or egg yolks are formed, and the oviduct where the yolk is encased in the various layers of albumen, and finally the shell. They are both very vascular organs and subject to congestion due to errors in feeding, as well as to many disorders which may be classed as physical disorders. Physical or structural disorders are of interest only, and are in no way of an epizootic nature. Inflammation of the oviduct and ovary, due to the prolonged feeding of food of a highly nitrogenous nature, have to the writer's knowledge been responsible for exceptionally heavy losses among leghorn hens. No other treatment than mild purgatives and a change of diet is of any value.

Kidneys and Ureters.—The bird has two kidneys and two ureters. The kidney is divided into three distinct lobes each connected with the ureter. They commence from the rear of the reproductive organs, continuing one on each side of the spine to the rectum. They are elongated in shape, fitting themselves into the irregularities of the bony structure of the bird. The ureters continue along the surface of the kidney, ending in the lower portion of the cloaca. The kidney is not an organ frequently affected with disease, but cases of abscesses have been reported, while the prolonged feeding of food excessively rich in protein causes whitish areas and a general paleness of the kidney.

The heart is affected with several troubles, dropsy of the heart sac being by far the most frequent. The trouble, however, is not of a serious nature in flocks receiving the ordinary amount of care and attention. Rupture of the heart or large blood vessels also occurs occasionally in birds over-exerted or in their effort to escape capture. The trachea right and left bronchial tubes and right and left lung forms the principal parts of the respiratory system. Many of the troubles affecting these organs can be determined without postmortem examination, while congestion of the lungs, a trouble frequently effecting young birds and birds during the moulty period, is readily diagnosed by examination. With this trouble the engorgement of the blood vessels causes pressure upon the air cells, resulting in death from asphyxia, or there may be a rupture of a blood vessel which blocks up the bronchial tubes. Pneumonia is a stage beyond congestion, as well as congestion a liquid collects which by coagulating makes the lung more or less solid, rendering it useless as an organ of respiration. Another trouble is the development of a mould fungi which is present in musty straw and grain. This fungi develops very rapidly in warm weather. Presence of this trouble is indicated by tubercular-like nodules varying in size from a pinhead to that of a pea in the tissue and even in the bones. On the

Plate 87 (Fig. 3).—Third Stage, which Exposes Internal Organs.

PLATE 88 (Fig. 4).—INTERNAL ORGANS OF HEN.

lining of the air tubes a membraneous formation an eighth of an inch in thickness may be found. These patches are at first soft, but become firmer with age and yellowish in colour. The lungs of poultry in common with other internal organs are subject to general tuberculosis, but it has not been the writer's experience to encounter any case where the lung has been affected.

Peritonitis, inflammation of the peritoneum, the delicate membrane covering the abdominal cavity and the organs in that cavity, is another frequent cause of death. It is generally due to disorders of the liver, kidneys, or perforations of the intestines caused by worms allowing the escape of some of the intestinal content, or it may be caused through the septic condition arising from severe bruises or body blows.

From postmortem, therefore, a definite knowledge of the reason of losses can be secured which enable the breeder to take timely steps to prevent diseases of an epizootic nature from spreading. If the trouble be due to errors in feeding and housing have them rectified. Although poultry-keepers will not admit that the conditions under which they keep their fowls are responsible, they are in the main the predisposing cause for outbreaks of sickness. An ill-nourished, badly-housed, or wormy-infested flock offer little resistance to the inroads of disease organism. Once an outbreak of disease of an epizootic nature has occurred, a thorough clean-up of the premises should be made and disinfection practised. The runs should be ploughed in order to bury the excreta and parasites and bring fresh soil to the surface, but previous to ploughing, if it is possible to keep birds out of the pens, it could be dressed with a good coating of lime. Birds which are apparently sick should be either destroyed or isolated, and a careful watch kept upon the balance of the stock.

POINTS IN SEED MAIZE SELECTION.

Improvement in yield and quality can be brought about by seed selection. High yields are obtainable by breeding from prolific strains.

Strong, healthy, vigorous plants should be chosen to bear seed and should not have more than two well-developed ears.

Selection should commence in the field, where the characteristics of each plant can be observed.

Plants which bear ears low down on the stem withstand heavy winds, and do not heel over readily when the soil is soaked with moisture; harvesting is simplified.

Ears which turn down as they ripen, and are covered with a fine-textured husk, are not readily damaged by birds or insects.

Seed ears should be uniform in size, shape, and colour, according to variety.

Cylindrical ears produce a more uniform sample of grain. Allowance must be made in this respect according to the characteristic shape common to different varieties.

Wedge-shaped grains having straight sides and edges fit together so compactly that little or no space is wasted; common to ears with sixteen to twenty rows.

By increasing the depth of grain in proportion to the diameter of the cob the shelling percentage of grain is increased.

Grains possessing a large embryo or germ have a relatively high oil and protein content; they give a stronger germination and are more nutritious.

Ears with straight, regular rows with firmly attached grain carry more grain of uniform quality than ears of the same size with twisted or irregular rows with loosely attached grain.

Wide spaces between rows and consequent loss of space causes a reduction in yield per ear.

Ears fully and firmly covered by the husk protects the silks and, later on, the grain from weather and insect attacks. Husk covering should be close-fitting and fine-textured.

Fine piths or cores dry out much better and are usually associated with deep, plump grain. Coarse piths dry out slowly and usually indicate shallow grain and coarse stalks.

In very moist districts hard grain showing a high proportion of horny starch should be selected in preference to softer and more starchy kinds, which are readily subject to insect attack and mould.

C. McKEON, Assistant Instructor in Agriculture.

BIOLOGICAL CONTROL OF INSECT PESTS.

ADDRESS BY PROFESSOR E. J. GODDARD, B.A., D.Sc.

The results achieved in the sphere of biological control were reviewed interestingly by Professor E. J. Goddard, B.A., D.Sc., in his presidential address at the annual meeting of the Entomological Society of Queensland, held at the Queensland University of 16th March. The results achieved in different parts of the earth, he said, pointed to the necessity for intensive ecological entomological work, and appreciation of the fact by all members of the community that, with alarming suddenness, apparently useless entomological scientific work might assume a grand economic status.

Broad Basis of Research.

Professor Goddard, whose subject was "Biological Control by Insects," pointed out that recent developments within the State of Queensland, as instanced by the institution of a Faculty of Agriculture at the University, and the great interest manifest throughout the Commonwealth in entomological problems, as illustrated by the appointment of competent entomologists by the Commonwealth Council of Scientific and Industrial Research, all pointed the way to the necessity for planning the needs of the country and elaborating entomological research of an economic nature on a broad basis. The scope of economic entomology embraced a study of the structure and life histories of injurious insects, and their relations to all the natural and artificial conditions to which they might be subjected. It included also the investigation of the nature of the losses engendered by such insects and the practicable means by which they might be prevented or lessened. The great variety of insect forms, their diverse methods of food habits, the large number of hosts which supplied them with food, and the enemies which tended to destroy them—all these made it evident that the problem of insect control was most complex. The control of insect pests had become a most important matter, and if only a portion of the loss which insects caused could be prevented the work of investigators would be well repaid. In a general way the methods of control of insect pests might be differentiated into normal methods, artificial methods, and biological methods. The first of these included hand-picking of certain insects, collection of eggs, cleaning up rubbish and weeds, planting early or planting late, rotating crops, using resistant varieties, ploughing at certain seasons of the year, utilisation of some mechanical impediment, traps, &c. Artificial methods consisted mainly in the use of insecticides.

Chemical Line of Attack.

Professor Goddard dealt at length with the great advance made in this—a chemical line of attack—during the past twenty-five years. Incidentally he referred to the utilisation of waste products for the elaboration of insecticides, and the commercial use of aeroplanes for the purpose of spraying or dusting crops covering an extensive area. Yet there were many insect problems for which normal and artificial methods of control appeared to offer no solution. It was in such cases that recourse must be had to Nature's help, and the aid of some biological method of control sought. The forces of Nature, if left to themselves, tended towards a state of equilibrium or to maintain a condition of balance; no one plant or animal was able to maintain an ascendency over others for any long period of time. If an insect increased abnormally for a period of years, certain natural forces, such as climatic conditions, parasitic and predaceous insects, birds and fungus diseases, attacked it from all quarters, and reduced it to its normal numbers. Knowledge of these facts had led to the idea of appropriating some of these natural agencies and using them to check the abnormal increase of certain insect pests, to reduce them to normal numbers, and to suppress their ravages. This constitutes the biological method of control. Professor Goddard dealt in detail with successful efforts of biological control, such as the cottony-cushion scale (imported into California from Australia), by a ladybird imported from Australia; suppression of a leafhopper (which found its way from Australia to Hawaii, and did much damage to sugar-cane) by a parasite imported from Australia; control of citrous white-flies by a fungus (Aschersonia); control of gypsy and brown-tail moths in America by parasites imported from Europe and Japan. He paid special attention to the efforts at biological control in New Zealand, such as woolly aphis by *Aphelinus mali;* pear leaf curling midge, earwig, oak scale, pear slug, and aphides by respective parasites. Professor Goddard eulogised the work accomplished by Mr. G. H. Hardy, Walter and Eliza Hall Fellow, University of Queensland, in elaborating means of successfully breeding parasites of the sheep blow-fly. He also referred to the successful biological control of the coconut moth of Fiji by an imported parasite. The utilisation of insects for destroying prickly-pear, blackberry, lantana, &c., was discussed, and the opinion proffered that some other noxious weeds would ultimately be destroyed by the employment of these means.

Professor Goddard indicated the great advantages of biological control by stating that artificial and normal methods of control demanded annual repetition, faithful discharge of recommendations by all agriculturists at the right season of the year, and continuous expenditure. Biological control was cheap and permanent. While much could still be anticipated in the use of chemicals, it was the duty of the economic entomologist to-day to leave no avenue unexplored in attempting to establish biological control of insect pests.

METHYLENE BLUE REDUCTION TEST.

ITS VALUE IN MILK GRADING.

C. McGRATH, Supervisor of Dairying.

The methylene blue reduction test, as a quick method for determining approximately the number of bacteria present in a sample of milk, is recommended to graders at cheese factories and milk-receiving stations.

The process is not as accurate as the plate culture or the more recent direct microscopic count methods.

The latter tests, however, are more complicated and expensive, and call for special training and more skill than in carrying out the methylene blue reduction test.

A comparison of the results of grading milk by the direct microscopic count and the methylene blue reduction determination has proved that the latter test can be used with advantage where milk is received for human consumption or manufacturing purposes.

The methylene blue reduction test is of special value for the grading of milk received at cheese factories, as a fermentation test can be made on the same sample of milk, after the colour reduction time has been recorded.

It is not suggested that this test would take the place of the usual inspection and grading of the milk which must always be carried out by a qualified milk-grader.

No technical description of milk and no test at present known can replace the practical knowledge obtained by experience in the grading of milk and its products.

Descriptions of odours and flavour of milk and its products, in terms definite enough to guide an inexperienced grader, have been found to be impossible.

The methylene blue reduction test can be made when the grader decides that it will aid him in determining the quality of milk.

The test, however, should be applied to each milk supply a few times each month, and by averaging the reduction time results the work of the grader becomes of greater value.

When the test has been in operation for some time, the average quality of each patron's milk can be more definitely determined.

Attention can be given to improve the quality of the milk below first grade.

In classing the milk delivered at a cheese factory, the grader will readily discern the night's milk from the morning supply.

A pleasant, clean, partially-ripened flavour of the milk held overnight indicates that the milk has been produced under sanitary conditions, and the desirable lactic acid micro-organisms predominate.

The clean, pleasant, fresh smell and flavour of the morning's milk is indicative of the conditions under which the milk is produced, handled, and delivered at the factory.

To produce a first-grade milk having a low acidity and bacterial count and free from excess sediment requires care and attention on the part of the producer and is a more expensive operation than the production of milk of a lower grade. High-grade milk and its products increase consumption and raise the price of such products with benefit to all engaged in the industry.

Producers of first-quality dairy products should be paid a substantial premium. Low-grade dairy products decrease consumption and lower the price for high-grade products.

The Test.

It has been determined that when a definite amount of methylene blue has been added to a sample of milk and a temperature of 98 deg. Fah. is maintained, that decolouration occurs at a rate determinable by the number of bacteria present.

Milk which contains several million bacteria per cubic centimetre will be decoloured in a few minutes, while milk which contains a few thousand bacteria per cubic centimetre will retain the blue colour for several hours.

The decolouration is dependent upon the amount and rapidity of acid produced by the activity of the bacteria in the milk samples.

To carry out the methylene blue reduction test only a small amount of apparatus is required, and consists of—

Glass test tubes, 6 x ¾ in.;
Rack for holding same;
Water bath to maintain temperature of samples;
120 c.c. milk pipette.

Stock solution of methylene blue is made by dissolving 1.1 grams dry methylene blue dye in 500 c.c. of distilled water.

The dilute solution for use is made, as required, by adding 39 c.c. of distilled water to 1 c.c. of methylene blue stock solution. This dilution will keep three days, and gaves one part of dry crystalline blue in 200,000 parts of the milk sample tested.

Procedure.—Mix the milk thoroughly before drawing off the sample.

Pipette 20 c.c. of the milk with a sterile test tube, add 2 c.c. of dilate methylene blue. Mix thoroughly, and close with a cotton plug. Place the test tubes in a bath and keep at a temperature of 98 to 100 deg. Fah. Observe the change in the colour of the milk at intervals.

By comparing the tests milk samples with a quantity of normal milk the time of disappearance of the blue colouration can be fixed.

The grade of the milk is determined by the rapidity with which the blue colour disappears.

The following time records the standard according to Hunziker:—

Time decolouration.	Quality milk.
2 hours	Poor
2 to 5½ hours	Fair
Over 5½ hours	Good

Methylene blue test and its relation to bacterial content of tested milk, according

Time decolouration.	Classification.	App. number of bacteria per c.c.
Less than 20 minutes	Poor	20 millions
20 minutes to 2 hours	Medium	4 to 20 millions
2 hours to 6 hours	Fair	½ to 4 millions
6 hours or over	Good	Less than ½ million

Sterilise test tube pipette by boiling for 20 minutes before use.

Close test tubes with plug of cotton when in rack awaiting use, and insert cotton plug as soon as sample of milk is delivered into same, and keep closed during the period of the test.

Rinse the pipette with boiled water after sampling each supply.

The stock solution will keep for six months.

The dilute solution to be added to the samples of milk will keep three days.

The methylene blue reduction test will assist the grader to divide the milk supply into several grades. A low bacterial count is indicative of sanitary production and handling of the milk.

The age and local climatic conditions, together with the milk grader's practical experience, enable him to assess the value of the test which can be used in cheese factories and milk receiving stations with advantage.

RURAL PROBLEMS.

CONFERENCE OF LOCKYER FARMERS.

There was a representative attendance of delegates from the several branches of the Local Producers' Associations in the Lockyer at the Queensland Agricultural College and High School on 22nd March, for the annual conference. Mr. W. A. Fielding presided, and extended congratulations on behalf of the conference to Mr. J. K. Murray on his appointment as the first Professor of the Faculty of Agriculture at the Queensland University.

Price-Fixing Board for Pigs.

There was a long discussion on the question of forming a Price-Fixing Board in connection with the pig industry, it being contended that the producer should have some knowledge as to how the price paid for pigs was arrived at. General disappointment was expressed at the failure of the Murarrie and the Downs Co-operative Bacon Companies to formulate some scheme of amalgamation. It was finally decided that the appointment of a committee to go into the question of price-fixing of pigs should be deferred, and that the directors of the co-operative bacon factories should be invited to attend the next meeting to give first-hand information.

Milk Transport.

Mr. L. H. Paten, of Calvert, brought forward the matter of the inconvenient train arrangements for the farmers who supplied whole milk to Brisbane from Grandchester down. They were at a disadvantage compared with suppliers on the other side of Brisbane. If they could get one of the rail motors it would overcome the difficulty. The conference gave its wholehearted support to the matter and appointed Mr. Paten its representative on any deputation appointed to wait on the authorities concerned.

An Irrigation Project.

The secretary read a report from Mr. C. Harland, of the Irrigation Commission, on the possibilities of irrigation in the Lockyer Valley. This matter, the delegates thought, was of the utmost importance. Messrs. J. Logan (Gatton), L. Raymond (Lockrose), and K. Jamieson (Tent Hill) were appointed a delegation to wait on the Acting Premier and urge that a weir should be put across the Lockyer at some suitable spot as an experiment.

Fodder Conservation.

The question of the conservation of fodder was exhaustively discussed. No finality was reached, but a motion, moved by Mr. T. Hayes (Laidley), was carried—"That the conference expresses its adherence to the principle of fodder conservation, and that the details of a scheme be formulated for the conference in June."

It was decided to invite the Acting Premier (Hon. W. Forgan Smith) to be present at the conference in June.

Price of Millet.

The Lower Tent Hill L.P.A. asked how it was that when the price of millet was fixed at £56 per ton, and the levy at 2s. 6d. per cwt., growers could obtain only £50 per ton on the open market, yet they were compelled to pay the levy when no assistance was rendered by the Board in obtaining the fixed price? It was decided to obtain information on this matter through the Council of Agriculture.

Address by Professor Murray.

Professor J. K. Murray (Principal of the College) addressed the conference on the problems confronting agriculture. They required more efficient crops and more efficient stock. Every dairy herd in the State could be improved. The qualities and values of the various crops were outlined by him, and advice given as to what varieties of seed to plant. The secondary industries connected with agriculture were dealt with, manufacturing, storage, sales, service, and transportation being reviewed. Speaking on the spirit of co-operation, Professor Murray thought a broader view would benefit the various industries. Taking the pig industry as an example, it was not a question whether the Downs or the Murarrie factory wanted support, but where could the pigs be treated best in the State in the interests of the industry. He believed the railways could do more to assist our primary industries than was being done at present. Good butter was produced from good cream, and one of the most important things with cream was a better means of transport.

Some national insurance policy was needed in connection with droughts. There was no reason why Queensland could not meet its own problems. Speaking on the Faculty of Agriculture, he said he appreciated the honour that had been conferred on him. It was the first of its kind in Australia, and he liked it because it linked up the University with the College and the Department of Agriculture, and with the three pulling together we should get better results for agriculture in Queensland. No Faculty of Agriculture, however well equipped and staffed, could turn out first-class men unless it was provided with students who were able and possessed of common sense.

VANISHING BIRD LIFE.*

Native wild-life is slowly, but surely, vanishing from our midst, and will continue to do so under existing conditions. The game laws of the different States vary one from the other, and should be under one department. For instance, ducks can be shot in New South Wales earlier than in Victoria, and we make the Murray River the boundary, whereas the ducks recognise no boundary. Take the last opening of the duck-shooting season in New South Wales. Many hundreds of ducks were nesting, or had young broods, as the season was slightly later than usual, and men who went out shooting saw nearly as many flappers as adult birds. So that hundreds of young ducks must have perished through the parents having been shot; to say nothing of the unhatched eggs left to grow cold.

Our natural resorts for wild-fowl, quail, pigeons, and other species are gradually becoming less as the country is opened up and cleared, and swamps drained. Then again, in spite of the close season, many birds are shot in the country districts. The birds also have foxes and domesticated cats gone wild to contend with, as well as the usual birds of prey. As so much of the natural cover has been done away with, the birds are now much more confined to restricted localities than they formerly were, and, therefore, fall an easier prey to their enemies. Again, poison laid for rabbits has accounted for the death of very many birds, but that cause of death can be much reduced by laying the rabbit poison carefully and covering it, and by not using grain.

The Value of Birds.

As birds are of such great value to our State—far more than we can realise—we should do all in our power to protect them. The wild birds do not belong to us to treat as we like. Go where one will in Victoria, the same story is heard, that is the diminution of ducks, quail, snipe, and the other sporting birds, as well as those that are not used for food. and are strictly insectivorous. We have to use all kinds of poison to destroy the insect pests which often infest our fruit and other trees, and this is work that the birds should largely do for us. Thousands of birds are shot in cherry and other orchards when the fruit is ripe. When forming his orchard, the orchardist could erect a light framework over his trees, and when the fruit was ripe, hang netting over the trees, and so protect them from the birds. When the fruit was gathered the netting could be rolled up until next year. The first cost would be the last cost; the fruit would be protected, and the exceedingly useful birds would have the free run of the trees for the rest of the year. This would be far more effective and cheaper in the end than shooting the birds when on the fruit trees, as the shot generally injures the fruit and branches, as well as killing the birds.

Birds a National Asset.

We should recognise the birds as a national asset, and do all in our power to preserve them, and let them have as many sanctuaries as possible. Portions of our State, which are set apart as forest or other reserves, should be proclaimed "Bird Sanctuaries," and should be jealously guarded from deletion; they are also a national asset, and increase in value as time goes on. It is only right that we should leave some of our country as we found it, so that it may be enjoyed by our children's children, and that they, too, may see the wonderfully interesting and useful fauna that their forefathers saw.

To make a calculation as to the number of injurious insects destroyed in one year is impossible; they would number billions. The value of fruit, grain, vegetables, grass, forests, &c., saved for our farmers by the destruction of these insects by

* Reprinted from the "Graziers' Review" (Q.), 16th March, 1927.

birds is also beyond computation. A most valuable work on this subject has lately been written by Dr. W. T. Hornaday, of New York. It is entitled "Vanishing Wild Life," and applies to America mostly, but what applies to that country does so equally to our own. In this book Dr. Hornaday states:—

"It is undeniable that the welfare and happiness of our own and all future generations are at stake in this battle for the preservation of Nature against the selfishness, ignorance, and cruelty of her destroyers. We no longer destroy great works of art; they are treasured and regarded as of peculiar value; but we have got to attain to the state of civilisation where the destruction of the glorious work of nature, whether it be cliff, forest, fern-tree gully, giant trees, or a species of mammal or bird is regarded with equal abhorrence. The whole earth is a poorer place to live in when a colony of exquisite egrets, or birds of Paradise, is destroyed in order that plumes may decorate the hat of some lady of fashion, and ultimately find their way into the rubbish heap. Our game does not belong exclusively to the men who kill; the other 97 per cent. of the people have vested rights in it, far exceeding those of the 3 per cent. who kill. Posterity also has claim upon it that no honest man can ignore. I am now asking the true sportsman, and people who do not kill wild things, to awake and do their plain duty in protecting and preserving the game and other wild life which belongs partly to us, but chiefly to those who come after us.

"A continent without wild life is like a forest with no leaves on the trees. At present it seems that the only remedy lies in Federal protection of all migratory birds, because some of the States will not do their duty. For educated, civilised man to exterminate a valuable wild species of living thing is a crime, both against his own children and posterity. No man has any right, either moral or legal, to destroy or squander an inheritance of his children that he holds for them in trust. Man has not created even the humblest of the species of birds, mammals, or fish that adorn and enrich this earth.

"The earth is the Lord's and the fulness thereof." To-day the civilised women of the world are directly promoting the extermination of scores of beautiful species of birds by the devilish persistence with which they buy and wear further ornaments made of their plumage. They are just as mean and cruel as a truck-driver who drives a horse with a sore shoulder. Our object should be—

First—To save valuable species from extermination.

Second—To preserve a satisfactory representation of our once rich fauna, to hand down to posterity.

Third—To protect the farmer and fruitgrower from the enormous losses that the destruction of our insectivorous and rodent-eating birds is now inflicting upon both the producer and the consumer.

Fourth—To protect our forests, by protecting the birds that keep down the myriads of insects that are destructive to trees and shrubs.

Fifth—To preserve to the future sportsmen enough game and fish that they may have, at least, a taste of the legitimate pursuit of game in the open that has made life so interesting to the sportsmen of to-day."—Dudley Le Souef, Melbourne.

FARMERS APPRECIATE THE JOURNAL.

The following excerpts are typical of quite a number of references to the usefulness of the Journal by farmers in correspondence with the Department in the course of the month:—

A Stanthorpe subscriber writes: "I would like to state that I find your Journal intensely interesting and of inestimable value to anyone interested in Agriculture, or in any of the many branches of that science."

A North Coast farmer endorses previous appreciative references to the Journal by fellow farmers, and adds, "No farmer with any pretensions of being business-like is, or should be, without it."

Answers to Correspondents.

A Stock Lick.

J.H.F. (Texas, Q.)—

A copy of "Stock Foods," has gone forward. The "Journal" for March, 1925, is, we regret, unavailable.

Your inquiry concerning sheep lick was referred to the Agricultural Chemist, Mr. J. C. Brunnich, who advises as follows:—

It is a mistake to give too much salt in a lick, and only a sufficient amounts of salt are necessary to make licks more palatable.

Nauru phosphate is practically lime or calcium phosphate containing also some lime carbonate.

Sterilised fine bone meal, if obtainable, may be more palatable and more easily digested than Nauru phosphate.

I recommend a lick made as follows:—

20 parts of salt,
40 parts of sterilised bone meal or finely crushed Nauru phosphate,
40 parts of finely crushed lime carbonate,
1 part of iron sulphate.

It is optional to moisten this lick with about 5 to 10 parts of molasses.

Extraction of Salt from Saline Water.

R.B. (Mareeba)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

No practicable method to remove salt from saline water or effluents exists. Any such water, even after being treated to remove the organic matters to prevent putrefying decomposition, will still contain the salt and be a menace to all vegetation.

Destruction of Khaki Weed.

J.W. (Thane, Inglewood Line)—

Your inquiry concerning the destruction of Khaki Weed was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—

A heavy dressing with coarse salt (waste salt from butcher shops and hide stores) will effectually destroy khaki weed. The salt will make the soil barren for a short period, until heavy rain washes the salt out.

A Complete Fertiliser.

C.O.N. (Montville)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises:—

A mixture of—

Bone Dust	54 parts
Sodium Nitrate	22 parts
Potassium Sulphate	17 parts
Sand	5 parts

will make a complete fertiliser, 5.13.8.

BOTANY.

Following are selected replies by the Government Botanist, Mr. C. T. White, F.L.S., to correspondents in the course of the month:—

"Bamboo Grass."

D.L. (Canungra)—

The specimen is *Stipa micrantha*, sometimes known as "Bamboo Grass." It is more abundant on the Downs than on the coast, and in the former districts provides a bite for stock. It is, however, not a particularly valuable forage grass and hardly worthy of a place on the rich Beechmount Tableland, where better grasses can be grown.

Wampi—A Saltbush Variety.

A.H.B. (Townsville)—

The tree with the large leaves.—It is very difficult to name trees accurately from a single leaf. However, we think the specimen now sent represents the Wampi (*Clausena Wampi*), a small tree of the orange family, a native of China, but widely cultivated throughout the tropics and subtropics. The rather pleasantly flavoured sub-acid fruits are said to make excellent preserves, but seem to be little used here. We would like a few fruits to veritfy the determination.

The small creeping plant.—*Enchylæna tomentosa* var. *glabra.* A rather fleshy member of the saltbush family. We do not know a common name for it. The small red fruits were said to be eaten by the natives, but we have no very definite information about their properties.

"Christmas Tree" and "Bean Tree."

L.R.B. (Barrine, Kulara, N.Q.)—

It is very difficult to name specimens of trees from leaves only. Of the two the "Christmas Tree" is, we think, *Lagerstræmia flos-reginæ*, the "Crepe Myrtle." Several garden varieties of this tree are grown in Queensland. They bear large trusses of flowers with crinkled petals—red, white, or lavender. Send a few flowers or seed pods to verify.

The "Bean Tree" is *Castanospermum australe.* Local names are "Bean Tree," "Black Bean," and "Moreton Bay Chestnut." The wood is very beautiful cabinet wood, but is difficult to obtain sound in large sizes. It is also rather hard to work. The large chestnut-like seeds contain a poisonous saponin and cause severe gastro-enteritis in cattle and horses. The natives, however, eat them after grinding, washing, and cooking.

"Black Sally"—Maiden's Wattle—White Bloodwood.

T.A.P. (Toowoomba)—

1. *Acacia salicina.* Sometimes known as the "Black Sally." "Sally," as you probably know, is the vernacular applied to many wattles.
2. *Acacia Maidenii.* Maiden's Wattle. Reputed good forage for stock during times of drought.
3. *Eucalyptus trachyphloia.* White Bloodwood.

Black Mauritus Bean—Pig Weed—Fodder Grasses—Cultivated Fruits in Papua.

P.N.C. (Port Moresby, Papua)—

1. The bean is *Stizolobium aterrimum*, the Black Mauritius Bean. It is widely cultivated in some of the sugar-growing areas of Queensland as a green manure. It has not run out and become a pest so far, though it has been cultivated here for many years. It is widely cultivated throughout the tropical regions of the globe, but solely as a green manure and cover crop. The vines are never eaten by stock, and the seeds or pods never eaten raw or cooked by animals or man. We do not know that the properties of the bean have been investigated, therefore we cannot answer all your questions regarding its poisonous properties.
2. The weed is *Trianthema monogyna*, known in Queensland as "Giant Pig Weed," sometimes as "Hog Weed." It is widely distributed as a weed in cultivation over the tropical regions of the globe. Replying to your questions—(*a*) It is not a legume; (*b*) would make a cover crop of sorts but there are better things; (*c*) it is eaten by stock, but is neither particularly pālatable nor nutritious.
3. The best fodder grass to grow on alluvial flats in Papua, we should say, is unquestionably *Panicum muticum*, the Para Grass. It is generally planted by cuttings of roots as it does not set much fertile seed. Guinea Grass is another grass that should do well in Papua. It would have to be kept cut regularly to prove palatable. Sudan Grass is worthy of a trial, but it would have to be treated as a field crop for cutting, not as permanent pasture.
4. We should say grapes were hardly worth bothering with in Papua—it is too wet during the fruiting season. They grow grapes quite well in parts of the Queensland Gulf country, but the summer rainfall is probably not quite as heavy as yours.
5. Peaches—some varieties of the China race—cultivated in Coastal Queensland might possibly grow and fruit. Figs, we should say, are not worth bothering about. Mulberries are worth a trial.

"Rattle-pod."

A.D. (Morayfield)—

The specimen is a species of "Rattle-pod" (*Crotalaria striata*). A pamphlet on the weed has been forwarded. Deaths of cattle on the Caboolture River some years back were traceable to this plant. So far as we have noticed, however, stock have got to be forced on to it by drought conditions; when there is plenty of feed about they leave it alone.

Seeds Required.

L.P.R. (Epping, N.S.W.)—

The seeds you ask for are not generally stocked by seedsmen, and you will have difficulty in getting supplies.

Pleiococca Wilcoxiana. This is very abundant on Fraser Island and is in full fruit in late May or early June. If you write the Officer in Charge, Forests Office, Fraser Island, via Maryborough, Queensland, he might send you a bag of fruits. It fruits very heavily some years.

Rhodosphæra thodanthema. This is common in Queensland scrubs, and we often have seeds on hand. Next time we have any we will remember your request.

Hicksbeachia pinnatifolia. Not common in Queensland; much more abundant in the Northern Rivers District of New South Wales. Impossible, we should say, to supply.

"Red Bush Nut." Do not know to what you refer.

"Crow-Foot Grass"—"Button Grass."

P.D. (Yarwun)—

The larger specimen is *Eleusine indica*, "Crow-foot grass." This grass is widely distributed over the warmer regions of the globe. In Queensland it occurs mostly in cultivation paddocks, along headlands, around cow-yards, &c., or anywhere where the land has been broken. It provides a large amount of coarse forage, but should be fed on with care as, like Sorghum and some other plants, it contains a prussic acid-yielding glucoside and if fed on greedily by hungry stock may cause bloat and even death, though we have not been able to trace any deaths of stock in Queensland directly to this grass. It can be spoken of as an annual grass that comes up with the summer rains, though sometimes it lasts through more than one season. Though known commonly as "Crow-foot" it must not be confused with the herb on the Downs country that goes under this name.

The smaller grass is *Eleusine aristat*, the "Creeping" or "Perennial Button Grass." This grass is fairly common in North Queensland and extends to tropical Asia. It is quite a useful pasture grass though not, perhaps, of any special merit.

Euphorbia or "Caustic Creeper."

INQUIRER, (Hughenden)—

The specimens forwarded are species of Euphorbia and are allies of the "Caustic Creeper." A number of species of Euphorbia are suspected of poisoning stock. The specimens sent may be the cause of the poisoning of the sheep, as they are suspected poisonous plants. The sheep would be particularly susceptible to poisonous forage after being released from trucks, as they would presumably, have empty stomachs. The poisonous character of the "Caustic Creeper" (*Euphorbia Drummondii*) has been definitely established. One of the symptoms of poisoning by the "Caustic Creeper" is swelling of the neck.

Spermacoce Brachystema.

J.B.S. (Nebo)—

The specimen submitted by Mr. Alan Shannon, which he reports is exported by Chinese in large quantities, is *Spermacoce brachystema*, a plant which is confined to Eastern Australia. Coumarin, an aromatic substance, which is used in perfumery, has been found in some species of *Spermacoce* and may be present in the species submitted.

Stanthorpe Plants Identified.

S. (Stanthorpe)—

The plant specimens forwarded through Mr. Hubert Jarvis are—

1. *Commelina cyanea.*
2. *Phyllanthus minutiflorus.*
3. *Trachymeme incisa.*
4. *Cynoglossum Drummindii.*
5. *Datura Stramonium.*
6. *Aneilema gramineum.*

No. 5, *Datura Stramonium,* is a poisonous plant. The seeds of this species are especially poisonous, a number of deaths of human beings having been traced to it. Analyses have shown that the seeds contain as much as 0.33 per cent. of atropine, a poisonous alkaloid. In the same analyses the leaves were found to contain 0.2 per cent. atropine. In cases of poisoning by it atropine causes paralysis.

VETERINARY.

Blight—Head Swelling in Cow.

P.M.R. (Mundubbera)—

Veterinary Surgeon J. A. Rudd, of the Stock Branch, advises:—

1. Cure for Blight—Try nitrate of silver, 5 grains; distilled water, 1 oz. Place a few drops into the eye of the animal with an eye dropper every day, or draw a camel-hair brush, moistened with the lotion, gently across the eyeball once every twenty-four hours.

2. Cow with Swelling—*Case:* A springing cow running with other stock. About a week before she was due to calve a swelling appeared under the jaw, which increased until it covered the jaws down to the mouth. She could not open her mouth to feed. The swelling extended down throat and brisket to a front leg. When rubbed it crackled as though there was a sort of jelly underneath the skin surface. Kerosene was applied and bathing with hot water and turps tried. When death was evident, the swelling was opened and much matter like dirty water was drained away. The swelling continued to extend and the cow died. *Answer:* The mouth was probably in a septic condition due to a wound, or a piece of bone or like substance was pressed in between the molar teeth, the ends of which were irritating the tongue and cheek bringing sepsis, or blood-poisoning. An examination should have been made of the mouth immediately. The swelling, which was soft and fluctuating, was opened at a point furthest from the obvious seat of trouble. Surgical interference in this way is hopeless if the condition is allowed to remain until it is apparent that the animal is on the point of death.

Nasal Fly in Sheep.

W.I.S. (Amby)—

The Instructor in Sheep and Wool, Mr. W. G. Brown, advises as follows:—

"Yes, I remember receiving specimens of Nasal Fly from your correspondent, and I still have them in the office.

"I regret to say that there is no known way of dealing with the pest, excepting in the early stages, when a teaspoonful of petrol squirted into the nostrils will kill them.

"The running at the nose is one of the surest symptoms. They usually fly, in Queensland, from August to December every year, and the grubs remain in the nostrils for seven or eight months. The Nasal Fly is now to be found all over Queensland. I have not seen any deaths, but hear of occasional sheep dying, and the owners attribute the mortality to the grubs.

I have never known bleeding at the nose to be caused by the grub. The grub itself does not attack the flesh of the nasal passages, but lives on the mucus. It is, of course, possible that the bleeding is caused by them.

"Bleeding may be caused by the inhalation of foreign matter in dry grass or chaff.

"Under separate cover is forwarded 'The Farmer's Sheep in Queensland,' in which is discussed the Nasal Fly."

Mortality Among Lambs.

A.J.B. (Kogan)—

Mr. W. G. Brown, Instructor in Sheep and Wool, advises:—

I note that your correspondent has had a few deaths amongst his four months old lambs. He says that there is no sign of worms, but that there is sand in the third and fourth stomachs. In the absence of worms this shows that there must be some irritant poison present. The congestion of the small intestines also point to some irritant being present. After a drought with heavy rain following, there are often poisonous herbs that spring up almost in a night. One of these, the "onion lily," is often very fatal. It grows on your correspondent's country, especially on the sandy lands.

I am pretty sure that the lambs have been eating some poisonous weed.

Sheep Shedding Wool.

D.J.E. (Dayboro')—

We are pleased to know that your sheep came through the heavy rains so well. You will learn that if sheep cannot stand hardship either under dry or wet conditions none of the other domesticated animals can either.

In regard to the small patches of wool coming away from the skin, the Instructor in Sheep and Wool, Mr. W. G. Brown, advises that this is a very common occurrence, and is usually caused by fevered conditions of the animals. Sometimes if sheep have been feeding on dry grass, or under drought conditions, a flush of green grass causes a new growth of wool, and just at the point where the conditions change, there is a break in the wool. There is no remedy as far as the wool is concerned. It will fall off if you do not pull it off, and the new growth will take its place. There is nothing to be alarmed at. In regard to the lameness, there is a gland between the toes of sheep which, if obstructed, leads to lameness until the obstruction be removed. Examine the feet of the lame sheep, and, taking a wooden sliver—an ordinary safety match will do—remove the mud or grass-seed and squeeze gently the joint of the foot. When a little pus or matter comes out the sheep will soon be relieved. Dress with a solution of bluestone and water, 2 lb. to 1 gallon, or the equivalent. In regard to the ram your neighbour lost, retention of the urine is a common occurrence, mostly caused by calculi or chalk stones. Some animals are peculiarly liable to this infection; others are never troubled. It is commonly known as gravel. The symptoms are known early. The animal is uneasy and constantly turning his head towards his flank, lying down, and then getting up again.

If your or your neighbours' sheep show these symptoms again, give a drench—2oz. saltpetre (nitre), 2 quarts water; dose 2 fluid ounces. That will help.

PIG RAISING.

Subjoined are replies to correspondents, selected because of their general interest, by the Instructor in Pig Raising, Mr. E. J. Shelton, in the course of the month:—

Evils of Early Weaning.

H. (Caboolture)—

It is evident that the pigs purchased by you were weaned too young, and had suffered such a setback by early weaning and sudden change of food that their digestive organs and bowels were not able to cope with the class of food given, and they gradually declined. This trouble is not uncommon and many thousands of pigs die annually as a result. Pigs should not be weaned before they are eight weeks old. In cases like this the strongest and best pigs last the longest, but stoppage of the bowels is fatal no matter what the food or housing may be like. We can only suggest more care and stricter attention to feeding of young animals to ensure that the bowels are free and that they assimilate the food given. We certainly think it would pay you to breed your own pigs, too, in preference to buying stores, for the latter are usually unsatisfactory.

Pie Melons for Pigs.

W.L. (Rockhampton)—

The feeding value of preserving melons for pigs is somewhat difficult to estimate, as so much depends upon the age and condition of the pigs. Very young pigs, for instance, would not benefit to the same extent as mature breeding sows and boars in serviceable condition. It is to the latter type (breeding sows and the boar) that we advise feeding melons in the raw state, together with pumpkins, root crops, greenstuff, grasses, and a limited proportion of grain. Very young pigs require food that is more concentrated and more readily assimilable, for their stomach is very small in comparison, and they will not thrive if fed on bulky foods carrying a very high percentage of water. On the other hand mature stock whose bodies are already built up and who require to be maintained in reasonable condition benefit very considerably by these bulky foods.

Jerusalem Artichokes as Pig Feed.

Inquirer (Brisbane)—

Jerusalem artichokes are useful for pig-feeding; in fact, they compare very well with all root crops and, though perhaps not quite so productive as sweet potatoes, they have the advantage that they are available during the winter months when there is usually a limited supply of green food available. They are particularly suited to feeding weaners and pigs in the store and porker stage. They are also appreciated by bacon pigs, breeding sows, and all grades of young and mature pigs. It is customary to plant them in a similar way to planting English potatoes, during August or September, in drills 3 feet 6 inches apart, placing the tubers 18 inches apart in the drills. The soil should be well cultivated, for artichokes occupy the ground for several years. Four to five cwt. of seed drilled per acre is necessary to properly seed the land, but we suggest planting a small patch and growing your own tubers for planting next year. Yields of 6 to 8 tons per acre are not uncommon in good seasons. The plant is of the sunflower type, the flower being similar to a miniature sunflower. The tops are of no value for stock feeding; they die off when the tubers are ripening. It is best after securing the tubers required for your own use to hurdle or fence the block off, dig a few and then turn the pigs in to do their own harvesting, supplying them with water, greenstuff, and charcoal, &c., while so engaged. Further information as to the growth of these crops may be obtained from seedmen's catalogues.

PUBLICATIONS RECEIVED.

"The Individuality of the Pig."

Robert Morrison. John Murray, London. 10*s. net.*

"The individuality of the Pig" is a new treatise on the humble hog. Mr. Morrison deals with the pig as an individual; he sets out his early history and development, and describes most interestingly his introduction into the commercial world of to-day. Chapters are devoted to breeding, feeding, and management, to the selection of boar and sow, the dentition of the pig, feeding and the cultivation of crops, preparation of animals for exhibition and sale, and marketing. The several breeds of pigs are described, while the closing chapters deal with diseases of the pig and with the subject of bacon curing. Altogether, Mr. Morrison's book is full of interest to farmers engaged in the industry, and to both student and master. To the Australian reader the book lacks one very important feature in that it is not well illustrated, and probably on that account would not be as widely read as are those publications illustrating both by photographs and drawings the various phases dealt with in the text. It is not an easy matter securing good clear live stock pictures, but the trend of modern life both in the city and on the farm is such that profusely illustrated publications sell and are read more freely than those that lack this attractive feature. The book published overseas at 7s. 6d. net retails at leading booksellers here at 10s. net, at which it represents good book value. If farmers generally were as conversant with the subject as the author of this publication all would be well. Our copy is from Barker's, Brisbane.

"Soil Management."

Firman E. Bear, Professor of Soils, Ohio State University; Associate in Soils, Ohio Agricultural Experimental Station. Edited by F. G. Lipman, B.Sc., A.M., Ph.D. John Wiley and Sons, Inc., New York; Chapman and Hall, Ltd., London.

The purpose of this book is primarily that of acquainting the student with the application of those scientific facts and principles which are of use in planning constructive systems of soil management and in increasing the productive capacities of soils. It is attractively printed and well illustrated, and covers the requirements of crops, characteristics of soils, utilisation of soil resources, conserving and supplementing soil resources. It is designed for the use of advanced students in agricultural science and practice.

"Agricultural Marketing."

John Truman Horner, Prof. Ec., Michigan State College. Same publishers. 12s. 6d. net. Our copy from Chapman and Hall, Ltd., 11 *Henrietta st., Covent Garden, London W.C.* 2.

With recent changes in the world's markets there has come a great interest in that phase of economics known as marketing. Everyone is looking for information concerning various processes of getting goods from the producer to the consumer and this volume is a valuable contribution to our general knowledge. It is an attempt to shed more light upon our economic problems, and certainly helps us to a better understanding of marketing methods and the factors governing them. The author discusses marketing and its scope and place in economics, standardisation of production, preparation of goods for market, storage, transportation, risk as a market cost, selling, the financing of agricultural marketing, care in producing, handling, and preparing for market, demand, correlation of supply and demand, market information and market weaknesses and remedies.

"Weeds of New Zealand."

F. W. Hilgendorf, M.A., D.Sc., F.N.Z. Inst. Whitcome and Tombs, Ltd., Auckland (New Zealand) and Melbourne.

One very obvious way of increasing agricultural and pastoral production is the fullest possible utilisation of nature's gift—land. This means, among other things, the elimination of weed growths from field and run. This book epitomises the hard-earned experience of many expert farmers and gives an account of the war on weeds as carried out in our sister Dominion—an account not without practical value to the Australian farmer.

"The Principles of Dairying—Testing and Manufactures."

Henry F. Judkins, Head of Dairy Department, Massachusetts Agricultural College. John Wiley and Sons, Inc., New York; Chapman and Hall, Ltd., London. 12s. 6d. net. Our copy from Chapman and Hall.

Most books on dairying deal with general production practice, and relatively little discussion is offered as to what happens to the product. This is a concise volume written in simple language and covers practical information on factory processes and practice. A very useful handbook.

"Dairy Engineering."

John T. Bowen, B.Sc., Engineer, Bureau of Dairying, United States Department of Agriculture. Same publishers. 12s. 6d. net. Our copy from Chapman and Hall, London.

This practical handbook is intended primarily to aid those engaged in the dairying industry in the selection, installation, operation, care, and management of the necessary machinery. It is also a good text-book on dairying. Its subject-matter is presented clearly and systematically.

"Chemistry for Agricultural Students."

R. H. Adie, M.A., B.Sc., Sometime Lecturer in Chemistry, St. John's College, Cambridge, Lecturer in Physics and Chemistry, School of Agriculture, Cambridge. W. B. Clive, University Tutorial Press Ltd., High st., New Oxford st., London, W.C. 5s. 6d. net. Our copy from the publishers.

This book contains the results of many years' experience in the endeavour to show the student how even the most fundamental facts and inferences of Chemistry and Physics have at once a bearing on his practical work and observations. The more advanced work based on chemical and physical principles deduced from mathematical considerations has been left by the author to specialist study. The volume is a very useful contribution to current technical and scientific literature.

Plate 89.—A Good Stand of Honey Sorgho grown by Mr. W. Jackson, North Eton, Mackay.

In twelve weeks it showed a growth of ten feet and returned a forty-ton crop.

Plate 90.—Honey Sorgho Crop on Mr. W. Jackson's Farm, North Eton, Mackay.

Another view showing good growth.

TRACTOR SCHOOL AT GATTON.

The Fourth Tractor School for farmers will open at the Queensland High School and College at Gatton on 12th April, under the direction of the Principal, Professor J. K. Murray. Following is the programme of activities in the course of the currency of the school:—

Tuesday, 12th April—

Morning—

7 to 8.30—Taking up and Adjusting Bearings; Mr. May (Tractor Engineer).
8.35 to 9.35—Cultivation; The Principal.
9.40 to 10.40—Farm Bookkeeping; Mr. Gallwey (Secretary).
10.45 to 11.45—Plant Breeding; Mr. McMillan (Plant Breeder).

Afternoon—

12.45 to 5 p.m.—Practical Work on Tractors.

Wednesday, 13th April—

Morning—

7 to 8.30—Taking up and Adjusting Bearings; Mr. May (Tractor Engineer).
8.35 to 9.35—Four-cycle Operations; Mr. Barratt (Chief Engineer).
9.40 to 10.40—Timing of Valves; Mr. May (Tractor Engineer).
10.45 to 11.45—Cooling Systems; The Principal.

Afternoon—

12.45 to 5 p.m.—Practical Work on Tractors.

Thursday, 14th April—

Morning and Afternoon—

Practical Work on Tractors.

Friday, 15th April—

Morning—

7 to 8.30—Taking up and Adjusting Bearings; Mr. May (Tractor Engineer).
9—Combined Protestant Church Service; Mr. Lapthorne.
10.30 to 11.30—Fertilisers; The Principal.

Afternoon—

12.40 to 1.45—Carburettors; Mr. Barratt (Chief Engineer).
2 to 3—Green Manuring; The Principal.
3.15 to 4.15—Diesel and Semi-Diesel Engines; Mr. Nixon.

Saturday, 16th April—

Morning—

7 to 8.30—Taking up and Adjusting Bearings; Mr. May (Tractor Engineer).
8.35 to 9.35—Four-cycle Operations; Mr. Barratt (Chief Engineer).
9.40 to 10.40—Transmission and Steering of Track Laying Tractors; Mr. May (Tractor Engineer).
10.45 to 11.45—Clutches and Differentials; Mr. May (Tractor Engineer).

Afternoon—

12.45 to 5 p.m.—Clearing Land by Explosives.

Sunday, 17th April—

Morning—

7.15—R.C. Church Early Mass, Gatton.
8.45—Protestant Church Service; Mr. Lapthorne.

Afternoon—

Picnic Luncheon; Glenore Grove.

Monday, 18th April—

Morning—

7 to 8.30—Taking up and Adjusting Bearings; Mr. May (Tractor Engineer).
8.35 to 9.35—Tractor Costing; The Principal.
9.40 to 10.40—Care of Tractors; Mr. May (Tractor Engineer).
10.45 to 11.45—Lubrication of Tractors; Mr. Barratt (Chief Engineer).

Afternoon—

12.45 to 1.45—Gear Boxes and Drives; Mr. May (Tractor Engineer).
3.15 to 4.15—Magneto Construction; Mr. May (Tractor Engineer).

Tuesday, 19th April—

Morning and Afternoon—

Practical Work on Tractors.

Wednesday, 20th April—

Morning and Afternoon—

Practical Work on Tractors.

Thursday, 21st April—

Morning—
Practical Work on Tractors.

Afternoon—
Distribution of Pamphlets.

EVENING TIME TABLE.

7 to 7.30 p.m. each evening will be devoted to any query regarding tractors or general agriculture that may be asked.

Lectures will follow at 8 p.m. as follows:—

Tuesday, 12th April—Mr. R. Veitch, Chief Entomologist, Department of Agriculture and Stock.

Wednesday, 13th April—Mr. E. McNicol, Gippsland and Northern Co-operative Pty., Ltd.

Thursday, 14th April—Picture show.

Friday, 15th April—Rev. Mr. Turner.

Saturday, 16th April—Wireless concert.

Monday, 18th April—Mr. A. G. Crawford, Chief Lubricating Engineer, British Imperial Oil Co.

Tuesday, 19th April—Vacuum Oil Co., Lantern Lecture on Internal Combustion Engines.

Wednesday, 20th April—Ford Motor Co., cinematograph.

AERIAL TRANSPORT IN QUEENSLAND.

The Queensland and Northern Territory Aerial Service figures for February were:—Route passengers, single stages, 148; taxi passengers, 25; freights (lbs.), 483; miles flown for month, 9,627; total company mileage all without injuries to personnel or passengers, 449,008.

The most interesting flight carried out during the month was that undertaken by Captain Moody, who flew from Longreach to Brisbane in 8 hours flying time. Roused from his couch at midnight on Friday, Pilot Moody was asked by a caller on the 'phone, 270 miles distant, whether he would undertake to pick up a passenger in Charleville and land him in Brisbane on Saturday afternoon. At peep of day the ''prima donna'' of the Quantas fleet, ''Iris,'' took off from the Longreach aerodrome and nosed her way through the dawn, arriving in Charleville at 8.30. Here the passenger was picked up. En route to Brisbane landings were made at Mitchell and Dalby, at each of which towns both machine and occupants re-fuelled. Brisbane was reached at 4.30 p.m., and a pioneering effort had been accomplished by the company. On his return journey Captain Moody proceeded at leisure, landing at Toowoomba (to familiarise himself with the ground there), Dalby, Mitchell, and Charleville.

As a natural sequence to the heavy rains with which the north-western portion of the State was blessed, taxi planes were called into requisition by those desirous of moving any distance from their domiciles. From Cloncurry centre three such trips were carried out during the drying-up process. Two passengers were conveyed from Cloncurry to Julia Creek—a distance of 90 miles—and three to Glen Isla, a place 30 miles out of Cloncurry. The third trip was one which called for the utmost expedition, as a child's life was in the balance. A medical man had received an urgent call to a sick child. Within two hours of receiving the message the doctor was attending his little patient some 80 miles out of Cloncurry. Yet another trip of somewhat similar nature was that conveying a parent from Longreach to Barcaldine (70 miles) to comfort his child who had met with a nasty accident.

It is becoming more and more apparent every day how the man in the country is learning to regard aerial travel as his most efficient and economical means of getting about.

Notwithstanding the cyclonic disturbance which swept over the northern portion of the State, the usual weekly service between Charleville and Camooweal was studiously maintained.

General Notes.

Bananas in the North.

A proclamation under the Diseases in Plants Acts has been issued, prohibiting the introduction of banana plants into that part of Queensland within a ten-mile radius of Rollingstone Railway Station.

Queensland Pastoral Supplies.

We have received a comprehensive illustrated catalogue from the Queensland Pastoral Supplies, Ltd., universal providers, of Brisbane. It is a very useful publication, and in it is listed and priced every possible requirement for the home, station, and farm. It also contains much practical information which increases its value as a handy reference work.

Castration of Pigs.

A comprehensive pamphlet, profusely illustrated, on this important subject has been prepared by the Instructor in Pig Raising, Mr. E. J. Shelton, and is now in the hands of the printer, and will be published shortly. No pig raiser should be without such a practical handbook. It will be issued to farmers free of charge, and early application, which should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane, is advised.

Cotton Board.

An Order in Council enabling the Cotton Board to give the necessary securities to the Commonwealth Bank, for the financing of the Cotton Board's operations during the coming season, has been approved.

The following have been appointed Members of the Cotton Board, as from the 19th February, 1927, to the 18th February, 1929:—Messrs. D. Jones, Brisbane; H. R. Brake, Don River; J. Bryant, Chowey; D. C. Pryce, Toogoolawah; F. A. Kajewski, Ma Ma Creek; and L. R. Macgregor (Director of Marketing, Brisbane).

Cane Prices Boards Appointed.

As no nominations were received for representatives on the undermentioned Local Sugar Cane Prices Boards, the following representatives have been appointed:—

Fairymead Local Board.—Canegrowers' Representatives: F. J. Wheeler and E. M. Bauer.

Mount Bauple Local Board.—Canegrowers' Representatives: P. B. Scougall and A. W. Messer.

North Eton Local Board.—Canegrowers' Representatives: Geo. Johnson and H. C. Ross. Millowners' Representatives: E. Hannan and S. H. Scougall.

Obituary.

We have to announce with sincere regret the death on the 3rd March of Frederick William Becker, a member of the Fruit Branch of the Department of Agriculture and Stock.

The late Mr. Becker, who was an Inspector under the Diseases in Plants Act, entered the Public Service on 7th December, 1922, and was appointed Inspector on 7th June, 1923, and was a promising officer. He served overseas with the Australian Imperial Force in the Great War.

The funeral took place at Toowong Cemetery on the following day, in the presence of sorrowing relatives, and private and Public Service friends, and former comrades of the A.I.F.

Reduction of Freight on Silo Moulds.

It has been a Departmental practice for some years past to provide plans, specifications, and advice without charge to farmers who desire to construct silos for fodder conservation; and, in the case of reinforced concrete structures, to loan, also without fee, moulds for silos of 14 feet, 15 feet, and 17 feet diameter, to intending builders. Through the courtesy of the Railway Commissioner the moulds have now been scheduled in a new freight class, which means that the carriage on them to country centres has been very considerably reduced.

Accountancy Methods of Fruit Agents Standardised.

Regulations have been approved under the Fruit Marketing Organisation Acts standardising the accountancy methods of agents dealing in fruit. These Regulations take effect on and after the 1st March, 1927, and provide for the keeping, by fruit agents, of growers' receipt books, railway advice notes, accounts and records, &c. Agents will be required to permit any officer of the Committee of Direction of Fruit Marketing, duly authorised by the manager of the Committee, to inspect such books, accounts, &c., as may be necessary to ascertain whether the Regulations are being complied with. A penalty not exceeding £50 is provided for any breach of the Regulations.

What Music Means.

Few would care to dispute the fact that music plays an important part in our lives, and has a vital effect on our happiness. It would indeed be a much happier world if there were more music in it. Not without reason have man's ideas about Heaven been associated vividly with visions of music and singing. Writers, poets and artists tell us in prose, poetry and pictures about "the Harps of the Angels," "the Music of the Spheres," "the Harmony of the Heavens," and other similar ideas. This is because they have recognised the vital force, inspiration, and beauty of music, and associate it closely with the ideal of perfect happiness. Paling's announce that their Player Piano is a revelation of true musical beauty, and is the finest medium for musical education and entertainment. They may be obtained on easy terms, particulars of which may be had on application to their Brisbane warehouse.

Sugar Industry Finance.

Consequent on an arrangement which the Sugar Board has made with the Colonial Sugar Refining Company, it is expected that a sum of about £1,000,000 will be made available to the Board, without payment for interest, at a date about a month earlier than last year, and thus permit the Board, in the interests of the producers, to anticipate the final returns and payments of the 1926 season.

The Acting Treasurer (Mr. J. Mullan) recently made available to the Press the following statement by the Chairman of the Sugar Board (Mr. W. J. Short) on this subject:—

"The Board has been negotiating with the Colonial Sugar Refining Company with a view to finalising the transactions of the 1926 season before the due date, which, in the ordinary course, would be July next.

"Due to the cyclonic disturbance and floods in the North, and to the drought effects in the South, an earlier settlement is much to be desired. Whilst it is a little early yet to make the determination and declaration devolving upon the Sugar Board under the proclamation acquiring the sugar, sufficient data are available to enable it to be authoritatively stated that the net oversea price will approach £15 per ton.

"The result of the Board's operations will enable a sum of £26 15s. per ton to be paid for home consumption, 94 per cent. net titre sugar, so that an average price of £24 7s. 6d., approximately, will be the return for the 1926 season.

"Recognising the desirableness of anticipating final returns and payments in view of the necessities of the industry, the Colonial Sugar Refining Company was good enough to fall in with the Board's representations, and whilst a large sum, approximating a million sterling, is required, the company has agreed to make the sum available, without payment for interest, as early as it can be arranged after the issue of the Board's declaration.

"This payment, it is anticipated, will be about a month earlier than last year, when payment was made in June. However, this notification of an additional payment, it is expected, will enable producers to make satisfactory arrangements with the trading banks for necessary accommodation."

A Banana Plant Prohibition.

A Proclamation has been issued prohibiting the introduction of banana plants from any part of Queensland on to Bribie Island.

Entomological Society of Queensland.

The report of the Council of the Entomological Society of Queensland, read at its annual meeting at the Queensland University on 16th March, showed a steadily increasing membership. Officers elected for the ensuing year are:—President, Professor E. J. Goddard, B.A., D.Sc.; vice-presidents, Dr. J. Turner, M.D., and Mr. R. Veitch, B.Sc.; secretary, Mr. J. L. Froggatt, B.Sc.; treasurer, Mr. G. H. Hardy; councillors, Messrs. H. Hacker, A. P. Dodd, and L. Franzen.

Winter Feed—Good Crops on the Downs.

Winter feed is now being harvested in many parts of the Downs, and there are some wonderful crops of millet, Sudan, and other fodders. In places these are 10 feet high. At the Farm Home for Boys, Westbrook, Superintendent Jones announces that they have been busy making ensilage, and already have 200 tons. From Clifton district a remarkable yield of panicum is reported. A resident near the town sowed 12 lb. of seed in about half an acre of land, and has now harvested eighteen bags.

WHAT A FARMER THINKS OF THE JOURNAL.

A North Coast Farmer renewing his subscription writes:—

"Permit me to express how much I feel indebted to the Journal. Each month it comes without fail laden with information direct from the man of science and the expert, and its general get-up is excellent. The farmer is well and truly catered for in the Journal, and it is ours practically for the asking."

Staff Changes and Appointments.

Mr. R. M. Wallace, of the Stock Experiment Station, Townsville, and Mr. E. R. Hollanby, of Hermit Park, Townsville, have been appointed Inspectors of Slaughter-houses, Department of Agriculture and Stock.

Mr. O. St. J. Kent, B.Sc., Assistant to Analysts in the Agricultural Chemical Laboratory, has been appointed Analyst, Agricultural Chemical Laboratory.

The following transfers of Dairy Inspectors have been approved:—L. W. D. Verney, from Bundaberg to Beenleigh; E. W. Ladewig, from Beenleigh to Murgon; F. T. Heers, from Kingaroy to Bundaberg; and Mr. D. F. Keith, Herd Tester and Inspector of Dairies, Brisbane, will be attached to Cooroy.

The resignation of Mr. Jas P. Dowling, Inspector of Stock, Towoomba, has been accepted as tendered.

Mr. George Williams, Experimentalist and Instructor in Fruit Culture, has been appointed Acting Director of Fruit Culture as from 1st April, 1927.

The appointment of Mr. L. V. Hodge as Manager of the Callide Cotton Research Farm, Biloela, has been confirmed as from the 9th August, 1926.

Mr. D. C. Pryce, of Toogoolawah, has been appointed Chairman of the Cotton Board to the 18th February, 1929.

The following have been appointed Rangers under the Animals and Birds Acts, and are attached to the Department of Agriculture and Stock with headquarters as under:—

	Headquarters.
Messrs. W. E. Black	Mackay
J. H. Dendle	Emerald
W. F. Hough	Roma
A. K. Williams	Rockhampton
W. D. Wilson	Brisbane

Close Season for Quail.

The period of close season for quail has been extended for one month as from the 31st March, 1927, to the 30th April, 1927.

Peanut Board.

An Order in Council has been approved, enabling the Peanut Board to give the necessary security required for the financial accommodation to be provided by the Commonwealth Bank.

Babinda Cane Prices Board.

The following members have been appointed to the Babinda Local Sugar Cane Prices Board:—Millowners' Representatives: Messrs. F. A. Lamont and W. J. Ryan. Canegrowers' Representatives: Messrs. S. H. Warner and D. C. James. Chairman: Mr. A. H. O'Kelly, Police Magistrate, Cairns.

Cheese Traders' Licenses.

Owing to the passing of "*The Primary Producers' Organisation and Marketing Act of* 1926," it was necessary to revise the Regulations providing for the licensing of persons trading in cheese. This has been done, but no material alterations have been made in the Regulations as passed under the Primary Products Pools Acts.

The Sydney "Bulletin" goes Farming.

The Sydney "Bulletin," known to country readers for a generation as the "Bushman's Bible," recognising the immense importance of Agriculture to the Commonwealth, has decided to extend its service to the man on the land. Its habit, as is well known, is to take the broader view of Australian life and problems, and its plan for making more articulate the man who matters most—the producer—is sure to win widespread commendation. In furtherance of this aim, it has increased its size to include an ably supplied farm and station section. The farmers of Queensland will, no doubt, welcome this improved medium of expression of much that is best in our national life and work.

Metropolitan Milk Supply.

The Acting Premier and Minister for Agriculture, Mr. W. Forgan Smith, has informed the Press that his notice has been drawn to the references made at a meeting of the City Council to the matter of the metropolitan milk supply.

"In connection with this matter," said Mr. Smith, "it will be remembered that a deputation from the City Council waited upon me as Minister for Agriculture in March of last year and, *inter alia*, requested that the control of the milk supply within the Greater Brisbane area should be handed over to the Greater Brisbane Council. I agreed to the necessary powers being vested in the City Council, but could not, as wished by the Council, give it authority to exercise powers over dairies outside its area, because to do so would interfere with the rights of the local authorities in those places.

"I appreciate clearly the importance of citizens being supplied with adequate supplies of pure milk, and serious efforts have been exercised by officers of my Department to ensure that the milk consumers are being supplied with the wholesome product. It is the function of the health authorities to submit samples of the milk to such tests and examinations for purity as are considered necessary, and the reports from the Commissioner of Public Health indicate that close attention is being given to this matter, and that considerable improvement in the quality of the milk has been effected. The matter of tuberculosis of the bovine type being conveyed to humans through the medium of the milk supply has been referred to from time to time, but from the evidence available it is difficult to determine whether the milk supplied in Brisbane is a potential medium of conveyance of this particular disease. However, the cows from which milk is drawn are subject to careful inspection, and the whole matter of whether or not the tuberculin test should be applied to animals from which milk is drawn for human consumption is under consideration. In conclusion, I may say that since the deputation in March, 1926, to which I have already referred, no definite intimation has been received by me from the Greater Brisbane Council that they wish to assume the responsibility and expense of the direct control of the milk produced and distributed within the metropolitan area. Consequently, I am somewhat surprised to notice that an alderman is reported as having stated that it was not true that the Government was prepared to give up its powers in connection with milk supervision in the Brisbane area."

Organisation and Marketing—New Regulation.

A further Regulation under the Primary Producers' Organisation and Marketing Act has been approved providing that all containers of seed cotton shall be branded by the grower prior to despatch to the Cotton Board, with initials and surname in full of the grower, the name of the station from which the cotton is consigned, and the registered number of the grower as supplied to him by the Queensland Cotton Board, in letters not less than one and a-half inches in height. Growers must apply to the Queensland Cotton Board for their registered numbers.

The Marketing of Immature Oranges.

The Acting Premier and Minister for Agriculture and Stock, Mr. W. Forgan Smith, informed the Press recently that Inspectors of his Department had brought under his notice the matter of immature oranges that were being sent on to the market. Samples of these oranges had been analysed and had been found to contain up to 2½ per cent. of citric acid. As the maximum amount of citric acid allowable in an orange under the Fruit Cases Act is only 1½ per cent., it will be seen that many of the oranges now coming forward are really palpably immature. The persons who are sending these oranges forward are rendering themselves liable to prosecution, and the Minister wishes it to be known that if the law in this respect is further transgressed in the future legal proceedings will be instituted.

Our Right to Responsibility.

Thus Principal L. P. Jacks in the New Zealand "Dominion":—"The ideal social system is sometimes represented to us as though it would automatically relieve the citizen of the burden of his responsibilities. The citizen has only, it is suggested, to put his vote in the ballot-box as he would put a penny in the slot, and the ideal social system will do the rest. We sometimes delude ourselves by thinking that that is just the sort of system that will suit us. In reality there is none of us who could endure it for a day, because it would deprive us of our right to responsibility, which is the last thing a free man could ever surrender. Surely it is nearer the mark to say that the good social system is one which will increase the responsibility reposed in the citizens and not the one wihch deprives them of responsibility by treating them as if they are all regimented units in a mass."

Arrowroot Board.

The following nominations have been received at the Department of Agriculture and Stock for the election of five growers' representatives on the Arrowroot Board:—

Alexander Clark, Pimpama.
Hans Grantz, junr., Norwell.
Alexander McGregor Henderson, Redland Bay.
John William Latimer, Norwell.
William Frank Oxenford, Oxenford.
Benjamin George Peachey, Ormeau.
Wilhelm August Schipplock, Norwell.
Robert Stewart, Ormeau.
Johann Friedrich Wilhelm Sultmann, Pimpama Island.

The election will take place on the 14th April next, and the successful candidates thereat will hold office for a term of one year.

Royal Society of Queensland—Council's Report.

Sixteen original papers were read and discussed before the society and published in the course of the year. One meeting of a popular character was held. On this occasion Mr. E. Ballard, B.A., delivered a lecture on "A Journey up the Markham Valley, New Guinea."

The council wishes to acknowledge generous subsidies amounting to £205 from the Queensland Government towards the cost of printing the Proceedings of the Society. Appreciative acknowledgment is also expressed to the University of Queensland for housing the library and providing accommodation for meetings.

The membership roll consists of seven corresponding members, six life members, 155 ordinary members, and six associates. During the year eight new members and one associate were elected. One corresponding member and two life members died.

The deaths of the Honourable A. J. Thynne (a trustee), Mr. Chas. Hedley (corresponding member), Mr. R. H. Roe (life member), and Mr. W. Weedon (life member) are reported with regret.

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. 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, SOUTHERN AND CENTRAL 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 become 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.

Farm and Garden 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.

Cleveland, 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.

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, snowflakes, 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.

DEPARTMENT OF AGRICULTURE AND STOCK, QUEENSLAND.

PRICE LIST OF STUD BERKSHIRE PIGS FOR SALE
at
STATE FARM, WARREN, via ROCKHAMPTON, CENTRAL QUEENSLAND.

The undermentioned animals are available at Prices Quoted for the Current Month only:—

LIST No. 1 FOR MONTH OF APRIL, 1927.

Farm No.	Description.	Sire.	Dam.	Date Farrowed.	Price. £ s. d.	Remarks.
1269	Berk Sow	Warren Monarch	W. Sadie	2-11-26	4 4 0	
1274	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1275	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1276	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1277	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1281	Berk Boar	Warren Baritone	W. Pansy	17-11-26	4 4 0	
1282	Berk Boar	Warren Baritone	W. Pansy	17-11-26	4 4 0	
1213	Berk Boar	Warren Premier	W. Bliss	26-8-26	5 5 0	
1205	Berk Sow	Warren Premier	W. Perfection	27-8-26	5 5 0	
1206	Berk Sow	Warren Premier	W. Perfection	27-8-26	5 5 0	
1194	Berk Sow	Warren Monarch	W. Elsie	10-8-26	6 6 0	
1163	Berk Sow	Wilmot Ron	W. Pansy	6-5-26	7 7 0	
1120	Berk Boar	Warren Baritone	W. Buxom	20-3-26	7 7 0	

The above quotations are for pigs crated on rails Warren Station.

When placing orders full forwarding instructions should be furnished, together with Remittance, with Exchange added.

Further particulars may be obtained upon application to the Manager, State Farm, Warren, *via* Rockhampton.

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.

1927.	March.		April.		Moonrise. March.	Moonrise. April.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.46	6.24	6.3	a.m. 5.50	2.25	a.m. 4.33
2	5.47	6.23	6.4	5.49	3.32	5.41
3	5.48	6.22	6.4	5.48	4.41	6.48
4	5.48	6.21	6.5	5.47	5.49	7.55
5	5.49	6.20	6.6	5.45	6·57	9.1
6	5.49	6.19	6.6	5.44	8.4	10.7
7	5.50	6.17	6.7	5.43	9.10	11.11
8	5.50	6.16	6.7	5.42	10.16	p.m. 12.8
9	5.51	6.15	6.8	5.41	11.18	1 3
10	5.51	6.14	6.8	5.40	p.m. 12.21	1.52
11	5.52	6.13	6.9	5.39	1.21	2.36
12	5.52	6.12	6.9	5.38	2.16	3.14
13	5.53	6.11	6.10	5.37	3.7	3.48
14	5.54	6.10	6.10	5.36	3.54	4.21
15	5.55	6.9	6.11	5.35	4.34	4.50
16	5.55	6.7	6.11	5.34	5.12	5.21
17	5.56	6.6	6.12	5.33	5.46	5.51
18	5.57	6.5	6.12	5.32	6.17	6.23
19	5.57	6.4	6.13	5.31	6.54	6.58
20	5.58	6.3	6.13	5.30	7.18	7.37
21	5.58	6.2	6.14	5.29	7.50	8.19
22	5.59	6.0	6.14	5.28	8.23	9.9
23	5.59	5.59	6.15	5.27	9.1	10.2
24	6.0	5.58	6.15	5.26	9.38	11.0
25	6.0	5.57	6.16	5.25	10.22	...
26	6.1	5.56	6.16	5.24	11.14	a.m. 12.3
27	6.1	5.55	6.17	5.23	...	1.8
28	6.2	5.53	6.17	5·22	a.m. 12.10	2.12
29	6.2	5.52	6.18	5.22	1.10	3.18
30	6.3	5.51	6.18	5.21	2.17	4 24
31	6.3	5.50	...	...	3.25	...

Phases o the Moon, Occultations, &c.

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

2	April	New Moon	2 24 p.m.
9	,,	☾ First Quarter	10 20 p.m.
17	,,	○ Full Moon	1 0 p.m.
25	,,	☽ Last Quarter	8 20 a.m.

Venus will be in conjunction with the Moon on the 4th, affording an interesting spectacle low down in the west half-an-hour after sunset.

Mercury will be at its greatest elongation west on the 10th of April.

The occultation of Saturn by the Moon, which will occur before 10 p.m. on the 20th, when both are well situated somewhat north of east, should afford an especially fine spectacle to all observers with or without binoculars.

Mercury will rise one hour fifty-six minutes before the Sun on 1st April, and two hours two minutes before on the 15th.

Venus will set one hour thirty-two minutes after the Sun on the 1st, and set one hour forty-six minutes after it on the 15th.

Mars will set three hours fifty-four minutes after the Sun on 1st April, and three hours fifty-one minutes after it on the 15th.

Jupiter will rise one hour forty-seven minutes before the Sun on the 1st April, and two hours thirty-five minutes before it on the 15th.

Saturn will rise three hours three minutes after sunset on 1st April, and two hours twenty-four minutes after it on the 15th.

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.

Anzac Day, 25th April, was commemorated reverently and with rare inspirational intensity in every State capital and in every town and hamlet in the Commonwealth. As the years go on around the name of Anzac and around the name of the A.I.F. there is gathering a great tradition. The service and the sacrifice of the men, who during the years of dreadful crisis offered their gift of clean, vigorous life and happy youth on the altar of human liberty, will continue for all time as an inspiration to young Australians. Of the lessons of their sacrifice we were reminded simply, yet eloquently, by the Duke of York in this message to the Australian people:—

> It is a very great privilege to take part in to-day's ceremony to celebrate the landing in Gallipoli, twelve years ago, of the Australian and New Zealand Army Corps, which has made for ever famous the name of "Anzac."
>
> That great feat of arms, and the heroic deeds of all who shared in it, will be remembered so long as the Empire lasts. They gave their all for King and Empire, and their sacrifice will remain for ever a shining example of what human will and endurance can accomplish.
>
> A memorial to those whom we commemorate to-day has been raised on Gallipoli soil, for ever sacred to British hearts, but the best and worthiest memorial we can offer them is to seek inspiration from their example, to endeavour to learn the lessons they teach—of courage, patience, and self-sacrifice—and consecrate ourselves afresh to those great purposes for which they gave their lives.
>
> Therefore, I would beg of you to regard this day, not so much as one of mourning for the dead, but as one of earnest resolve on the part of us, the living, to emulate their example.
>
> Let it be our endeavour to live more worthily of those who made the last great sacrifice for us, and to do the utmost that lies in our power to maintain and hand down to the children who come after us those traditions of loyalty, fortitude, and devotion to duty which animated those gallant men, and on the preservation of which the whole welfare and security of the Empire depends.

Faculty of Agriculture.

One of the more important of recent events was the establishment of a Chair of Agriculture within the University of Queensland. Work has already commenced and students enrolled. Mr. J. K. Murray, Principal of the Gatton Agricultural High School and College is the first professor. He will combine the duties of the Faculty with those of his post at the College. The students will take in their first year course subjects similar to those required in the first year of the Science course, in addition to elementary work in engineering, drawing, and designing. Practical work will be done at the College at Gatton.

Fine Public Spirit.

The Queensland Chamber of Agricultural Societies has decided to grant a scholarship to students who take up successfully an agricultural or veterinary course at the Queensland University. The sugar producers have made a similar grant. The Acting Premier, Mr. Forgan Smith, has commended warmly these practical expressions of lofty public spirit. They are examples, he said, that might well be followed by other public bodies.

The Duke of York and the University—The Importance of Education.

On the occasion of his receiving the degree of a doctorate of laws from the Vice-Chancellor of the University of Queensland, Dr. W. N. Robertson, the Duke of York said:—

> I thank you sincerely for the address with which you have just presented me, and the sentiments of loyalty which it contains, and I shall not fail to communicate them to His Majesty the King. I feel that I really should be addressing you in Latin on this occasion, but were I to attempt to do so I doubt if I should be intelligible to anyone.
>
> Although a University man myself, I must confess to having devoted my time to the study of economics rather than the classics, and so I will use my native language to express my deep gratitude for the very high honour you have paid me this afternoon in conferring a degree upon me.
>
> In these days, the importance of a good education is being increasingly realised throughout the world. It is the aim of modern parents to equip their children with sound knowledge and learning in order to fit them for the battle of life, and excellent as the training at school may be, my own opinion—and I speak from my own all-too-short experience—is that the boys and girls who are able to complete their education with a University career have gained an inestimable advantage which they will value more and more as time goes on.
>
> The Universities have an enormous responsibility. Not only are they training the minds, but they are also moulding the characters of a great portion of the nation's youth during the years when the younger generation is most susceptible to outside influences. It is upon that generation that the future prosperity and greatness of a country must depend, so it is no exaggeration to say that to a very large extent the destiny of Australia rests with her Universities.
>
> I have heard much of what you have done and what you are doing here. I know you are alive to your responsibilities, and that is why I deem it a very signal honour to have been made a member of the University of Queensland. I tender you once more my heartfelt thanks, and pray that your splendid work may reap the rich reward it deserves.

Education's Open Door in Queensland.

In the course of a notable address at the annual commemoration ceremonies of the Queensland University, the Chancellor, Hon. J. W. Blair (Chief Justice), had this to say of the educational opportunities for the young Queenslander:—"In those years the State scholarship system was placed on a qualifying basis, thus opening the doors to all young Queenslanders seeking higher instruction. Among other reforms the present system of extension scholarships leading to the Senior Public Examination was initiated. The present rural school scheme was another development of this period, which has since made satisfactory progress. For this advance, to Mr. J. D. Story and the staff of the Education Department Queenslanders will ever owe a deep debt of gratitude. . . . The influence of the University, however, does not end in Brisbane, in Queensland, or even in Australia. The problems of to-day are complex and manifold—some of them so difficult of solution as to call for the best brains, not only of the old land, but of the dominions beyond the seas.

"It is becoming more and more evident that to an increasingly large extent many vexed questions of the English-speaking races will be bound up with those of the South Pacific. The strategic positions occupied by Australia and New Zealand will make it necessary for the people of the Commonwealth and the Dominion to play a leading part in their solution. The handling of these matters cannot be left to chance; we must have highly trained and competent men to assist in their unravelling. For the training of such men the universities must, in a large measure, be responsible.

"Someone once said that for anyone with a capacity for knowledge to die ignorant is a tragedy. Is there any necessity for such a happening in Queensland? Here we have a co-ordination of educational institutions which enables the son or daughter of any citizen to attain to the highest position in the land, irrespective of wealth, creed, or social distinction. And here one might scotch the erroneous impression that a university is established solely to advantage the youth of the affluent. Such a view is not only unworthy but entirely without foundation. Rather is it a university's function to make discriminating search for talent and genius—in whatever walk of life they may exist—with the object of developing such gifts when discovered and thus transforming the possessors thereof into valuable national assets. And this search for and development of talent must proceed upon right lines in order to secure the best results. For to-day we have to admit, colloquially speaking, that there are many round pegs in square holes. It seems to be only the fortunate few who find work that is congenial. To many their daily occupation is burdensome or distasteful. Enormous loss to the State and disappointed lives result. All this surely can be avoided. Education is, after all, the leading forth or bringing up of the individual—the cultivating, guiding, developing, and disciplining of his or her powers, mental, moral, or physical, in order to prepare him or her for complete living."

Canberra.

May in Australia is a month of historic memories. Of the great events of the past one of the most important was the official founding of our federation and the opening of the National Parliament on 9th May, 1901. Just twenty-six years after, to the day, the coping stone is now being placed on the national edifice at Canberra, Australia's capital city. The first Commonwealth Parliament was opened by a Duke of York, the present King, and, fitly, another Duke of York, his son, will open the new Parliament House, a concrete symbol of the nation's unity, in Federal territory, again on the 9th of May. A Queensland poet, Brunton Stephens, with true prophetic vision, saw this day flashing its glory across the sun-flooded vista of Australia's future fifty years ago, and sung his song of golden prophecy, a forecast now fulfilled. In the twenty-six years of Australia's nationhood we have accomplished much and have endured much. We have witnessed the world changes of the most momentous quarter of a century of human history. In other lands we have seen the rise and fall of dynasties, and we have seen the welding of the British Commonwealth in common sacrifice and suffering. In our own land we have made remarkable progress. From east to west, from coast to coast, our widely separated communities have been linked by rail. Another transcontinental line from north to south is under construction, and in every State we have made immense material advances along every avenue of effort. In the years between, with the Motherland, we have had to fight for our liberty and national integrity. In the greatest test and contest of time Australian citizens gave proof of their courage and character at home and abroad. To those privileged to see and be with the men of the Australian Imperial Force, the world's only volunteer army, not on the outgoing transports with eyes alight with the spirit of adventure and eager service, not on the homecoming boats with eyes dimmed with poignant memories, but in the field in action could have nothing but faith in Australia's future. For the real capital of a country is the character of its people. That character was demonstrated on the ridges and in the gullies of Gallipoli, and was made further manifest on the heights of Pozieres, at Bullecourt, Messines, Paschendaele, and in Polygon Wood; and, during the last hundred days of fighting, from Hamel on to Mont St. Quentin and beyond, when Australian nationhood "forged on Thor's own anvil, and plunged in baths of hissing tears, grew tensile as steel." And so, when we reckon up our progress and assess the value of our harvests from the founding of our federation to the day when we arrive at complete national consciousness in the capital of the Commonwealth, the truth shines out, in all its bright significance, that, after all, Australia's greatest product is Men. In peace and war Australian manhood has been measured by world standards and has survived the test with honour. In the factors that count in human greatness, factors governed by character and competency, Australians have not suffered in comparison with other peoples. To-day, rising to the full height of their nationhood, conscious of their unity as symbolised at Canberra, inspired by the traditions of their race and the faith of their fathers, they step boldly out towards their national destiny.

PLATE 91—THEIR ROYAL HIGHNESSES THE DUKE AND DUCHESS OF YORK.

THE ROYAL VISIT.

THE DUKE AND DUCHESS OF YORK WELCOMED TO QUEENSLAND.

TRIUMPHAL PROGRESS FROM THE BORDER TO THE CAPITAL—REMARKABLE DEMONSTRATIONS OF LOYAL ENTHUSIASM—TRIBUTES OF TRUE ALLEGIANCE AND WARM AFFECTION.

For a week of brilliant sunshine, days complete with all the glory of Queensland's wonderful autumn climate, their Royal Highnesses the Duke and Duchess of York were the honoured guests of the Government and the people of the State. Their stay with us, from 5th to 12th April, was marked by daily demonstrations of a spirit of true loyalty, unspoilt in its spontaneous expression in the natural, cheerful Australian way. Their journey from Wallangarra to Brisbane, across the Darling Downs, one of the most fertile provinces in the British Dominions, was a triumphal progress. After the bountiful rains of summer the country looked its best. Their Royal Highnesses were accompanied by General the Earl of Cavan, the Countess of Cavan, the Hon. Mrs. John Little-Gilmour, Lieutenant-Commander C. Buist, R.N., Major T. E. G. Nugent, M.C., Surgeon-Commander White, M.V.O., Mr. H. F. Batterbee, C.M.G., C.V.O., Mr. P. K. Hodgson, C.M.G., O.B.E., Major-General Sir C. B. B. White (Commonwealth Director), and Senator Sir T. W. Glasgow.

At the Border they were met by the Acting Premier, Hon. W. Forgan Smith, who did not deliver a long oration. He chose, rather, to sacrifice formality for the more intimate touch of an extempore speech, expressive of the simple pleasure of Queenslanders in greeting the son of their Sovereign. "To your Royal Highnesses," he said, "I extend, on behalf of the Government and people of this, the Queen State of the Commonwealth, a most cordial welcome. I trust that your stay will be a pleasant one, and that you will carry away happy recollections of Queensland and its people."

At every town and wayside station country people, including many Great War veterans of the A.I.F., gathered to join in the welcome. The people at each centre, in their fine physique, frankness and freedom, and obvious prosperity, symbolised the finest attributes of Australian citizenship.

In Brisbane, on the following day, every section of the citizens joined in a demonstration of loyal enthusiasm, which was remarkable for its spontaneity and happy naturalness. The flag-adorned streets in the processional route were lined with dense, good-humoured, well-dressed, cheering crowds. At night the city throbbed with life in a blaze of light and colour.

THE STATE RECEPTION.

ACTING PREMIER'S ADDRESS.

At the State reception to the Duke and Duchess of York on the evening of the 8th, the Acting Premier read the following address of welcome:—

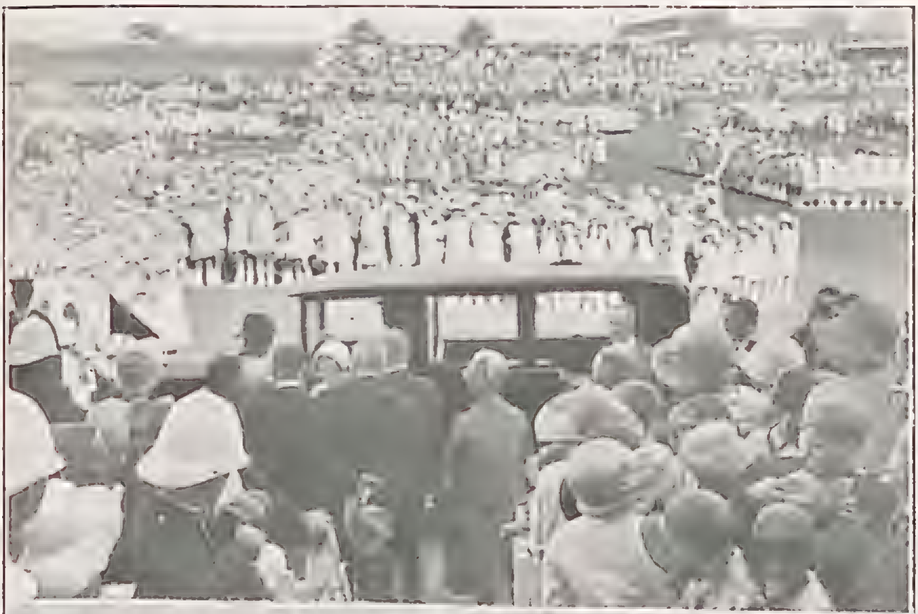
> May it please your Royal Highnesses:
>
> On behalf of the Government and people of Queensland I desire to convey to your Royal Highnesses a most cordial welcome to this State, and to express our grateful appreciation of your visit.
>
> It is a matter of considerable regret to the people of Queensland that, owing to the great distances over which you are called upon to travel, your Royal Highnesses will not have an opportunity of visiting the more remote parts of this vast State, especially the northern and western portions, where the residents are, in the face of many pioneering difficulties, developing in a truly wonderful manner our many and varied natural resources.

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 92.—ROYAL GROUP AT GOVERNMENT HOUSE, BRISBANE.

Seated (left to right).—THE COUNTESS OF CAVAN, MRS. FORGAN SMITH, THE DUCHESS OF YORK, MRS. W. LENNON, THE HON. MRS. J. LITTLE-GILMOUR.

Standing (left to right).—MR. H. F. BATTERBEE, C.M.G., C.V.O.; LT. COMMANDER BUIST, R.N.; MR. FORGAN SMITH, ACTING PREMIER; THE DUKE OF YORK; MR. W. LENNON, LIEUTENANT GOVERNOR; GENERAL THE EARL OF CAVAN, K.P., G.C.B., G.C.M.G., G.C.V.O.; MR. P. K. HODGSON, C.M.G., O.B.E.; MAJOR T. E. G. NUGENT, M.C.



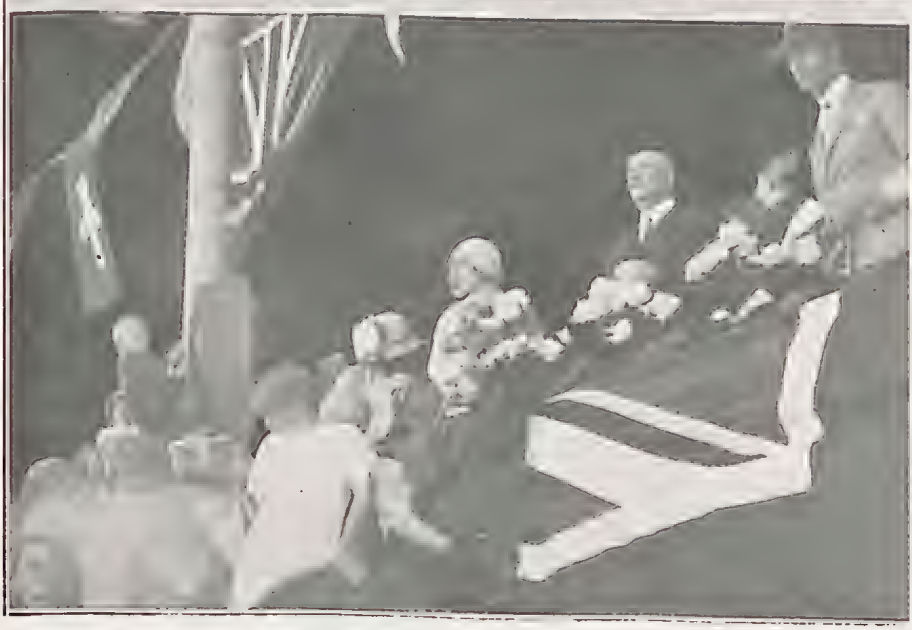


Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 93.

Top.—THE ROYAL VISITORS ARRIVING AT THE CHILDREN'S DISPLAY, EXHIBITION GROUND, BRISBANE, FRIDAY, 8TH APRIL.

Officials for the day being presented by the Acting Premier (Mr. W. Forgan Smith). Grouped in the background are representatives of Australia's greatest asset—her bonny children.

Bottom.—THE ROYAL VISITORS, ATTENDED BY THE MINISTER FOR PUBLIC INSTRUCTION (MR. THOMAS WILSON—CENTRE) AND MRS. WILSON, VIEWING THE CHILDREN'S DISPLAY.

We have pleasant recollections of the earlier visit to Queensland of your kinsman, His Royal Highness, the Prince of Wales, and we trust that your sojourn amongst us, also, will leave feelings of mutual understanding and a keener appreciation of the close ties of relationship. We trust that you will, on your return to the Motherland, be graciously pleased to convey to His Majesty the King an expression of the true allegiance and warm affection which the people of this State bear to His Majesty.

Earnestly wishing your Royal Highnesses the fullest measure of health, peace, and happiness in the future, and a safe return home after your long and somewhat exacting tour of the British Dominions, I have the honour to subscribe myself.

Your most dutiful and faithful servant,

W. FORGAN SMITH,
Acting Premier.

8th April, 1927.

THE DUKE'S NOTABLE SPEECH.

"STATE BEFORE SELF."

In reply, the Duke of York said:—

On behalf of the Duchess and myself, I thank you sincerely for your Address, and for the cordial words with which, on behalf of the Government and people of Queensland, you have welcomed us to this great State. I shall take an early opportunity of conveying to the King, my father, that message of loyalty and warm affection which the Address contains.

To us, also, it is a matter of deep regret that in the limited time at our disposal we shall not be able to see for ourselves the more remote portions of the State, especially those northern and western districts where, as your Address recalls, the residents are, in the face of many pioneering difficulties, developing in a truly wonderful manner many of the natural resources. Though we cannot visit these portions of Queensland for ourselves, we wish to learn all that we can of the manner in which those vast distances of the West and the tropical regions of the North are being developed.

I congratulate you on the public spirit which distinguishes your citizens. It is right that you should be proud of your State; it is right that you should desire to make it the greatest State of the Commonwealth. And you can only show that pride, and realise that desire, by one and all working and toiling for it. "State before Self" is a motto that all who love their country should everywhere set before them.

We are glad to have this opportunity of meeting and talking to you. No one can travel as we have without being impressed with the vast distances which separate the various portions of the British Empire. The day may come, or rather we may say, is coming, when we shall be able to speak to one another freely across those vast distances of ocean, and when the King's own voice may be heard speaking to his subjects in all British lands. In the meantime, the best way of bridging the distances that divide us and drawing together closer the bonds of kinship, understanding, and sympathy which bind us together, is by visits to one another such as this.

The message I would bring to you is this: Let us try to learn from one another, to know one another better, to see how best we can help one another in our various troubles. It is the desire of all of us to produce the best conditions possible for all the country's workers, and it is of special interest to us in the Old Country to see how the younger nations overseas are tackling those social problems which are common to us all. In these questions and their solution I am keenly interested, and it is my desire to learn all that I can about them during my stay.

We all have our difficulties, and when we see the courage and enthusiasm with which the pioneers in this State and elsewhere in Australia have triumphed over the troubles which beset them, it is an inspiration to us at home to meet the troubles, different in kind, but equally urgent, which now beset us, in the same spirit of dogged British perseverance. The Old Country is not done yet, and in spite of all the dark clouds which now fill the sky, I am confident that there is in store a new period of prosperity which I pray may be shared by all the members of the British Commonwealth.

Once again we desire to express our gratitude for the generosity, the warmth, and the real affection with which we have everywhere been received on this our mission. We can never adequately thank you, but we shall remember it as long as we live.

From the day that our Royal visitors crossed the Border at Wallangarra until they returned to New South Wales through Coolangatta, they established a relationship with the people that was as natural and friendly as that which exists in any happy household. Their appearance in public was always a signal for cordial cheers that expressed the general popular goodwill towards the Royal family. There was not an occasion graced by the presence of the Duke and Duchess at which there was not a record crowd. On their journey across the Downs to Brisbane and from Brisbane to the Tweed, the Royal visitors saw not only some of the finest agricultural land in Australia, but also some representative pastoral holdings. At Beaudesert and Tamrookum they got glimpses of station life in our cattle lands as well. Nobody in a week could have seen more of Queensland than our Royal visitors did, though their comings and goings were confined to a comparatively very small portion of the South-eastern corner of the State, and certainly no one could have manifested greater interest in what was actually seen. Absence of official restraint and their informal mingling among the people added, if that were possible, to the immense popularity of the distinguished visitors.

On the eve of their departure from Queensland, the Duke of York, on behalf of the Duchess and himself, sent the following farewell message to the Lieutenant-Governor (Hon. W. Lennon):—

On leaving Queensland, after our all-too-short visit, I desire, on behalf of the Duchess and myself, to convey to you and to the Government and people of Queensland our most heartfelt thanks for the overwhelming kindness and generosity with which we have everywhere been received throughout our stay in this beautiful State.

The Duchess and I are most sincerely grateful to you personally and to Mrs. Lennon for your great hospitality and especially for placing Government House at out disposal. We are also under an obligation to you for the most enjoyable ball on Thursday evening. We would ask you to convey to Mr. Forgan Smith and his fellow Ministers our gratitude for the State reception which they gave for us, and all the many kindnesses we have received from them during our visit.

We are especially glad to have had an opportunity of seeing something of the industries of Queensland and also of Australian bush life and ways. Our only regret is that we had not longer to visit the more northern and western portions of the State.

It has given us much pleasure to see so many of your younger generation. We shall particularly remember the gathering at the Exhibition grounds, and the children's healthy and happy faces will remain one of the pleasantest memories of our visit.

All our lives we shall remember the enthusiasm and generosity of our reception in Queensland, and we wish the State and its people all possible prosperity and success in the future.

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 94.—THE DUKE AND DUCHESS MEET THE COUNTRY PEOPLE AT THE BEAUDESERT SHOW, 9TH APRIL, 1927.

Photo. by H. W. Mobsby, F.R.G.S., Official Photographer.]

PLATE 95.

Top.—THE ROYAL VISITORS WATCHING CAMP DRAFTING, BEAUDESERT SHOW, 9TH APRIL.

The Judge of the Competition, Mr. S. Harding, explaining an interesting phase of life in the Queensland Cattle Country.

Bottom.—THE DUKE AND DUCHESS KEENLY INTERESTED IN RING EVENTS, WHICH ARE BEING EXPLAINED BY MR. E. T. BELL, M.L.A. MR. J. W. BLEAKLEY, CHIEF PROTECTOR OF ABORIGINES, IS ON THE LEFT.

Bureau of Sugar Experiment Stations.

FIJI DISEASE IN THE MARYBOROUGH DISTRICT.

By E. J. FERGUSON WOOD.

Extent.

See Map.

The disease is known to exist in the following areas in the county of March:—

(*a*) Walker's Point.—The finding of the disease here endangers the Island Plantation, and farmers in this latter area should be on the watch for the disease. The outbreak, however, is slight, and digging out of the infected stools as soon as infection is noted is the method recommended here. Make frequent inspections of your fields.

(*b*) Mungar Junction.—Another slight infection was noted here on one farm supplying Bauple mill. Efficient digging out of the infected stools will check the spread here.

(*c*) Welcome Creek, opposite Mungar.—A stool was found here, and the above recommendations apply here also.

(*d*) The Five-Mile, near Melrose.—Two stools were found here.

In all these occurrences the stools were in ratoon cane, which indicates secondary infection during growth.

(*e*) The main area.—Between the boundaries, from below Point Lookout along both banks of the Mary River to Lamington Bridge, and above the bridge on the northern side to a point beyond Croydon Junction. From Bidwell School along both banks of Tinana Creek to its junction with the Mary River. Several farms in this area are not at present infected, but must be regarded as in the infected area.

Suspected areas include:—

(1) Those farms within three-quarters of a mile of infected farms. This is an arbitrary distance;

(2) Those farms which are growing plants taken from infected farms.

The river is no barrier for Fiji disease infection.

No plants must on any account be taken from infected farms.

Causes.

The cause of the disease is at present a matter of conjecture.

Transmission.

The disease is transmitted:—

(*a*) In cuttings.—A heavy penalty will be incurred by anyone exchanging, buying, or selling plants from farms in the infected area without written permission of an inspector. Every cutting of a diseased stool, whether the latter appears diseased or not, will give rise to a diseased stool. Infection may not show up in a stool for months after it has taken place.

(*b*) By insects.—This method is thought to be a factor, and it is hoped to carry out some experiments aiming at proving this. Aphids (Aphis sp.) have been found on diseased plants in abundance, and the cane-leaf hopper, *Per insiella sacchari*, is regarded as a possible vector.

(*c*) Experiments go to prove that infection is not carried in the soil.

(*d*) Not on cane knives as far as is known.

Rate of Spreading and Losses.

The following observations will give a general idea of the rate of spreading:—

(*a*) In a field of M. 1900 S., 2nd ratoon, 1926, about one-eighth of an acre in extent, only a few stools are making growth, and it is doubtful if any will reach maturity. Some stools did not ratoon; others are stunted, and nearly all are infected. In December last the 1st ratoon crop was reported 2 per cent. infected. The field was planted from an infected field without seed selection. (Figs. 1 and 2.)

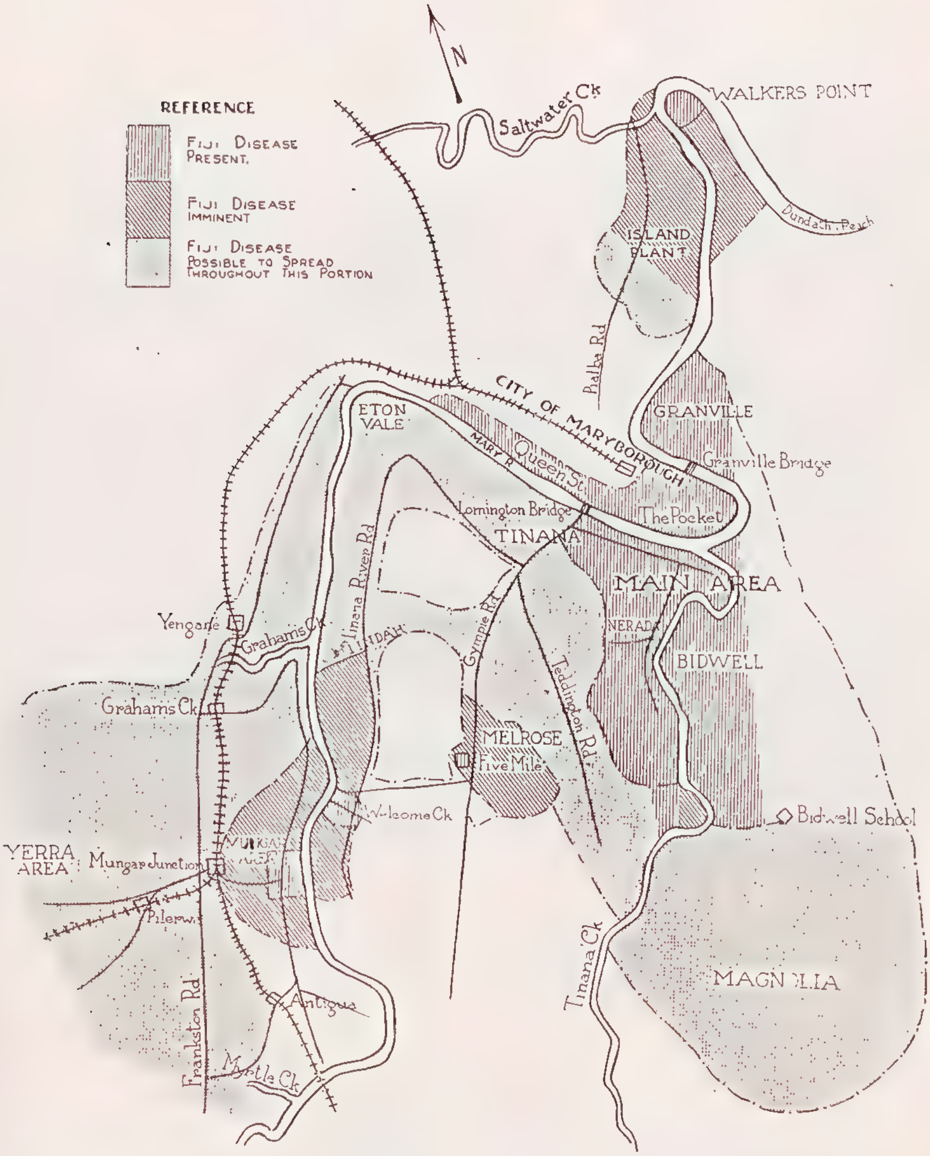


PLATE 96.—SKETCH MAP SHOWING THE INCIDENCE OF FIJI DISEASE IN THE MARYBOROUGH DISTRICT.

(b) A farm in Maryborough was visited in December last, and no disease was showing. Inspection at the end of January showed 1 per cent. infection in every field. The disease may have been latent in December.

In Fiji whole crops were destroyed by the disease, especially ratoons.

The disease is regarded by the Bureau as one of the most serious diseases of cane in Queensland. It is confined to the Beenleigh and Maryborough districts in Queensland, so far as is at present known. Therefore every step must be taken to prevent its spread.

PLATE 97 (Fig. 1).—FIELD OF M. 1900 S., 95 PER CENT. INFECTED WITH FIJI DISEASE.

Behind is Petite Senneville the same age. It can be seen by comparing the heights of the varieties that nearly all the M. 1900 S. is stunted due to the disease. Photo. taken at Maryborough by E. J. Ferguson Wood.

Effect on Plant.

(a) *Leaves.* (Figs. 3 and 4.)

(1) The leaves are as broad as usual, but about half their usual length;

(2) They are darker green than usual;

(3) They are twisted and deformed;

(4) They have small lumps or galls on the lower surface, running along the leaf from 1/32 to 1/16 of an inch in diameter by ⅛ to 1½ inches in length. They are light green or brown in colour.

(5) The leaves are bunched, and cabbage-like or fan-like. In the early stages the leaf galls are the only symptom, and these should be carefully looked for on plants surrounding obviously infected stools.

(*b*) *The Stool.*

(1) If infection is primary., *i.e.*, in the seed cane, the stool is rarely more than 18 inches in height.

(2) If infection is secondary, *i.e.*, due to infection of growing healthy plants by insect means, the stool usually ceases to grow, and shows leaf symptoms.

(3) Ratoons will, as a rule, either not come away or be stunted, as in the case of primary infection. Usually no cane is formed.

Galls similar to those in the leaves can be seen in the stem if closely looked for.

PLATE 98 (Fig. 2)—THREE ROWS OF DISEASED M. 1900 S. FROM THE SAME FIELD AS NO. 1.

The comparatively healthy field is Petite Senneville. In comparing the resistance of the varieties it must be remembered that the M. 1900 S. seed is from diseased and the Petite Senneville from healthy seed. (E. J. F. Wood, photo.).

Regulations.

(1) Under the Diseases in Plants Act, no cane sets can be removed from any plantation to any other plantation. Anyone within the county of March who removes cane from a truck or vehicle conveying mill cane from another farm in order to use it as seed is liable to a heavy penalty under this Act.

(2) An inspector may, if he deems it necessary, compel any farmer to destroy diseased plants. This power enables the Department to protect the good farmer from the careless one. It should not be necessary, for clean farms are in the interest of both the individual and the community. Fiji disease can easily be fought if every man does his bit, and helps—

(*a*) Himself, by cleaning up his own farm;

(*b*) His neighbour, by urging him or lending a hand.

A diseased stool next door is as bad as twenty on your own farm, but you cannot ask your neighbour to clean up his place till you have done yours.

Control Measures Suggested for the Infected Farm.

1. Inform the Bureau of the infection if it is not already known. You may save yourself and your neighbours.

2. In cases of fields less than 5 per cent. infected, dig out all infected stools and keep this up at least once a month till the disease disappears. If all the farmers co-operate in this, the disease will soon vanish. One man can spoil a whole district by failing in this. A diseased stool is a constant source of infection.

3. Never plant from a diseased field, or, if possible, from a field adjacent thereto. Rather get the plants, with the permission of the Bureau, from a clean farm. Facilities for this are present in Maryborough, for Pialba is apparently clean, and

PLATE 99 (Fig. 3).—FIJI DISEASE IN D.1135. TWO STUNTED STOOLS IN A RATOON FIELD.

A large gall can be seen on the leaf in the extreme left foreground. Photo. taken at Beenleigh by E. J. F. Wood.

plants from a different type of soil are considered to be beneficial. Mr. Murray, care of Experiment Station, Bundaberg, will advise you in this matter.

4. Resistant varieties.—From the data at our disposal we conclude that certain varieties are more resistant than others to the disease.

D. 1135 and M. 1900 S. are the most susceptible. Those of which we have hopes as resistant varieties are Q. 813, H.Q. 285, and Petite Senneville. No definite conclusions can be drawn as yet, but in the meantime we strongly urge the planting of Q. 813, and suggest the trial of H.Q. 285 and Petite Senneville.

Q. 813 may be seen at Beenleigh growing healthily alongside infected D. 1135, which is showing secondary infection. Owing to this cane's marked resistance to other diseases, it is expected that its resistance to Fiji disease will prove good. Apart from this, it is a cane well suited to the alluvial soils of the Maryborough district, having a high c.c.s., a good tonnage, good striking, and, if not cut too early, good ratooning qualities.

H.Q. 285 has not yet been sufficiently tested to show its resistance, but no Fiji has as yet been seen in it. It is an early-maturing cane, and a good ratooner with a high c.c.s. in the early part of the year. This is sufficient reason for its recommendation. It will not stand over.

Petite Senneville, which seems identical with Brown Innis, is a high c.c.s. cane, with good cropping and ratooning powers. What has been seen of this cane in disease areas gives indication of some powers of resistance.

Your cane crop is in danger.

Beat the disease before it beats you.

They did it in Fiji; you can do it here.

PLATE 100 (Fig. 4).—A TYPICAL STUNTED STOOL IN RATOON M. 1900 S.

The plants on either side are also infected. Behind is Petite Senneville. (E. J. F. Wood, Maryborough, photo.).

THE JOURNAL APPRECIATED IN THE NORTH.

Writing under date 26th April, 1927, a Northern reader expresses appreciation of the Journal in the following terms:—"Allow me to congratulate you on the fine standard maintained by the 'Queensland Agricultural Journal.' . . . . . Good illustrations are, I think a valuable aid if one would seek to make such publications popular amongst all classes interested in Agriculture."

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (26th March, 1927), from the Southern Assistant Entomologist, Mr. R. W. Mungomery:—

Soil Analyses in Reference to Grub Infestation.

From observations during the flighting period of *P. furfuracea,* the common cane-beetle of the Isis district, it has been almost definitely established that the beetles do not feed on any kind of foliage to promote subsequent development, but that, when the beetles emerge from the moist soil, the eggs of the females are in such a state of development that, after copulation has taken place, the eggs are soon ready for extrusion. This is at variance with the state of affairs which exists in regard to the greyback cane-beetle (*L. albohirtum*), which requires about a fortnight after its emergence before the first eggs are deposited. During the intervening time the females of the latter species feed from a large range of food plants, chief of which are members of the fig and eucalypt families, and it is generally recognised that the presence of these feeding trees in proximity to canefields has a decided influence on grub infestation in the surrounding cane crops. The general tendency in the North, therefore, has been either to get rid of feeding trees, or to have feeding trees in such a position that the beetles from them can be caught or otherwise effectively controlled.

Such a campaign of tree destruction instituted against the "furfuracea" beetle would result in so much waste of time, and with the point in view that these beetles are not in the habit of feeding on any of the scrub or forest trees, one would not expect any relationship to exist between the position of grub-infested land and the surrounding trees. This actually is in agreement with the area, which last year suffered grub damage in the Isis district, and affected parts being chiefly found in the centre of this large belt of cane land, whilst its outer confines, bordered by the forest, were not at all troubled with grub attack. Much the same may be said of the infestation of *P. furfuracea* in the Gin Gin district, where its grubs were found in the centre of the red volcanic areas on parts of the Watawa estate and surrounding farms; the grubs in the forest farms being those of *L. frenchi* or *L. trichosterna.*

One must therefore look for other causes to explain the occurrence of these pests in various parts of a district, and in soils of a comparatively uniform texture, colour, &c. It is found that there are definite lines of demarcation between the grubby areas and those not so infested. Thus the fact suggested itself that possibly there was some element or combination of elements present that made certain soils pre-eminently favourable for grub development, or, on the other hand, the presence or absence of such elements might exercise some prejudicial effect on the life of the grub. This conjecture has much to support it, for the presence of a good quantity of organic matter in the soil, brought about by ploughing in crops of green manure, has been the means of minimising grub damage in many places. Also, one often hears the opinion voiced by farmers that certain types of manures seem to bring about increased grub infestation, and others to lessen it, but nothing authentic can be said on this matter until further experiments have taken place.

The writer, accordingly, took samples of typical soils from the Isis district, three from grub-infested land and three from land free from grubs, and those have been analysed at the Brisbane Laboratory. It was hoped that from these analyses much data on the differences in the chemical constituents of each sample would be revealed, and with this to work on as a basis, it would provide a subject for future investigation. Results have, however, been of such a nature that no outstanding differences in the chemical compositions have been exposed whereby a connection could be established between the chemical composition and the presence or absence of grubs in any area under consideration. The analyses have, however, provided food for thought, and I have briefly summarised them as follows:—

—	Grubby areas.	Non-grubby areas.
Reaction	Very slight-very strong acidity	Very slight-medium acidity.
Nitrogen	Very fair	Very fair.
Humus	Fair-very fair	Very fair-good.
Available potash ..	Low-fair	Low-good.
Lime	Low-fair	Low-very fair.
Phosphoric acid ..	Low	Low.

From an inspection of the above table it will be seen that the noticeable differences existing in the respective groups are the somewhat lower humus and potash contents of the grubby areas in comparison with the other areas. The lower humus was not surprising, and it goes to confirm previous experimental work elsewhere in this direction, when growers were advised to adopt the slogan "Conserve the humus." Though undoubtedly humus conservation is an important factor, deficiency in this is not alone responsible for the appearance of grubs in certain blocks of cane, and fields of cane which previously have been heavily manured with green crops have since developed grubby patches, while the persistence of these patches from year to year has often been noticed. This is perhaps due to the "homing instinct" possessed by several beetles of this family, whereby the same fields are infested annually or biennially, according to the life cycle of the beetle under consideration, and in this connection "furfuracea" beetles have been known to lay their eggs in land that was fallow during the flighting season but which had previously been infested with grubs.

With reference to potash analyses, I have sometimes heard the opinion expressed that the application of either the sulphate or muriate of potash to grubby areas has been the means of getting rid of these pests, but, without exception, checks have not been kept by the growers. So it is impossible to state that the potash salts have been instrumental in freeing the land of grubs or whether other natural agencies have been at work. The results from the table certainly encourage this view, and it would be a good plan for growers to try a small experimental plot fertilised with potash on those lands which suffered losses through grubs in the past.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (26th April, 1927) from the Assistant to Pathologist, Mr. E. J. F. Wood, for March-April, on the Isis district:—

The two major cane diseases present in the Isis district are Mosaic and Gum. Mosaic is present probably on every farm, usually only to a very small extent. The average infection would be, I should say, well below 1 per cent., and frequently the number of infected stools on a farm can be counted on one hand. It is very gratifying to see farmers removing such stools as soon as they are pointed out. This happy state of things has been achieved in the main by careful seed selection and subsequent roguing with frequent inspections. North Isis is a splendid example of this, and varieties as highly susceptible as Black Innis (M. 147) are grown practically free from the disease. In this district, however, as in every other, there are one or two farmers who are not careful, and the result is a heavy infection of their own farm, and an increase in the infection of their neighbours.

It was noted on one farm that wild sorghum on public land was causing heavy Mosaic infection (over 50 per cent.) in cane, the plants of which had been selected, and which had been rogued since planting. Special efforts should be made to keep public lands, railway property, and tramlines clean, and the policy of the railways in letting their lands for cultivation is to be commended.

On account of Mosaic, I do not recommend the planting of M. 147 Black Innis, Striped Singapore, Rappoe, or Rappoe Seedling. Black Innis on one plantation has been rogued several times and is now over 50 per cent. infected.

I do not think that farmers need fear to plant E.K. 28, M. 55, or H.Q. 285 on account of Mosaic. These are of about the same order of susceptibility as M. 1900 Seedling, which is not seriously menaced. None of these canes have shown any signs of such virulent attacks as are usually seen in M. 147. At Dallarnil, Mosaic is very prevalent in Striped Singapore, Rappoe, or Rappoe Seedling, the three main varieties grown. A change of variety seems necessary here. I should suggest trials of Q. 813, Q. 1098, on the lower and E.K. 28 and Q. 1098 on the upper lands. H.Q. 285 appears to do well as an early maturing cane in this area.

Booyal has some Mosaic also, but on the farms visited it was not serious. Better control could be exercised to reduce it still more in some cases. Many farmers asked me if I believe that corn is a good rotation crop for cane? I do not, for the following reasons:—

1. It is well known that corn contracts Mosaic—diseased stools can be seen in nearly every field—and this Mosaic may be transferred again to the cane, as the insect vector returns to the cane when the corn is harvested or ploughed under. It is stated that the high percentage of Mosaic in Louisiana is due to the habitual growing of corn and cane adjoining each other.

2. Corn stalks contain a high percentage of silica which tends to prevent their rotting down after ploughing under.
3. Corn does not give the nitrogen to the soil that legume crops do.
4. Corn and cane are very closely allied, and we should expect them to utilise much the same plant food. The land is in no way rested in this manner, and it would be better to plant a legume crop or root crop.
5. Corn forms no sort of a cover crop, and half the advantage of a green crop—that of keeping the weeds down—is lost.

Gum does not seem prevalent this year, though some streaks have been observed, and in a few cases the yellow gum has been seen to ooze from the cut ends of samples. Some farmers are wisely planting Q. 813 in the lower infected areas. In other cases it is sufficient to choose only plants from high ground and to leave the plants for a day or two under a bag before planting. Then reject any sets showing gum. D. 1135 seems the most susceptible variety in this district and should be avoided where the disease is at all prevalent.

Of the minor diseases, Knife Cut is present to some extent in D. 1135 and M. 1900 Seedling. Peg Leg or Foot Rot occurs on many farms in M. 1900 Seedling. Both these diseases seem to vary in intensity with the seasons. Peg Leg is especially destructive. Lime and good tilth will often help to eradicate this disease.

Iliau is a disease of more importance, and is occurring on many farms at Childers, Cordalba, North Isis, Knockroe, and Hapsburg Plantation. It has also been seen at Booyal in D. 1135. The disease was first discovered in Queensland by Mr. W. Cottrell-Dormer, of the Bureau.

Symptoms.—Young plant cane up to 2 ft. in height is usually the subject of attack of the Iliau fungus (*Melanconium iliau*). Young ratoon has also been seen affected. The leaf sheaths are bound together by a white fungus mycelium so tightly that the growing tip cannot pierce the spindle of the young leaves, and so often doubles over on itself and may force itself out by piercing the leaf sheaths at the side, or die off. In the former case partial recovery may take place.

Black masses, about one-sixteenth of an inch in diameter, may often be seen on the lower leaf sheaths. These are the pustules of the fungus, and serve for identification. If in a field of young plant cane many dead shoots are seen, closer examination may serve to reveal the symptoms of Iliau.

Control.—Iliau is caused by a fungus, the spores of which live over in the soil from crop to crop. They are, however, killed by the sun, and good and frequent tilth, prior to planting, is recommended.

A peculiar trouble is occurring in the Isis district, which I have tentatively called "X" disease for the sake of convenience. I shall deal with this trouble in a separate paper, which will include a description of control experiments. No method of control has yet been devised.

Several leaf spots were thought to be causing damage here, and in isolated cases these may cause damage to fields through reduction of leaf surface, but usually they are comparatively harmless.

Another peculiar disease affecting M. 1900 Seedling was observed on one farm, and the farmer stated that it is spreading. The stalks of the standover cane are long and spindly, and the rind is striped red and white as though by Mosaic. The leaves are covered with short, yellow stripes, arranged in an indefinite pattern, recalling Mosaic. These leaf markings are distinct from the latter in appearance, and do not affect the youngest leaf. Roots are apparently healthy. Its origin is a mystery, and no other occurrence has been noticed in the Isis with the exception of a dead top of M. 1900 Seedling, which was shown to me by another farmer, and which might have been similar. The farmer concerned was unable to show me any living specimen, though he told me that it had caused him some loss of crop some years ago. Both these occurrences were at South Isis.

Regarding varieties, it seems to me that M. 55, Q. 1098, and E.K. 28 are coming canes for the higher lands, while H.Q. 285, as an early cropper, N.G. 16, and Badila seem to show promise on lower fields. M. 1900 Seedling and D. 1135 are the most widely-grown canes, while H. 109, Q. 813, H. 227, Pompey, Oramboo, Korpi, and Nanemo are worth a thorough trial. Q. 813 is especially recommended for low lands where gum is bad. It is not wise to plant too much of a new variety, or to discard it without a good trial. Plant new varieties at the edge of a field, when their ploughing out, if it be necessary, will be easy and will not spoil both the field and the farmer's temper, and so prejudice him against introducing varieties.

The Director of the Bureau of Sugar Experiment Stations has received the following report from Mr. G. Bates, Assistant Entomologist at Bundaberg, for the period March-April, 1927:—

The Sugar-Cane Moth Borer *(Phragmatiphila truncata,* Walk.*)*.

This insect, which is to be found throughout the sugar areas, is, in most places in the Bundaberg district, purely of minor importance. Occasionally, however, it causes considerable damage, and calls for control measures. Dirty paddocks, more particularly in low-lying situations, and blocks adjacent to paddocks of Guinea and Natal grass are very subject to attack. This year, owing to the abnormal weather conditions, which prevented thorough cultivation, cane paddocks, especially in low-lying situations, became weedy and dirty, giving rise to ideal conditions for the breeding of this pest. It is to be found more or less throughout the district, and serious damage has been caused at Tantitha and South Kalkie. Standover cane appears to be a favourite breeding place, and in blocks of mixed varieties it is found that the softer canes suffer most damage.

The caterpillar of this moth is from 1 inch to 1½ inch in length, of a light purplish colour blotched indistinctly with dull white. The under surface of the body is dirty white, and the head light to dark red. It attacks both young and mature cane, and in the former case enters the shoot just above the ground, tunnels upwards, killing the growing point, and giving rise to what is known as "dead hearts." In big cane the borer is to be found in any part from the butt to the cabbage, where it tunnels about, sometimes causing the stick to break in two. Where cane is to be cut for plants this causes a lot of waste.

Fortunately, in this district the presence of a minute parasitic wasp, belonging to the family *Braconidæ,* generally keeps this pest in check. Borer larvæ have been collected from two farms several miles apart and were found to be heavily parasitised. This wasp is very small, measuring 2.5 mm. in length (approx. 3/32nd of an inch), and 4 mm. across the wings (approx. 5/32nd of an inch). It breeds rapidly, and it is interesting to note that one borer larva, parasitised under natural conditions, yielded ninety-four parasites, while another produced seventy-five. This wasp is easily bred under laboratory conditions and could be bred and liberated on farms where the parasite is not established.

One of the best means of controlling this pest is by clean cultivation. Headlands, &c., should be kept free of grass and weeds, and trash should not be left lying about but should be buried or burnt. It has been proved that this insect will breed in certain of the thick-stem grasses, so that these should be destroyed wherever possible. As mentioned before, this insect prefers the softer varieties of cane so that where it is particularly troublesome it might be advisable to plant harder varieties.

Aphis sp.

This insect is a minor pest of sugar-cane, usually more in evidence during the hot weather but still to be seen in one or two canefields. They are found on the under surface of the leaves, and being of a light green colour generally escape notice. They suck the plant juices and in dry weather are liable to check the growth of the plant. Their presence is often denoted by a sooty fungus which appears on the cane leaves, and many growers are under the impression that it is a disease. This is erroneous, as the fungus (*Capnodium* sp.) is a secondary thing and grows on the sticky juice secreted by the aphides while sucking the sap. These aphides are kept under control by several parasitic and predaceous enemies, and do not require any other control measures.

Grubs.

Owing to the fact that the three chief beetles attacking cane in the Bundaberg district—namely, *P. furfuracea, L. frenchi,* and *L. trichosterna*—have a life cycle that occupies at least two years, both large and small grubs of the same species, differing in age twelve months, can be found together in the soil at the present time. These smaller grubs, which are the result of eggs laid last flighting season, are now mostly in the second instar, and although not able to do any damage at the present time, will grow rapidly and be responsible for damage to cane next spring, so that growers are advised to collect grubs when ploughing, particularly the smaller ones.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (29th March, 1927) from the Entomologist at Meringa (Mr. E. Jarvis) for the period February to March, 1927:—

Field Experiments with Soil Fumigants.

During the past month advantage has been taken of the few brief spells of fine weather (rarely lasting longer than two to four days) in which to carry out field experiments against grubs of the greyback cane-beetle.

Fortunately the situation of our experiment plots on well-drained high land of volcanic origin permits of application to the soil of fumigants, such as napthalene, paradichlorobenzene, &c. (which are insoluble in water), a couple of days after the cessation of heavy rain. The various fumigants tested by us this season, up to the present, have been carbon bisulphide, chlorocide A. and B., "See Kay," paradichlor., carbosyl, calcium cyanide and "Kersinap."

An account of preliminary results obtained from some of these will probably be available for publication next month.

Notes on Parasite of Cane-Borer.

During the recent cyclone, on 9th February, the insectary building was blown from its blocks, but fortunately landed right side up, in such manner as to cause little damage to the numerous grubs being reared for purposes of study and experimental work.

Three large 6 to 7 feet square breeding-cages, however, situated close to the laboratory, and devoted to rearing specimens of *Ceromasia sphenophori*, the Tachinid Fly parasite of *Rhabdocnemis obscurus* Boisd., for distribution on canefields affected by this beetle borer, were greatly damaged, the netted sides and cloth tops of these cages being blown to tatters and scattered over the adjacent forest land. Two of the cages have been reconstructed, and the breeding of this useful parasitic insect is again progressing satisfactorily. The flood rains following this cyclonic disturbance also occasioned a certain amount of damage to young, late-planted cane by filling in the furrows above the deeply-planted sets before the shoots had attained a height of more than about 9 to 12 inches. The effect produced on the soil by the abovementioned weather conditions was rather curious, the entire surface being left perfectly level throughout, like a table for smoothness; the rows of cane shoots looking as though they had been stuck into the uniformly flat ground.

Termites Attacking Cane Stools.

An instance of "white ant" infestation of sets and basal portions of the stools of cane plants occurred at the beginning of this month (March) at Freshwater, on a farm situated close to scrub land. Damage was, fortunately, confined to a few stools scattered over about an acre and a-half of ground, the shoots of which were observed to be wilted or dying off. The ground supporting this cane had been cleared of scrub timber last year, the crop in question consisting of first ratoons.

Such trouble can usually be avoided if care be taken when clearing the land to "run" all the big roots to a proper depth, and grub out old existing roots or stumps.

Specimens of this termite procured by Mr. A. N. Burns, Assistant Entomologist, proved upon examination at our laboratory to be examples of an undetermined species of a genus somewhat resembling *Microcerotermes*, one species of which is already known to damage cane sticks in the Mulgrave area.

Remedial action in such cases is best effected by digging out and burning all diseased stools, and then treating the holes with from 1 to 8 oz. of benzene or carbon bisulphide in order to kill any termites mixed among the soil particles. After applying such fumigants, the earth above should be wetted or pressed in such manner as to consolidate the surface soil to keep the fumes from escaping too readily during daily evaporation of moisture by the sun.

An Interesting Predaceous Larva.

While examining the foliage of young plant-cane last month (February) for leaf-eating insects, the writer was fortunate enough to find an egg cluster of one of our predaceous Asilidæ (Robber Flies) attached to a cane leaf. The eggs of such species of this family as have hitherto come under our notice up to the present have been practically hidden under a thin, greyish, crust-like layer, composed probably of some hardened secretion of coriaceous texture, under which the eggs themselves to the number of one to two hundred or more are closely packed together side by side, lengthwise, at right angles to the surface of the leaf-blade.

These egg-masses are very irregular in form, and may vary in size from $\frac{3}{4}$-inch by $\frac{1}{4}$-inch to $\frac{1}{2}$-inch by $\frac{3}{8}$-inch, according to the number of eggs deposited.

When first hatched, the maggots, although only about three-sixteenths of an inch long, and no thicker than fine cotton, possess great powers of endurance, being found to remain alive in damp soil without animal nourishment for more than a fortnight.

During this interval, however, they increased noticeably in size, so that possibly, although predaceous in habits, these larvæ may be able to subsist for a time until meeting with some suitable host on organic matter in solution between the soil particles.

On 4th March, one of these maggots that had been placed in a breeding-cage was found attached to a small scarabæid grub near the head, having apparently been feeding for some days on its juices. This grub was nearly dead. Subsequently experimentation appears to indicate that after one of these predaceous larvæ has been attached to a grub for a few days the victim sickens and soon dies. The predator, however, is then able to subsist for a time in the soil until chancing to encounter another grub or soft-bodied subterranean insect.

Possibly our commonest species of Asilidæ attacking cane-grubs in the Cairns district is *Promachus doddi* Ric. This fly, which measures nearly $1\frac{1}{4}$ inch in length, is black, with buff-coloured hairs, which are longer and more numerous on the sides of its abdomen, ventral body surfaces, and pronotum. The wings are about three-fourths of an inch long, pale-yellow with reddish-brown nervures; while its stout, strong, dark-red legs have black tarsi (feet) terminating in two large claws.

The larvæ or maggots of this fly are sometimes found in furrows when ploughing, attached to the grubs of cane-beetles.

ENTOMOLOGIST'S HINTS FOR MAY, 1927.

BY EDMUND JARVIS, Entomologist.

Select Good Seed-Cane.

During planting operations reject all seed showing tunnels of the weevil borer (*Rhabdocnemis obscurus* Boisd.) derived from localities known to be infested by this cane beetle.

Such sets often harbour its eggs or young larvæ, and a few weeks after planting same the latter may eat a sufficient amount of an affected set to endanger or lead to death of the young shoots later on, thus causing unsightly misses. Moreover, it is by the means of such infested seed that these weevil borers often obtain a footing in clean localities, and once this pest becomes well established it is not easily got rid of.

Apart from the danger of introducing insect pests, it is always advisable to use well-grown healthy cane for planting, and to make sure that it be free from serious fungus diseases.

When cutting sets, throw aside any showing signs of reddish or other discoloration at the cut ends.

Except Indications of Grub Attack.

During this month, especially if dry weather should be experienced, unmistakable signs of grub infestation will be noticed on those areas where the cane usually suffers, more or less severely, each season from the ravages of this pest. We hope that upon the first appearance of grub attack growers will at once communicate with the entomologist at Meringa Laboratory, in order that advice may be given as to what action should be taken in such cases, with a view to the prevention as far as possible of similar trouble next season, or to minimising losses likely to result from present infestations.

How to Combat Grasshoppers.

Indications, during the latter half of April, pointed to the liklihood of trouble being experienced this month (May) from attacks of *Locusta danica* and *Locusta australis*, the so-called "Yellow-winged Locust," and "Large Mottled Locust," respectively.

These insects strip the leaf blades, leaving only the mid-ribs; but, fortunately, the damage is confined to small areas, and if taken in time this pest can usually be successfully combated.

The following methods of poisoning grasshoppers are recommended:—A bait that has proved very useful is made from 100 lb. of coarse bran (the coarser the better), with 4 lb. of finely powdered crude arsenic or Paris green, 4 lb. of cheap grade granular dairy salt, 2 gallons of low grade molasses, 3 oz. of amyl acetate, with 10 to 12 U.S. gallons of water. If bran be not obtainable, sawdust might be substituted. When large amounts of this bait are being used the arsenic should be added to the liquid ingredients, instead of being mixed with the bran while dry. Spraying a strip of grass around or in front of an advancing swarm with 1 lb. of sodium arsenite, 4 lb. of treacle, and 16 gallons of water has also been advised, it being important that the poison and the treacle should be dissolved separately in hot water and mixed when cold. To treat 6 acres one needs 28 lb. of arsenite and 1 cwt. of treacle. Another capital poison-bait, recommended by an American entomologist, has been found a simple, effective, and exceedingly cheap remedy:—Sawdust 100 lb., sodium arsenite 1 quart, molasses (crude) 1 gallon, salt 5 lb., Water 7 to 10 gallons. Apply this at rate of 10 to 20 lb. of wet bait per acre (according to amount of grasshoppers present).

Tachinid Parasites now Ready.

Any canegrowers troubled with the weevil borer in cane-sticks are invited to apply to the entomologist at Meringa for parasites of this pest; which will be released by the Sugar Bureau free of cost on such affected areas.

FIELD REPORTS.

The Central Field Assistant, Mr. E. H. Osborn, reports (25th March, 1927):—

Proserpine.

The township and district are steadily increasing in importance. Much time was lost through wet weather. Rainfall: January, 17.44 in.; February, 10.55 in.; March, 0.85 to 4th; total 28.84 in.

As much country is low lying, and also retains the moisture for a long time, practically all cultivation work had been at a standstill since Christmas, with the result that weeds had invaded the fields.

Where "bedding up" had been carried out, the growth in very many cases is irregular, the outside rows of the beds (½-chain ones) looking very poor in many places. Water furrows and headland drains not being deep enough for so much water seem to be the principal cause of this. Probably the two-row beds system, so successfully used about Rosella and Homebush, with the water furrows kept well open would be of much benefit if carried out locally.

Throughout the district some good patches of plant cane were noticed, mainly August planted, but the cane planted later had suffered so much from dry weather that it was smothered with weeds when rain came. The ratoons, too, were only medium, all suffering from want of working, due to continuous wet spells.

Last year some 72,200 tons of cane, with an average c.c.s. of 13.3, were crushed, representing 1,060 samples taken, or one for every 7.2 tons of cane, while 375 growers supplied cane to the mill.

The following list of varieties, giving percentage of each, and average density, are of interest:—

Variety.	Per cent. Grown.	Average c.c.s.
H.Q. 426 (Clark's Seedling)	22.3	14.3
Q. 813	22.0	13.4
M. 1900	13.0	12.9
N.G. 15 (Badila)	19.4	13.4
Malagache	4.0	11.8
Mixed	8.7	13.7
D. 1135	1.6	12.2
Goru	3.6	12.8
Q. 1121	.81	13.6
Q. 116	.32	12.4
Q. 114	1.00	14.0
7 R 428 (Pompey)	.93	10.7
E.K. 28	.84	11.5
Striped Singapore	1.50	12.5
Total	100.00	

Varieties such as Striped Singapore, Malagache, D. 1135, Goru, &c., have steadily decreased in favour during, say, the past four years, whilst Q. 813, H.Q. 426, M. 1900, and N.G. 15 are far more popular; Badila (N.G. 15) having gone ahead by 10 per cent. This is accounted for to an extent by plantings in the new areas of Banana Pocket and Bloomsbury.

Fertilising.—Although not carried out to a very large extent, some growers are persisting with fertilisers.

Liming.—Some liming in the low-lying, heavier class of soil is being carried out.

Tractors.—Tractors have demonstrated their efficiency in the few fine days that the district has been favoured with since Christmas. All makes are being used.

Diseases.—Leaf Scald was noticed on a few stools of E.K. 1 plant at Preston.

Bowen.

Present indications are that this area will gradually go out of cane, and operations be confined to fruit and vegetable growing.

When visited, only small areas of cane were seen, showing fair growth, however.

The Southern Field Assistant, Mr. J. C. Murray, reports (28th March, 1927):—

Wallaville.

This district has made a good recovery from the dry weather which prevailed towards the end of last year. The cane is now growing rapidly, and, provided a fairly open winter prevails, there should be a crop of 20 tons per acre, on an average. Varieties doing well are M. 1900, H.Q. 285, D. 1135, Q. 813, and N.G. 22 (Mahona). H.Q. 285 and Q. 813, in the writer's opinion, are the best canes in this group.

Mosaic Disease is in evidence. As this disease is readily controllable, the growers should make a special effort to get rid of it. Take 1,000 acres on the Burnett River at the present time, embracing land from the top of Wallaville to the bottom end of Millbank, and the total loss per annum would work out as under:—

Varieties—D. 1135, M. 1900, Black Innis, Malagache.
Percentage of stools infected—50 per cent.
Loss in weight in twelve months' growth—30 per cent.
Assume a normal crop of 20 tons per acre—loss through Mosaic would be 3 tons per acre.
Assume a net price of 30s. per ton—loss per acre, £4 10s.
Loss per 1,000 acres—£4,500.

Other areas have been badly affected with Mosaic, but by working along lines laid down by the field staff, the disease has been practically wiped out.

Soils along the bank of the Burnett River at Wallaville are of an alluvial nature. This class of soil belongs to the transported soils group, and is one of the most important. Alluvial soils are rarely stoney, are usually level, fine grained, and very deep. Water usually leaves the soil it carries in more or less distinct layers; this "stratification" can often be seen in alluvial soils. Alluvial soils are mostly of very fine sand, silt, and clay. They vary greatly in chemical composition.

Growers in the Wallaville area are optimistic regarding their future; and they should be. They have a good mill in first-class condition, and, in spite of what some people think to the contrary, the bulk of the land in the mill area is good soil upon which excellent crops can be raised if reasonable rains occur.

Mullet Creek.

The cane observed here looks splendid. The varieties are B. 208, Q. 813, E.K. 28, D. 1135, and Black Innis. Very little disease was noticed, and the growers have no complaints to make regarding the depredations of grubs, &c. The countryside generally presented a fine aspect, with the tall forest trees and luxuriant undergrowth. Not far away is the mouth of Littabella Creek, famous for its good fishing. Owing to the good soil and many natural advantages, closer settlement will eventually come to all these places along the main North Coast line.

CHILDERS.

Great changes have occurred here since last visiting this district. Before Christmas there was every appearance of an absolute failure in the crop, now there is a splendid prospect of a good season. The heavy rain has, however, caused a great deal of soil loss through washing. Some farms will keep their owners busy filling up holes for some time to come.

The farmers, although their cane has responded readily to the heavy and well-distributed rains, do not want to overlook the fact that a great deal of fallowing and green manuring is required in this district. Although the crop this year may average 20 tons per acre, it would probably have been 30 tons if the soil had been kept free of root-destroying fungi by a system of fallowing.

The green cane that is to be seen now in the Childers area would go off if a drought came much more quickly than the cane would, say, in the new red forest soil in the environs of Bundaberg, where there is very little depletion of the root system by root rot. As stated there has been a great deal of the topsoil washed away in this area, thus it is essential that the farmer should know something of the nature of the subsoil.

The soil immediately beneath the richest part of the surface is called the subsoil. It may be of any depth, and extends to the underlying rock. The distinction between the soil and the subsoil, as the two names are commonly used, lies almost entirely in the colour and texture, due to the greater amount of humus near the surface. In cultivated Childers soil there is usually a more or less distinct line between the heavy red topsoil and the poorer or lighter coloured subsoil.

In nearly all cases the subsoil contains less available plant food than the soil above, because it is not affected as much by the weathering, being protected; and, because it is less affected by acids resulting from the decay of vegetation, since it contains less humus. The subsoil might be called rotting rock, and the soil rotted subsoil. This is an effective arrangement of nature. If the plant food in all the soil down to bedrock were as easy to lose as that in the first 9 inches of soil, our fields would soon become unproductive. The subsoil is a store of plant food that is held in reserve. We should look upon the rocks, stones, pebbles, and subsoil of our fields as so much potential plant food. It is being doled out from year to year as fast as can be used to advantage. The subsoil sets a limit to the depth at which certain soils can be ploughed. It may be yellow or of a different nature than the surface mould, and contains a large amount of raw plant food. If much of this raw soil is mixed with the surface soil the productivity of the land may be seriously reduced for a number of years.

Cane varieties that the growers here are advised to try more than they are doing are H.Q. 285, E.K. 28, and Q. 813. They are also recommended to try more local experiment in relation to fertilisers, and, generally, to take the initiative and assist and encourage experimental work in every possible way. There are growers in this area who have been planting D. 1135 and M. 1900 for years, and have not made the slightest attempt to systematically test new varieties. They have had them but have discarded them on a year's trial, or because someone else said they were valueless. It takes at least eight years to test a variety.

APPRECIATION OF THE JOURNAL.

A farmer on the Western Line writes (18th April, 1927):—"I am a reader of the 'Queensland Agricultural Journal' and I think it is a very fine book and all farmers should be subscribers to it. I would suggest that, if possible, you include an article each month on various breeds of dairy cattle on the same lines as your articles on pigs."

A Burnett farmer writes under date 24th March, 1927:—"We appreciate your Journal immensely."

RECORDS OF AUSTRALIAN THYSANOPTERA (THRIPS).

By A. A. GIRAULT, B.Sc., Entomological Branch.

When working up some material in this group the following records of distribution and hosts were gathered. Unless otherwise stated the localities are Queensland and the collector the author, while the insects were taken from the flowers unless stated to the contrary. The plants were kindly identified by Mr. C. T. White, Government Botanist.

1. *Thrips tabaci* Lindeman.—Supposed to be the common inhabitant of gardens and cultivated flowers but comparatively scarce. European. The following are new records:—From *Ageratum conyzoides,* November, 1925, Morningside, near Brisbane. *Loranthus longiflorus,* same place, October, 1925. *Buddleia madagascarensis,* same place; of these two were quite pale yellow with median line of abdomen dusky. Strawberry, Wellington Point, Tryon. On "silvered" melon leaves, Chinese garden, Coorparoo, 31st December, 1926. On *Mesembryanthemum equilaterale,* October, 1925, Brisbane River. Wild flowers, Gympie, July, 1924; also in October. The species has already been recorded as injuring onion foliage, and was taken from watermelon flowers at Raby Bay, 24th February, 1927. (See No. 35.)

2. *Thrips imaginis* Bagnall.—This is without doubt the commonest species in flowers and is native and widely distributed. It was described quite recently and had been confused with *tabaci,* which it closely resembles. The records of Victorian collections are by R. Kelly. Injuring grape blossoms, Amiens, Q., 2nd November, 1926, H. Jarvis; an asparagus, Gippsland, Vic., 22nd February, 1919; *Acacia decurrens,* Healesville, Vic., 26th November, 1925; *Verbena erinoides,* Roma, Q., 3rd December, 1925; *Xanthorrhœa minos,* Healesville, Vic., 28th October, 1926; *Helichrysum scopoides,* Healesville, Vic., 29th October, 1926; *Pultenea gunnii,* Healesville, Vic., 29th October, 1926; cultivated *Watsonia,* Malvern, Vic., 1st November, 1926; *Brioza minor,* Healesville, Vic., October, 1926. On elderberry flowers, Lilydale, Vic., 13th November, 1925; *Holcus lanatus,* Melbourne, Vic., 24th November, 1925; *Bursaria spinosa,* Yeringberg, Vic., 7th January, 1926; *Albizzia labbak,* Norman Park, Q., 5th December, 1926; jacaranda, Brisbane, 19th October, 1925; white clover in meadow, Norman Park, Q., 28th November, 1926; on strawberry, near Brisbane; columbine, Rochester, Victoria, 3rd November, 1925; *Acacia saligna,* Rochester, Vic., 3rd November, 1925, and *Leptospermum scoparium,* Yeringberg, Vic., 7th January, 1926; from roses, Melbourne, Vic., 24th December, 1926, G. F. Hill.

3. *Pseudanaphothrips achætus* Bagnall.—This is another common and widely distributed species. On tomato flowers, Wellington Point, Q., J. H. Smith, 22nd September, 1926; *Sonchus oleraceus,* Morningside, Q., 4th September, 1926; *Bækea virgata parvula,* Caboolture, Q., 14th December, 1925; wild flowers, forest, Gympie, July, 1924; forest, Bakers-

ville, Q., 15th March, 1919 (light specimen); flowers strawberry, Manly, Q., H. Tryon, 24th September, 1924; on same, Beerwah, Q., 9th October, 1920; lantana, Montville, Q., 16th December, 1925; *Glycine tabacina*, 9th November, 1925, Morningside, Q.; mango, same place, 7th September, 1926; also with No. 18 from peanut, and at the same time and place from *Verbena bonariensis* and *Sida Retusa.*

Nearly all the above specimens were blackish, the thorax sometimes reddish, the fore tibia and joint 3 of the antenna pale.

It has also been taken from *Mesembryanthemum equilaterale*, Brisbane, 25th October, 1925; *Duranta plumieri*, Morningside, 13th December, 1925; miscellaneous forest wild flowers, Gympie, 17th October, 1924 (thorax entirely black); *Verbena crinoides*, Roma, Q., 3rd December, 1925.

4. *Physothrips Kellyanus* Bagnall.—This is a large black-winged species of rather common occurrence, and the following data have been gathered in reference to it:—On flowers of orange, Botanic Gardens, Brisbane, J. A. Weddell, 27th September, 1924; *Cestrum parqui*, Brisbane, 27th November, 1926, I. W. Helmsing; *Duranta plumieri*, Morningside, 13th December, 1925; Gympie, Q.; lantana, Montville, Q., 16th December, 1925; cultivated lily, Brisbane, 19th October, 1925, W. A. T. Summerville; *Buddleia madagascarensis*, Morningside, Q.; jacaranda, Brisbane, 19th October, 1925; orange, Mapleton, Q., 15th December, 1925; 26th January, 1926. Also with No. 5, on the *Murraya.* Some specimens are considerably lighter in colour than others.

5. *Physothrips mjöbergi* Karny.—On flowers of the orange, Mapleton, Q., 26th January, 1926. Also from miscellaneous flowers, place unknown; from jungle, Gympie, Q., 14th July, 1924; *Ricinus communis*, Brisbane, 17th February, 1927; *Murraya exotica*, same locality, a month later; a tree solanum, Brisbane, 6th April, 1927. Also lantana, Norman Park, 23rd March, 1927.

6. *Physothrips brevicornis* Bagnall.—Dugandan, Q., 20th May, 1923; flowers of *Sonchus oleraceus*, Morningside, Q., 4th September, 1926; West Melbourne, Victoria, 15th March, 1925, R. Kelly; *Hypochæris radicata*, Lilydale, Victoria, 9th April, 1926, R. Kelly; also same host, Healesville, Victoria, 18th January, 1925, R. Kelly; *Hierachium*, Norman Park, 23rd February, 1927.

7. *Thrips lacteicorpus* Girault.—A moderately common species. Injuring flowers of grape, Amiens, Q., H. Jarvis, 2nd November, 1926; in blossoms of golden wattle, Morningside, 31st May, 1926; of the white bottle-brush ti-tree, same place, 18th October, 1925; *Clerodendron tomentosum*, amongst mangroves, Norman Park, Q., 21st November, 1926; *Albizzia labbak*, same locality, 5th December, 1926; tomato, Wellington Point, 22nd September, 1926, J. H. Simmonds; cultivated flowers, Morningside, Q., 1st November, 1925; *Acacia implexa*, Montville, Q., 16th December, 1925; white clover in meadow, Norman Park, 28th November, 1926; *Tristania suaveolens*, Morningside, 25th October, 1925; on foliage of fig, Sunnybank, Q., 21st April, 1925, H. Tryon; blossoms of *Leptospermum*, Morningside, Q., 4th and 11th November, 1925; *Jacksonia scoparia*, 13th October, 1925, same place; and mangrove, Norman Park, 7th November, 1926.

8. *Isononeurothrips australis* Bagnall.—Another common species. On *Loranthus longiflorus*, Morningside, 18th October, 1925; same locality,

4th October, 1925; forest, Wynnum, Q.; *Cocos plumosa,* 10th January, 1926; *Eucalyptus,* Melbourne, Vic., December, 1925, R. Kelly; on bottle-brush (white) flowers, Morningside, 18th October, 1925; *Syncarpia laurifolia,* December, 1925, and *Eucalyptus corynocalyx,* Melbourne, 24th November, 1925, R. Kelly; *Eucalyptus rostrata,* Sutherland's Creek, Anakie, Vic., 26th May, 1925, R. Kelly.

9. *Idolothrips marginatus* Haliday.—From this Department's collection (H. Tryon), a number of specimens labelled as having attacked leaves of choko, 15th November, 1916, at Sunnybank. This is the species heretofore known as *spectrum.* Also forest, Grandchester, 1st August, 1924.

10. *Idolothrips lacertina* Haliday.—In jungle at Gympie, 28th June, 1924; and at Mapleton.

11. *Desmothrips bagnalli* Karny.—In flowers *Cocos plumosa,* Morningside, 10th January, 1926; also in jungle, Montville, 12th September, 1923.

12. *Desmothrips tenuicornis* Bagnall.—Forest, Stanthorpe, Q., 24th April, 1924.

13. *Physothrips uniformis* Bagnall.—From flowers *Calotis cuneifolia,* Morningside, 23rd October, 1925.

14. *Thrips seminiveus* Girault.—From blossoms of rose and other cultivated flowers, Norman Park, 19th December, 1926 (with *T. imaginis*).

15. *Scirtothrips signipennis* Bagnall.—From miscellaneous flowers, Gympie, July, 1924.

16. *Cryptothrips dimidiatus* Hood.—Seems to be *Oedemothrips.* From miscellaneous flowers, forest, Gympie, 17th October, 1924. See No. 30.

17. *Adiaphorothrips semifuscipennis* Girault.—A male, forest, Rockhampton, 13th April, 1923.

18. *Physothrips cinctipennis* Bagnall.—Flowers white clover, Norman Park, 28th November, 1926; *Crotolaria striata,* same locality, February, 1927; peanut, Raby Bay, 24th February, 1927 (some of the females with legs, prothorax, also sides and undersurface of thorax and abdomen, light yellow); also with No. 5, from tree Solanum.

19. *Chirtothrips manicatus* (Haliday).—Brisbane, Department of Agriculture, associated with grain. European.

20. *Horistothrips ischnosoma* Karny.—A male, forest, Ipswich, July, 1919.

21. *Heliothrips hæmorrhoidalis* Bouché.—A cosmopolitan species. Curiously it has been taken in the jungle, Montville, 15th June, 1924, and a few more records are given herewith:—From *Rumex,* Healesville, Victoria, 18th January, 1925 (R. Kelly); jungle, Maleny, Q., 24th June, 1924.

22. *Isononeurothrips jenseni* Karny.—Several females from flowers of *Bidens pilosa,* Raby Bay, 24th February, 1927. This is likely an introduced species, as it was described from Sumatra.

23. *Neophysopus flavicinctus* Karny.—Another introduced species very likely but has been recorded already from Cape York Peninsula (Karny). A female was collected from the heads of the grass *Panicum crus-galli,* Raby Bay, 24th February, 1927.

24. *Stylothrips brevipalpus* Karny.—A female with No. 22 above. This is also an alien species, and was recently described from India. At Norman Park, 17th March, 1927, specimens were taken from the flowers of *Galinsoga parviflora* and *Amaranthus viridis* in a neglected garden, and see No. 35.

25. *Cryptothrips rhopaloides* Karny.—Two females, forest, Nambour, 31st October, 1923; a pair, forest, Gordonvale; femur 1 is swollen.

26. *Empresmothrips longfellowi* Girault.—From the forest, Beenleigh, 27th November, 1922; and Enoggera, 10th October, 1921.

27. *Horistothrips xanthocnemis* Karny.—Several males, jungle, Gympie, 28th June, 1924.

28. *Horistothrips australiæ* Morgan.—A male with No. 27.

29. *Horistothrips curviseta* Girault.—The mouth-cone is rounded, and this species belongs to the genus *Mesothrips.* The species was bred from galls on a forest tree at Taringa, J. H. Simmonds.

30. *Cryptothrips dimidiatus* Hood.—A macropterous form, sex unknown, forest, Gympie, 9th October, 1924. Like the other, wings dark brown, without interlocated fringes. The thorax and head were darkish, and the ocelli present and in a curved line upon the wide vertex; they are pale. The anal bristles are not elongate. The macropterous form is a typical *Cryptothrips.* The head is subquadrate, subequal prothorax. See No. 16.

31. *Neophysopus fragariæ* Girault.—Flowers of *Rumex,* Brisbane, W. A. T. Summerville, 22nd December, 1925; on foliage of strawberry, injuring it like red spider, Raby Bay, 30th March, 1927, J. H. Smith.

32. *Ceratothrips rufiventris* Girault.—This is a species of *Phibalothrips.* Forest, Manly, Q.

33. *Hydatothrips poeta* Girault.—Jungle, Cedar Creek, 3rd October, 1921. This species apparently represents a new genus near *Physothrips,* characterised by bearing one post-lateral bristle and a transverse head.

34. *Polyphemothrips brunneicorpus* Girault.—A male marked North Queensland. The antennæ here 8-jointed; 3–7 equal, 8 distinctly smallest, merely sutured from 7. The cheeks bear stout, moderately long setæ.

35. *Thrips shakespearei* Girault.—Originally described from jungle, and doubtless native; at Brisbane in an open city lot, it was found to be abundant upon the flowers of *Ricinus cummunis,* 17th February, 1927; and of *Tagetes glandulifera,* 12th April, 1927; in the latter case with species Nos. 1 and 24, No. 24 being most numerous.

36. *Adiaphorothrips io* Girault.—A specimen from *Polysporus* (part of plant not given), Darwin, N. Ter., 6th February, 1915, G. F. Hill.

37. *Frankliniella æschyli* Girault.—One female specimen from the flowers of lantana, Norman Park, 23rd March, 1927.

PROFESSOR J. K. MURRAY.

The first Professor of Agriculture at the Queensland University, Mr. J. K. Murray, was born thirty-eight years ago at Brighton, Victoria. He was educated in New South Wales—taking degrees in Agriculture (day) and Arts (evening), and a diploma in Military Science at the University of Sydney. During the great war Mr. Murray served overseas with the Australian Imperial Force. After the Armistice he took advantage of the excellent facilities provided by the A.I.F. Educational Service and studied at the Dairy School for Scotland, where he took the National Diploma in Dairying with first place in the final examinations. Mr. Murray came back to Australia through Canada and the United States, where he spent four months inquiring into agricultural educational methods, city milk supply systems, and the

PLATE 101.—PROFESSOR J. K. MURRAY, B.SC. (AGR.), B.A., N.D.D.

Principal of the Queensland Agricultural High School and College at Gatton, who is the first occupant of the Chair of Agriculture at the Queensland University.

manufacture of dairy produce. On his return he was stationed at the Hawkesbury Agricultural College (N.S.W.) as Lecturer in Bacteriology. While there he conducted research work on the relationship of micro-organisms to cheese made from pasteurised milk, and the numbers of micro-organisms and H-ion reaction in raw creams.

In 1923 Mr. Murray was appointed Principal of the Queensland Agricultural High School and College. In 1924 he married Miss Evelyn Andrews, a graduate of Sydney University in Agricultural Science. As chief of the College at Gatton Mr. Murray's work is well known and appreciated by all interested in the development and progress of agriculture in Queensland.

RETIREMENT OF MR. BENSON.

DEPARTMENTAL VALEDICTORY.

Mr. A. H. Benson, Director of Fruit Culture, retired from official life on 31st March, and the occasion was marked by a large gathering of fellow officers, representative of every branch of the Department. On their behalf he was presented with a well-filled wallet by the Under Secretary, Mr. E. Graham, as a mark of his thirty years association with the service. In the course of a valedictory address Mr. Graham referred to Mr. Benson's connection with the land since he was dux of the Royal Agricultural College, Cirencester, in 1879, until he joined the Queensland Service in 1896, after working in California and New South Wales; and added that Mr. Benson left the Department with the good wishes and respect of the Minister and every one of his fellow officers.

Mr. Benson expressed his pleasure at the good feeling that had always existed between him and his brother officers. He said that it was by no means his intention to become dissociated from the fruit industry, as he had arranged to enter banana-growing on the North Coast immediately.

Mr. Albert H. Benson, M.R.A.C., is the only son of the late Joseph Benson, a pioneer Queensland squatter in the Burnett district during the fifty's. Mr. Benson was born near Taunton, in Somersetshire, England, on his father's estate, and was educated at Taunton College, and the Royal Agricultural College, Cirencester, of which he is a member and gold medalist. He has been connected with agriculture during the whole of his life, and is a recognised authority on fruit culture. Shortly after he was twenty-one Mr. Benson was given the management of an agricultural estate in East Lothian, Haddingtonshire, Scotland, a county noted for its good farming. There he gained experience in growing various farm crops, and breeding and fattening sheep and cattle, as well as raising fat lambs for the English market. He occupied this position for five years, when his employer having accepted the Governorship of Madras, decided to let all the farms that had been under his management. Having heard a very glowing account of the prospects for successful culture of fruit in California, Mr. Benson decided to go to that country, where he remained five years, and gained practical experience in all branches of the fruit industry, as well as a general insight into American methods of agricultural investigation and experiment station work; besides taking a course of training at the University of California.

Mr. Benson left California for Sydney early in 1892, and was offered the position of fruit expert to the New South Wales Department of Agriculture, and was the first person in the Commonwealth to be given this title. Although appointed fruit expert, his work was not confined solely to fruit matters, but the knowledge he had gained of American agricultural and horticultural experiment work was made use of during the establishment of the Wagga, Bathurst, Pera Bore, and Wollonbar experiment farms. The value of his work was appreciated very highly by the then Premier of the Mother State (the late Right Hon. Sir George Reid) and Minister for Agriculture (Mr. Sydney Smith).

In 1896 Mr. Benson was offered the position of instructor in fruit culture for Queensland, by the late Mr. A. J. Thynne, then Minister for Agriculture. His services in this State also were not confined to the fruit industry, but included general agriculture as well. Much of his instruction in fruit culture was of a practical nature, given in the orchard itself, and included cultivation, manuring, pruning, pest destruction, and handling and packing fruit for market.

Early in 1908 Mr. Benson was sent to England as a representative of his department at the Franco-British Exhibition, and was absent for twelve months. On his return he visited Ceylon and the Federated Malay States to obtain information in connection with tropical agriculture, and pineapple canning in particular. He resumed his duties as instructor in fruit culture early in 1909, but resigned his position at the end of March, 1910, to take up that of Director of Agriculture in Tasmania. Here his early training proved of great value, as his duties necessitated having a good general knowledge of agriculture, stock, and fruitgrowing.

In 1915 Mr. Benson returned to Queensland as Director of Fruit Culture, which position he held until his retirement.

PLATE 102.—A. H. BENSON, M.R.A.C., DIRECTOR OF FRUIT CULTURE, DEPARTMENT OF AGRICULTURE AND STOCK, WHO RETIRED UNDER THE AGE LIMIT ON THE 31ST MARCH.

DRY SEASON SAFEGUARDS FOR THE GRAZIER.

N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

Experience of the seasons, since the beginning of land settlement in Queensland, shows that periods of more or less acute shortage of pasturage recur at irregular but frequent intervals. A review of the past forty years will reveal long dry periods, fodder shortage, and great losses of stock over the greater part, if not the whole, of the State in the years 1888, 1902, 1915, 1919, 1923, with probably the worst experience in 1926. While these years were notable as affecting the greater part of the State, different districts experienced bad seasons in one or more of the intervening years.

Losses of stock are not only disastrous to the owners, but to the State as a whole, for the prosperity of the one is reflected in the other.

The actual loss to the pastoralist cannot be set down as merely what it would cost to replace the animals that perished, even if, where careful breeding has been practised for years, animals of equal quality could be secured. To this amount must be added the cost of purchased fodder landed on the holding, the extra cost of attention in hand feeding, or the cost of transport by rail, by droving, or both, to and from the relief country, the cost of such country, attention there, and the loss of income during the period. These and other points discussed by Mr. Pollock in the following pages will command the attention of every stockowner and farmer among our readers.

The loss to the State in any period of prolonged drought is generally looked upon as being that shown in the lower collection of income tax, but a little reflection will show many other directions in which revenue will be adversely affected, while the community as a whole will also, in greater or less degree, feel the absence of the circulation of that larger amount of capital created when the season is good. The economic loss, due to the disastrous season of 1926, in the woolgrowing industry has been set down by a gentleman intimately connected with the business side of that industry as in the vicinity of £12,000,000, a figure which many well versed in the ramifications of finance hold to be a reasonable estimate.

When to this amount is added that which could be estimated in the other industries affected, some idea of the national character of the calamity can be gained.

Looking Ahead.

With the certainty of the recurrence of bad seasons in future years, ways and means of providing against future visitations merit serious consideration.

Obviously, the safeguard against loss of stock from starvation or disease engendered by a lack of nourishment in a dry season must be looked for in a scheme to provide the necessary nutrition. In this direction, three schemes may be considered—

1. Relief country and transport thereto.
2. A stored supply of fodder, such as hay, grain, &c., in dumps at one or more centres on the railway.
3. Growth and conservation of fodder on the holding.

Relief Country.—Advocates are not wanting for the construction of the one-time proposed Great Western Railway from Camooweal in a southerly direction through the West of Bourke, in New South Wales, and the extension of our present lines to connect therewith, to allow of the transport of sheep to relief country. When consideration is given to the progress of land settlement which this proposed railway would tend to accelerate, the area of country available for relief could be expected to become less and less as the years went on. The experience in 1926 with sheep on the east coast, the Gulf, and the Atherton Tableland, though satisfactory in individual instances, cannot be considered to have been profitable on the whole. These latter lands, as time goes on and settlement progresses, can also be expected to decrease in available area. In consequence, dependence on relief country as a safeguard against abnormally dry seasons in the future does not appear feasible.

FODDER CROPS.

Storage of Fodder as Hay or Grain at Central Points.—Some consideration was given in 1923 by the Council of Agriculture, and a comprehensive scheme of fodder conservation was submitted to the Government with a view to the preservation of dairy herds during prolonged dry spells.

This scheme suggested the provision of central storage dumps of baled lucerne or other hay, wheaten or oaten chaff in bulk, cereals, &c., at railway sidings, from which supplies could be drawn when needed; some particulars of this scheme were set out in the March issue of the "Queensland Agricultural Journal" in 1923, mention being made of some three and a-half million pounds sterling being required to finance it. The scheme, however, ultimately appears to have been abandoned.

A storage of fodder, such as lucerne or other hay, or grain, at central points on the railway to serve the pastoralists' need would require a large expenditure in the erection of sheds to contain the fodder and silos or other receptacles to hold the grain. The purchase of fodder and grain would be suggested during a season when supplies are abundant and prices low. Allowing that the necessary capital was forthcoming to erect buildings and purchase fodder, it must be expected that the greater demand thus created would tend to increase the market price at which the fodder or grain could otherwise be purchased. Adding to this original cost of the fodder, yearly interest thereon, yearly interest and redemption with upkeep of buildings, &c., yearly insurance premiums, yearly cost of administration, together with freight and handling costs to the holding, it may be expected that the cost per ton when required would approximate that usually paid in the worst seasons. The purchase of fodder, &c., in normal seasons for storage on the holding until required would also for much the same reasons be too expensive to warrant consideration.

Growth and Conservation of Fodder on the Holding.—The improbability of relief country in sufficient area being available, and the ultimate high cost of fodder under any scheme of purchase and storage appearing uneconomical, it remains for consideration to be given to a scheme for the growth and conservation of fodder on the holding.

The fodder capable of growth and conservation on the holding may be summarised as hay from the natural grasses, generally termed bush hay, hay from the cultivated crops, ensilage from cultivated crops, and grain from cultivated crops.

HAY STORAGE.

Bush Hay or Hay from the Natural Grasses.—In any normal season on all holdings there is a luxuriant growth of the natural grasses, which when mown at the right time and properly cured yield a most palatable and nutritious fodder. On the rolling downs where such valuable grasses as "Mitchell" (*astrebla* sp.), "Blue" (*andropogon sericeus*) and "Flinders" (*Iceilma Mitchelii*) predominate, most experienced graziers agree that a yield of half a ton per acre therefrom can be regarded as a conservative estimate on average land, while on the best land this estimate would be considerably exceeded. The grasses most common on the coastal slopes, such as "Kangaroo" (*Anthistina ciliata*), "Bunch Spear" (*Heteropogon contortus*), several "Blue" grasses (*Andropogon* sp.), "Brown Top" (*Pollinia Fulva*), Native Sorghums (*Sorghum Fulvum* and *Plumosum*), &c., can be expected to yield, on a conservative estimate, an average of from 15 to 20 cwt. of hay per acre, with probable increases on the most fertile soils.

Hay from Cultivated Crops.—On the areas devoted to grazing pursuits, largely by reason of a lesser rainfall than is required in general agriculture and dairying, dependence cannot be placed on the rainfall during the winter months in which such crops as wheat, oats, barley, rye, &c., are grown, so that consideration of crops for hay can only be given to those likely to succeed in the warmer months or wet season when the greatest rainfall occurs. Such crops as Sudan grass, white panicum, or Siberian millet, Liberty or Hungarian millet, and Japanese millet are suggested with legumes such as cow peas and velvet beans, as likely to succeed under careful cultivation on the Western Downs, and still more so towards the eastern coast where the average rainfall is greater, while on any holding where there is a sufficiency of water for irrigation, lucerne, the best of all fodders, should be successfully grown. Particulars of these crops in cultivation and yield will be given later.

Curing of Hay.—The nutritive value of any sample of hay depends on the nature and quality of the material from which it is made, the changes and losses, if any, incidental to the process of curing, and the changes which occur after it is stacked. Hay making admits of several variations according to the variety of fodder and seasonal conditions when harvested. There are several conditions which must always be observed to insure a good product. To make the best sample, the crop must be cut at the right time and the curing done so as to secure a bright green colour, good aroma, retention of the leaves and other fine parts, especially in legumes, and absence of dust or mould.

Time to Cut.—The proper time to cut is when the plant possesses the greater amount of digestible nutrients combined with palatability. In cultivated crops, other than legumes, this is indicated by full flowering; in lucerne, when the first flowers appear, or when new growth is starting at the crowns; in other legumes when the pods are well set but not mature. In grasses of perennial habit, more especially those grasses which tend to grow tall and rank, the proper time is just prior to breaking into flower. This is most important since from the time of flowering the amount of woody fibre rapidly increases, digestibility decreases, and palatability in many instances disappears. All pastoralists have experience of the unpalatability of many grasses when well matured especially when the growth has been rank, and, in dry seasons, have been impressed with the indigestibility of an excess of woody fibre in the old grass consumed, when instances of impaction occur. Further, when the plant becomes fully matured, the greater part of the valuable mineral matter contained in the body of the plant during growth passes into the seeds and is consequently lost to the animal when that seed is shed.

In grasses of annual habit, of which "Flinders" affords a good example, palatability is not completely reached until the seeds are fully formed—a probable provision of nature to secure their reproduction. In these cases, cuttings may be deferred until that stage is reached.

The curing of hay lies in the abstraction by drying out of that excess of moisture which would cause deterioration through undue fermentation and the production of fungi and moulds.

The amount of moisture in properly cured hay varies from 10 to 20 per cent., largely in proportion to the crop of which it is made. An indication of a good keeping quality is shown when in stacking it packs well when trodden down. As a general rule, the hay should not feel damp to the hand neither should it be so brittle as to break easily when twisted or bent, while, needless to say, no moisture should be apparent when the stems are twisted.

The time occupied in drying depends on the degree of succulence in the crop and the weather conditions. The dryness and temperature of the soil, the humidity of the atmosphere, and intensity and continuity of sunlight and heat are all modifying factors which continue to prevent any set rule being established. On the Western Downs, where evaporation due to warmth and a very low atmospheric humidity is very great, the curing of hay would be more rapid than towards the coast, where atmospheric humidity is greater. A general fault with hay makers, especially in the North, is to leave the hay out too long before putting it in the stack. With the natural grasses, more particularly in the West, the grass cut in the morning can often be stacked sufficiently cured as hay in the afternoon.

A consideration of the processes the plant undergoes in being cured will be helpful. Various changes rapidly set in as soon as the crop is cut, the most obvious as well as the most important being the evaporation of moisture. After the plant is cut the leaves and stem remain alive for some time, and the leaves continue to draw moisture from the stem if not killed too soon. As the stems are the most difficult to cure, it is obvious that the leaves should be allowed to assist in drawing off all possible moisture. Hence the necessity of protection from the direct action of a hot sun or drying wind by raking into windrows or cocking loosely as early as is directed by weather conditions. On the Western Downs there are days when the mower should almost immediately be followed by the hayrake. Judgment is needed in cocking before the leaves are entirely dried out and their property of drawing moisture from the stems destroyed. Hay cocked in the hot sunshine entraps much warm air, which greatly assists the transpiration of moisture. The size of the cocks will to an extent be governed by the succulence of the material, and they should be narrow and high rather than broad and low. Generally it is not necessary unless rain falls to interfere with the cocks before carting to the shed or stack, but if uncertainty is felt of the completeness of cure of the lower portion of the cock, it may be turned over an hour or so before loading. (Remarks on cocking apply particularly to cultivated crops, as bush hay will be sufficiently cured in the windrows.)

The rate of evaporation depends on the temperature, dryness of the atmosphere, and the total bulk. Therefore, it is very variable, and under favourable conditions is usually rapid. The evaporation of moisture produces a bleaching action which reduces the original green colour; if the material is wet and dried again, it is still further reduced if not entirely bleached. The direct rays of the sun will also have a bleaching effect. A good illustration of the bleaching due to direct sunlight can be gained by wrapping one plant loosely in brown paper and hanging it in the shade, and leaving another exposed to the sunlight until dry. Keen exhibitors at agricultural shows frequently cure portions of various crops for competition as hay or chaff, under cover, with as much light as possible excluded, to retain the bright green colour so desired. During the process of curing fermentative changes occur in the plant, whereby a large proportion of the carbohydrates which are present in the material before it is cut are rapidly resolved into soluble substances; aromatic compounds, probably due to the presence of essential oils, are formed, which, though perhaps of no great food value, impart flavour and render the hay more palatable and inviting. In cold countries seed of the sweet-scented vernal grass is frequently added to that of mixed pasture grasses from which meadow hay is to be made solely for the aroma it is capable of imparting to the hay. The action of rain and heavy dews on hay when curing is to leach out those soluble and aromatic substances with a corresponding loss of nutriment. In experiments carried out in Great Britain it is recorded that as much as 20 per cent. of the nutrients in fresh grass can be lost by weathering. In addition to loss of nutriment, the wetting of hay tends to the production of objectionable moulds, which cannot afterwards be got rid of, and which, while making the hay distasteful, are also at times a cause of digestive troubles. Properly cured hay is very little, if any, less nutritious than the material it was made from at the time of cutting.

Brown Hay.—Brown hay is obtained by cocking before sufficient wilting has taken place or by stacking when insufficient moisture has been dried out; as a result greater fermentation produces sufficient heat to brown or even char the mass. Stacking with excess of moisture due to rain or dew is more liable to produce spontaneous combustion in a stack than excess of the natural moisture contained in the material. This class of hay, though favoured by some users, has nothing to commend it, unless, as in the case of some coarse fodders with hard, thick stems, that, owing to combined heat and moisture, are thereby softened and rendered more palatable. On account of the loss of nutrients in curing, brown hay is not so valuable as the bright green sample, and its production is not commended except in weather that will not admit of curing in the proper manner.

HAY MAKING.

Successful Hay Making.—To sum up, the necessary operations in successful hay making are to—

Cut at the proper stage of growth when all dew is off;

Rake into windrows or into cocks as soon as sufficient wilting occurs;

Allow as much access of air as possible without direct sunshine amongst the curing mass;

Leave not more than from 10 to 20 per cent. of moisture in the finished article;

Prevent wilting by rain or dew at any time after cutting.

While stacking hay, it is a common practice to sprinkle salt and sometimes lime amongst it; the addition of these substances tends to check fermentation and to prevent the growth of moulds. In properly cured hay, these additions are not essential and their use can only be commended when incompletely cured hay has to be stored in bad weather, or in country where it is desired to supply salt to the animals.

Haymaking Machinery.—A considerable number of years ago, though still within the memory of many settlers, haymaking operations were conducted almost wholly by hand, thus necessitating the employment of much labour in the use of sickles or scythes, hand rakes and forks, then the only tools in general use. Since then, the evolution of haying machinery, such as the mower, reaper and binder, horse rake, hay sweep, hay loader, and hay stacker, allows the making of a maximum amount of hay with a minimum of labour.

Mowers.—For making hay on a considerable scale, and especially for bush hay, those of heavy type with a 6-ft. cut are to be preferred. The area which can be cut in a day depends on the nature of the crop, the frequency of turns, and the presence of obstacles to be avoided. A heavy growth of bush grass in which many tough stems of the previous year's growth had to be cut would naturally increase the draught and decrease the speed of the team. On the open downs of the West where no obstacles are encounterd and where the growth allows of between, say, 10 to 15 cwt. of hay per acre the work of cutting would be easy. Travelling an average of $2\frac{1}{2}$ miles per hour throughout a day of eight hours the team of two horses would negotiate 20 miles and cut slightly over $14\frac{1}{2}$ acres. This area could also be allowed in cultivated crops which, though heavier in yield, offer in cheir succulent stems less resistance to the knives of the machine. Where the mowing machine is fitted to and worked by a tractor the average speed and the area cut would be much increased.

Reaper and Binder.—A machine of this character, which cuts and mechanically binds the crop into sheaves, is not recommended on pastoral areas for hay making, as much more labour is required in subsequent handling to the stack. On agricultural farms it is useful where the crop is to be threshed for grain and the straw saved or the crop cut for chaff to be marketed, as feeding into the chaffcutter with sheaves is easier, and a better cut sample obtained than with loose hay. In districts where the weather is not dependable it is also useful in hay making, as the stooks of sheaves can be more easily protected and are subject to less damage from rain than loose hay in the windrow or cock.

Hay Rakes.—These are of several designs, the most common being that drawn with a single horse which collects the hay in its progress until a sufficiency is gathered, when it is dumped by hand or by mechanical means. Other designs which are an improvement are left and right hand delivery requiring two horses, which gather the hay from the swath and deposit it in a loose condition in windrows, making one windrow to each swath. The left-hand side delivery rake which does the work of a rake and tedder as well, finds most favour, as, working in the same direction as the mower, it deposits the hay on clean stubble in a loose condition with most of the leafage covered up within the windrow. A possible disadvantage in a light crop is that the windrows being limited to one swath would be rather thin; however, where the area cut would be sufficient for two rakes, the use of a left and a right hand delivery would allow two swaths to be put into one windrow.

Hay Loader.—This is a machine that is attachable to a wagon, behind which it is drawn over the swath or windrow; the wheels of the loader in motion drive the mechanism, which picks up the hay cleanly from the ground and elevates it on to the wagon, where it is spread by a man with a fork, while another drives the team until the wagon is fully loaded. The loader can now be detached from the loaded wagon and attached to an empty wagon, which will continue loading operations while the first proceeds to the shed or stack.

A machine of this description is useful when the hay has to be transported some considerable distance to the stack or where it has to be stacked in a shed where a hay stacker cannot well be used.

Hay Sweep Rake.—For rapid transport of hay from the field to the stack when the distance covered is short, these implements are a great saving of time and labour. The rake consists of a platform some 12 feet wide, composed of wooden teeth about 8 feet long by 2 inches by 2 inches, set with centres 12 inches apart, the points of which can be lowered or raised at will by a lever control from the driver's seat. In action the points of the teeth are lowered and the platform forced under the windrow or cock until fully loaded, when the front is raised and the load transported to the hay stacker or elsewhere required. In unloading pins are driven into the ground at the back of the hay and between the teeth, when the implement is backed out until its platform is clear. The most popular type is that in which the two horses are hitched at the rear and propel the machine with the rake or platform immediately in front.

In heavy crops two of these hay sweeps are usual to deal with the cutting of one 6-foot mower, but in a light crop, such as in bush hay in the West, it is considered three of them could handle the cutting of two 6-foot mowers. A load up to 5 cwt. of hay can be carried with ease on each trip.

Hay Stackers are of various designs. Usually a long lever is attached to a mast, with the longer end fitted with a platform to hold the hay, resting on the ground. To the shorter end is attached a rope through a system of pulleys which, giving advantage, enables the horse pulling on the rope to lower the short end, thus elevating the platform with the load of hay over the stack on which it can be dumped where desired. The most approved type is built on a sledge or slide, allowing it to be moved readily to any portion next the stack. By its use stacks over 25 feet in height can be built.

One man with a horse can control the work of the stacker with three or four sweep rakes bringing in the hay, while two men are sufficient on the stack. The load from the hay sweep rake would be transferred to the stacker by projecting the platform of the former over that of the latter, inserting the pins as previously described, and backing the sweep rake out. The stacker can elevate any load that could be brought in by the sweep rake.

Hay Making Costs.

Cost of Making and Stacking Hay.—Assuming, as is estimated, 10 cwt. of bush hay can be secured from an acre on the Western Downs, and that each mower would cut 14½ acres per day, the cost of a large stack, allowing 20s. per day as wages for men and 2s. 6d. per head per day for horses, could be set down for each 14½ tons:—

	£	s.	d.
Two men and four horses mowing	2	10	0
Two men and four horses with rakes	2	10	0
Three men and six horses with hay sweeps	3	15	0
One man and one horse with the stacker	1	2	6
Two men building the hay stack	2	0	0
	£11	17	6

A cost of a fraction of a penny under 15s. 9d. per ton.

With a heavier yield per acre which the same equipment and labour could deal with, a decrease in cost would result.

Cost of Haying Equipment.—The cost of the machinery equipment considered sufficient to make and stack up to 400 tons of hay in a period of six weeks, on the use of which the estimate of 15s. 9d. per ton was based, according to a recent quotation f.o.r. Brisbane, would be approximately:—

	£	s.	d.
Two 6-feet cut heavy mowers, at £40 each	80	0	0
Two side delivery hay rakes, at £42 15s. each	85	10	0
Three hay sweep rakes, at £28 each	84	0	0
One hay stacker, at £39	39	0	0
Sundries and spare parts, say	11	0	0
	£300	0	0
Add fifteen sets harness, approximately	60	0	0
Add freights and transport to the holding, say ..	40	0	0
	£400	0	0

With reasonable care this equipment would last for many years. Allowing for interest and depreciation thereon an addition of 4s. per ton, when 300 tons was made, would need to be added to the cost of putting hay in the stack, making with the previous estimate a total of 19s. 8d., still under 20s. per ton.

Hay loaders are priced at £52 5s.; the use of one of these would require several wagons or motor lorries for transport according to distance, but would dispense with the purchase of the three hay sweep rakes costing £84. Hay presses are priced as one-horse power £95, and two-horse £133 and £152, according to size. Its use in the field would dispense with the cost of the hay stacker (£39), but require means of transport for the baled hay, in which a ton motor truck would probably be sufficient.

An Alternative to Stack Building.

Baling Hay.—An alternative to building stacks in the field or in carting loose hay some distance to where storage is desired and then building into a stack may be considered in the baling of hay in the field for storage at or near the homestead.

Hay presses are made of various sizes, from that worked by one horse with a capacity up to 10 tons per day, different sizes worked by two horses with capacities ranging from 10 tons to 15 tons per day, to those worked by engine-power pressing up to 30 tons per day.

The weight of bales turned out depends on the size of the bale, chamber of the machine, the amount fed in, and the different kinds of hay, and may be from as low as 50 lb. with the smallest press to 160 lb. each with the largest.

Large sheds would naturally have to be provided to store baled hay, but this extra expenditure might be counterbalanced by the lesser space occupied by the baled hay and the greater facility with which it can be taken out and fed to the stock.

Stack Building.

Building Hay Stacks.—Stack building is recognised as more or less an art of farming, expertness therein only being gained by practice. It is advisable to have a foundation laid on which to build the stack in order to keep the hay from contact with the soil, as thereby some of it is likely to be spoilt. Failing logs, poles, or such like timber, stones, if handy, would make a good substitute. The more circulation of air under the stack the better. In building the stack it is advisable to engage the services of experienced men, more of whom are available in pastoral districts than might be thought. The chief points when building are to keep the centre a little higher than the edges, to keep the walls plumb, and to use the rake freely on them to straighten projecting straws and turn them in a downward direction to run water off and to keep beating rain from entering. Straight poles may be used at the corners and elsewhere, as guides to keep the corners correct, sides straight, and walls plumb, of course being removed when the stack is completed.

While the length of a stack will be governed by the amount of material to be stacked, the width and height will be limited to those dimensions within which the stacker or elevator can lift and deposit the material. When preparing the top of the stack for the covering, especially if thatch is to be used, care should be exercised to see that an even surface without hollows or bumps is maintained, and that in the completed roof there will be a good pitch to run the water off.

Covering Stacks.—As haystacks erected as a standby in time of fodder shortage may not be required for some years their covering to prevent damage from rain is a matter of importance.

Thatch.—Expertness in thatching can only be gained by careful observation and practical experience. Of great importance is the material which may be used. The straighter, longer, and tougher the material the better and more lasting it will be found. On the Western Downs the best material available will be the cane grass usually plentiful near creeks; bulrushes also suggest themselves, but would be probably expensive to secure owing to the necessity of cutting them by hand. On cattle areas, especially on the Eastern coastal slopes, there are many tall-growing fibrous grasses which should answer admirably.

The material to be used should first be thoroughly dried, the loss of leaves and seed-heads being more of an advantage than otherwise, as the flow of water will not be obstructed thereby. An illustration of the manner in which thatch is expected to shed water can be noted by pouring water on a straight, slanting stick. It will be noted that a certain proportion of the water will flow along the stick to the end before falling off, whereas if the stick were held horizontally all the water would fall off before reaching the ends, hence the advisability of giving a good pitch to the thatched roof.

Wet material will sit better and pack tighter than dry material, for which reason experienced thatchers always prefer to damp the heap of thatching material by pouring buckets of water over it; it is then trodden or beaten down to loosen leaves, &c., as well as to compact the mass, so that the straws grasped in a double handful from the bottom, and drawn out by a quick pull first to one side and then to the other, come out in straight lengths.

Thatching is started at the eaves with a double layer to allow a projection beyond the walls to throw water clear; layers of thatch are then put on much in the same way as slates or shingles are placed on a roof, being secured with binding cord or wire held down by pegs about 2 feet long driven horizontally, not vertically, into the stack, and the layer of thatch then combed down with a special rake to keep the straw straight. While thatching is in progress all hollows or bumps should be levelled to make the thatch sit properly, and so best perform its function. A medium coating of thatch well laid will throw off water much better than a larger quantity indifferently laid.

A smart appearance is added to the stack, and water better thrown off, by the even and correct trimming of the eaves, the outer straws of which should slightly project beyond those immediately under them, so that viewed from beneath the projecting thatch appears to be cut horizontally from the outer edge to the wall.

Corrugated Iron.—As an alternative to thatch as a covering for haystacks, corrugated iron may be considered. As a waterproof material and in length of service there is no doubt of its superiority to thatch, so that the question to be considered is that of cost. While thatch can only be used once, corrugated iron, with reasonable care in handling, can be used many times over, in consideration of which it would not be reasonable to charge the total cost of the iron against the stack each time. Probably 15 per cent. of the landed cost of the amount used, added to the cost of placing on the stack, would form a fair comparison with the cost of procuring the thatch and placing it on the stack. In the Western districts, where thatching material is not as a rule easy to secure and the labour of expert thatchers costly, it will probably be found that the use of iron will be more economical as well as more satisfactory.

The use of iron on a stack does not necessitate any timber for supports, for the hay can be so distributed as to allow the iron to sit snugly on it.

A curved roof is suggested as likely to be the most satisfactory and easiest to put on. The sheets would need to be curved to form a semi-circle to suit a slightly larger diameter than that of the stack, so that the edges would project a little over the sides of the stack to throw the water clear. Each sheet being exactly the same curve as the others should have the bolt holes in exactly the same positions and of exactly the same size, just large enough to receive the bolts used to keep them in place, six being suggested as sufficient in each sheet. The bolts suggested are those generally used with corrugated iron on curved verandas, but, as the nut would require to be screwed on from the top, a lead washer is suggested on either side of the iron as tending to make it more watertight, while a little paint on the top of the nut and projecting thread of the bolt will prevent rust and allow ease in removal and subsequent use.

It would appear advisable to place the first sheet on the top, adding to both sides at the same time while correcting inequalities on the surface of the hay, which should be stacked as nearly as possible to conform with the curve of the roof to make the roof sit snugly.

When all the sheets of iron have been put on the stack and bolted together to completely cover it, a length of 1½-inch or stouter angle iron could be bolted along the sides 6 inches or so from the edge to make for greater stability. To this end 24-gauge iron would be preferable to that of 26-gauge for the roof. As this roof would fit snugly on the hay there would be little likelihood of its being blown off in a gale of wind, but an additional precaution could be effected by passing a stout wire or wire rope over the roof at each end and in the centre, and attaching it to heavy weights or long stakes driven into the walls of the stack.

Protection of Stacks.

Fire.—The greatest danger to which haystacks are subject, especially when built in the open, is that from bush or grass fires. Cropping during the wet and fallowing during the dry season an area round the stack offers the best precaution, while a number of smaller stacks offers less risk of total loss than one large one.

Vermin.—Mice and rats are partial to haystacks as domiciles, especially when seed is contained therein; plagues of these rodents also are liable to appear in most districts, when a great deal of damage might be effected. A sure protection against their entry could be effected by a fence made of sheets of galvanised iron, up which the rodents cannot climb, sunk about 6 inches in the ground and leaning outwards from the direction of the stack, special care being taken with the corners. An additional precaution against those gaining entry when the stack was building could be taken by laying poison round the base of the stack in such a manner that the portions not taken could be collected before any part of the stack was used.

CULTIVATION OF PARTICULAR FODDER CROPS.

Soils.—Naturally the best soil in the handiest position on the holding will be chosen for the cultivation paddock. Where alluvials obtain in sufficient area on river or creek banks not subject to flooding in ordinary seasons, choice of site is easily arrived at. Failing alluvial, the experienced settler will choose a well-drained flat or gentle slope with a reasonably deep soil, the fertility of which will be indicated by the kind of trees growing thereon and the manner of their growth, as well as by the quality and growth of the grasses or herbage present.

On all holdings areas are to be found sufficiently fertile to grow satisfactory crops, yet the addition of animal excreta from the stock or sheep yards will effect a good improvement. Most of the soils in Queensland in districts of light rainfall are deficient in humus and decaying organic matter; the addition of this not only enriches the soil from the amount of plant food thus added, but renders the soil more friable and easier to work, capable of retaining more moisture, and keeps it at a more even temperature, as well as supplying bacteria recognised as of great soil value in the growth of crops.

Most of the soils will be benefited by the use of a phosphatic fertiliser, since phosphoric acid is the necessary element of fertility usually shortest in supply; on country where the cattle are bone chewers, sure indication of its shortage is thereby given. Quantities of 50 to 100 lb. of superphosphate to the acre in drills with the seed, or 200 to 300 lb. to the acre broadcasted and harrowed in when seeds are sown that way, are considered useful applications and likely to produce profitable results on most classes of country. Other phosphatic fertilisers that might be used are suggested in basic superphosphate, ground Nauru phosphate rock, and meatworks manure. Experiments on small areas, advice on which is available from the Department of Agriculture, will indicate the kind of fertiliser most suitable and the quantity to supply.

The brown soils of the rolling downs country is particularly rich in lime, and will be greatly benefited by the sheep droppings from yards and shearing sheds, while superphosphate in the quantities named may be expected to yield additional profit.

Field Practice.

Preparation of Soils for Fodder Crops.—Few soils should be ploughed deeper than 6 inches for fodder crops, as the humus and decaying organic matter, except perhaps in alluvials, is almost wholly contained within that depth, which also comprises the depth wthin which the bulk of the roots of the fodders to be grown exercise their functions. Ploughing is most effectively done when there is some moisture in the soil, and new land should be broken up some months prior to seeding to allow the fibrous roots of the natural grasses to decay and to sweeten the soil, and reploughed just before planting time. The use of the medium-weight harrows after ploughing will break up the soil to the fine tilth necessary when sowing seed. A thorough preparation of the soil is always of advantage. Seeds are either sown broadcast and covered with the harrow or sown in drills with a planter, to which can be affixed a fertiliser distributor.

Broadcast crops, beyond a possible harrowing or light rolling in some cases, require no further cultivation, while those sown in drills are benefited by scuffling between the rows until the crop is too high for further work.

Cultivation of crops generally means keeping the surface soil, where possible, between plants in a loose and fine condition for a depth of 2 to 3 inches, by which the soil is aerated, weeds are kept down, and evaporation of moisture is retarded.

Equipment and Cultivation Costs.

Farm Implements Needed.—The minimum number of implements for an area of about 60 acres on which fodder crops are to be grown are suggested, with approximate costs, as—

	£	s.	d.
1 2-furrow disc plough	30	0	0
1 set 4-horse equalisers and bars	5	2	6
1 set 4-leaf medium zigzag harrows	8	8	0
1 set 4-horse bars	3	0	0
1 single seed and fertiliser drill	13	10	0
1 double row cultivator	37	10	0
	£97	10	6

to which must, of course, be added cost of transport to the holding. Harness has not been added to this estimate, as it was provided for in the estimate of haymaking equipment.

Where, as in the case on many holdings in the West, a light tractor is used in making firebreaks, use of it also could be made in ploughing and harrowing.

Farming machinery is of many makes and prices; it may be possible to buy the equipment just mentioned at a lower price than that set down, while certainly higher prices can be paid.

Costs of Cultivation.—Amongst farmers great disparities exist in their estimation of the various costs of farming operations; all conditions being fair, using the equipment mentioned, the following costs should not be exceeded for the acre:—

	£	s.	d.
First ploughing, 2 acres per diem	0	15	0
Second ploughing, 2½ acres per diem ..	0	12	0
Two harrowings, 10 acres per diem ..	0	6	0
Sowing seed, 6 acres per diem	0	3	4
Harrowing to cover 10 acres per diem ..	0	3	0
	£1	19	4

Say a maximum of £2 per acre when the crop is broadcasted. When the crop is sown in drills necessitating cultivation between rows, allowance for such cost with the two-row cultivators must be made in three cultivations, at 8 acres per diem at 11s. 3d. per acre, making a total of £2 10s. 7d. per acre or, in round figures, £2 per acre for broadcasted crops, and £2 10s. for crops sown in drills, to which must be added the landed cost of the seed, which varies according to the crop.

Average Rainfall.—Taking the official recorded average of rainfall in districts devoted wholly to pastoral pursuits, it will be found that the only months in which a rainfall sufficient to permit of the successful growth of certain crops might be expected are December, January, February, and March. Sowings of seed would therefore not be advisable after mid-February, but preferably as early as possible after or immediately before the first good fall in December or January.

As previously mentioned, unless irrigation is practised, this rainfall will only permit of consideration being given to those crops succeeding in the warmest part of the year.

FORAGE CROPS FOR HAY.

Sudan Grass.—Probably this crop will be found to be the best of all crops for storage as hay in districts of light rainfall; it not only yields a heavy crop when the rainfall is sufficient but is a good drought resister, a quick grower, and, where the season permits, will yield more than one cutting. In addition to the heavy yield Sudan grass is very palatable and relished by all kinds of stock. Being a member of the Sorghum family there is a possibility of poisoning in the early growth, but at the time of flowering all poisonous properties disappear, from which period in its growth it can be profitably fed either green or as hay. Cuttings for hay should be made as soon as possible after the first flowers begin to show; if left longer the nutritive ratio widens and the subsequent cutting is not so good. In this connection it may be noted that nature's province is reproduction, and that, while it can, a plant will make growth in an effort to produce seed. Proportionate to the energy devoted to seed production up to the stage of cutting, so may the subsequent growth be affected. Sudan grass makes the most rapid growth under hot conditions, and in the warm months, under sufficient rainfall, the first cutting may be expected in from eight to ten weeks after germination of the sown seed. Subsequent cuttings should be allowable about every six weeks after the first cut, provided there is sufficient moisture in the ground, or irrigation is practised, until cold weather sets in, when growth is much slower if not brought to a standstill. Though the plant will frequently last over a year when seasonable conditions are suitable, it is best to sow seed each year.

The market price of the seed varies according to supply from 3d. to 9d. per lb.

When broadcasted 20 lb. per acre is suggested, and when sown in drills 10 to 12 lb. per acre. Drills should be just far enough apart to allow of intercultivation, 24 to 36 inches being usual.

The broadcasted crop should be harrowed when the growth is about 6 inches above ground, and after each cutting to kill out any weeds, while the drilled crop should have two or more scufflings during the growth of each cut. Yields will depend on the season and quality of the soil, but 1 ton upwards of hay per acre can be expected from most cuttings.

Liberty or Hungarian Millet, sometimes known as Golden Millet, also Foxtail Millet, and frequently miscalled White Panicum, and Giant White Panicum, is botanically known as *Setaria italicum* and *Setaria italicum* var. *germanicum.* It is easily identified from other so-called millets by its cylindrical seed-head tapering to a point.

This crop is usually sown broadcast at the rate of 16 to 20 lb. per acre, when it is desired to make hay from the crop. Seed costs from 3d. to 9d. per lb. according to market fluctuations. It is a quick grower and provides a palatable and nourishing fodder, the first cutting frequently being made in from six to eight weeks. Occasionally a second cutting can be made if the season is propitious. Yields of from 1 to 3 tons of hay per acre might be expected. For hay the crop should be cut just as the flower heads are emerging.

White Panicum, known also as Siberian Millet, is a very valuable crop for feeding off in its young stages. As a hay crop it gives excellent returns under good seasonal conditions, frequently yielding up to 4 tons of hay per acre. Like Hungarian millet it should be cut when just breaking into flower, when it is possible to get a second cutting. The first cutting can generally be made between six and eight weeks' growth. Sowings should be made broadcast at the rate of 16 to 20 lb. per acre. Seed is usually procurable at 3d. or 4d. per lb.

Japanese Millet is a close relation to White Panicum, though under some conditions it may not yield so well. The same remarks as under White Panicum otherwise can be applied.

In making hay from Sudan grass and the millets mentioned a longer time is taken in curing than with natural grasses, owing to their greater succulence or moisture contents. It will be advisable to cure these crops in cocks after wilting in the swath and raking into windrows. A good indication of cure, in addition to that described previously, will be found in a shrinkage at the nodes or joints of the stems.

Legumes.—The value of legumes such as clovers, trefoils, &c., in the pasturage is very well known; equally valuable is their presence in a mixed hay or as a hay to be fed in conjunction with hay from non-legumes; this feeding value is due to their higher content of proteins, which tends to narrow the nutritive ratio of a mixture and permit of successful nutrition with a lesser quantity.

Cow Peas.—There are many varieties; those chiefly on the market at present being Black, Clay, and Blackeye or Mottled, but better varieties are to be found in Groit, Brabham, or Victor, which in trials in North Queensland have proved more vigorous growers and yielders. Sowings should be made thinly in drills, at the rate of 8 to 10 lb. per acre, as early in the season as possible; germination is very quick, usually about three days, while under heat and moisture the growth of plant is very rapid. Cultivation should be effected between the rows of plants until they start to run, when they will quickly cover the surface of the ground. The nutritive ratio of legumes does not alter in later growth as is usual with non-legumes, so there is not the same necessity to cut at a particular time. However, it is usual to cut when the pods are well set but not ripe. Later cuttings, though giving heavier yields, will be found with much more fibrous stems. Though yields of green fodder, of from 10 to 20 tons per acre, have been obtained in the North, equal to from 3 to 6 tons of hay, a reasonable return may be set down in a fair season as from 1 to 3 tons of hay per acre. From 20s. to 30s. per bushel of 60 lb. is the usual price of seed.

Velvet Beans.—Except the Mauritius variety so largely grown as a green manure in the sugar districts, the velvet bean has not been extensively grown in Queensland. The varieties Early Georgia, Early Arlington, and Early Black, though vigorous growers are finer in the stems than the Mauritius variety and better adapted for conservation as hay.

The seed which is about the size of a small marble should be sown in drills 3 feet apart, single seeds being dropped therein 8 to 12 inches apart, allowing 12 to 15 lb. of seed for the acre. Cultivation should be practised between rows until the plants run and the crop cut when the pods are setting, as longer growth yields more fibrous stems. Though not so quick growing as cow peas, cuttings can usually be effected in twelve weeks from the time of sowing the seed. The yield of hay per acre can be set down as from 1 to 3 tons.

As both cow peas and velvet beans are inclined to run together into a tangled mass, they may be considered difficult to harvest; a knife divider on the mower which would be followed by the side-delivery rake will allow satisfactory cutting, after which subsequent operations will not cause much trouble. It should be remembered that in hay making great care in handling is necessary with legumes, so as not to lose the leafage and fine parts which are the most valuable.

CROPS FOR ENSILAGE.

The crops most suitable for ensiling are those with solid, succulent stems which yield a good tonnage per acre combined with palatability and food value; maize, sorghum, teosinte, and pearl millet are examples that might be considered with or without legumes.

Maize occupies first place in popularity where it can be successfully grown, but can be ruled out in almost the whole of the pastoral areas as a suitable crop, since during growth it will not stand up to a dry spell, and requires a more certain rainfall than can usually be depended upon.

Teosinte and *Pearl Millet* can be ruled out for much the same reason as maize, and also for their inferiority in palatability and food value in the maturer stages to sorghum.

Sorghum.—Of all crops for growth in the warmer months in all pastoral districts where the rainfall is unreliable or insufficient for maize, sorghum stands out as easily the best, not only for palatability and nutritive value but for yield.

There are two classes of sorghum, respectively termed saccharine and grain, with many varieties of each. Saccharine sorghums have a sweet, succulent stem, while the seed or grain is more or less bitter to taste; Honey, Sacchaline, Planters' Friend (or Imphee), Early Amber, and Orange are well-known varieties.

The grain sorghums have frequently a pithy stem, especially when matured, while the juice therefrom is not sweet; they are valuable for their yield of grain, which in total nutritive per cent., though a little lower than maize, is higher in proteins, and consequently of narrower nutritive ratio. Such varieties as Kafir, Milo, Feterita, and Kaoliang are well known and popular. These grain varieties possess a good fodder value in the whole plant up to the time of flowering, but when the seed is mature the balance of the plant has lost most of its nutriment.

A third class might be considered as in the broom millets, which are varieties of sorghum but valueless as fodder crops, and only grown for their heads, which are used in making the well-known millet brooms after the seed has been threshed off.

For ensiling, the saccharine group merit most consideration. The best variety for any district will only be arrived at by experiment, but in the warmer districts Honey and Sacchaline might be expected to give the heaviest returns. Pure seed is not always in good supply owing to cross pollination by bees and other insects when varieties are grown in proximity. Seed is usually obtainable at from 3d. to 6d. per lb.

Sowing in drills 3 feet apart is advised, when 5 to 8 lb. of seed per acre will be required; this is most satisfactorily effected with a corn drill, such as the Farmers' Friend, when fitted with a sorghum plate. A harrowing of the area three days after the seed is sown will allow the young plants to come up in a clean seedbed; within a fortnight thereafter the cultivator should be worked between the rows, and the soil kept loose and fine to a depth of 2 or 3 inches, until the crop becomes too high.

All sorghums contain a poisonous principle prior to flowering, before which they should not as a rule be fed. At and after flowering they can be fed without any danger.

For ensiling, a start in harvesting should be made when in flower. A cheap and effective means of cutting will be found in a slide or sledge narrow enough to go easily between the rows and decked with light boarding; a scythe blade is securely attached to the near or left-hand side, preferably through a mortice in the frame of the slide, at an angle adapted to give a slicing cut to the stalks when the slide is pulled forward. A guide rod fixed to the side will allow the stalks to be laid down in a regular swath from which they can be easily loaded on to the slide or wagon, and subsequently handled at the silo.

Crops thus grown can also be cut by hand with a cane knife.

If the season is propitious, sorghums cut at the flowering stage can be expected to make sufficient growth to allow a second cutting. Yields may be expected from 8 to 15 tons per acre from one cutting, but instances of up to 34 tons per acre have been recorded in North Queensland.

Legumes for Ensilage.—As an admixture with sorghum, legumes such as cow pea or velvet beans are valuable in narrowing the nutritive ratio by their high protein content, and are to be commended in that direction. Cow peas would best be grown separately, but velvet beans, which readily climb the sorghum stalks, may be sown in the drills with the sorghum, say, three weeks after its germination by single seeds at intervals of 3 feet. Growth in this manner, it is expected, will not unduly interfere with harvesting operations and will permit of a more intimate admixture in the silo than if fed in separately.

Grain Crops.—As a crop to provide grain for storage in dry times, to feed to stock, including poultry, at any time, or to grind into meal for human use, the grain sorghums stand unrivalled. Cultivation and rate of seeding is similar to that given for the saccharine class, but harvesting, of course, is delayed until the seed is ripe, when it can be detached from the stalk by a hackler driven by hand or engine power.

Yields of half a ton and upwards per acre may be expected under favourable conditions.

With Red Kafir, in the Pentland district, a yield of 2 tons of grain was estimated on the acre, while this has been greatly exceeded in other instances. The variety best suited to each district must be decided after comparative trials, but Kafir, Kaoliang, and Feterita may be suggested as likely to give good results in most districts.

ENSILAGE.

While the curing of a fodder as hay entails the drying-out of sufficient moisture from the crop to ensure that no injurious fermentation or the production of objectionable moulds shall occur, the curing of a crop as silage demands that the natural moisture or juices of the crop shall be as far as possible retained.

The curing of a fodder by the evaporation of its moisture is easily understood, but possibly the factors governing the making of silage are not so well known.

When green forage is cut, fermentation at once sets in, due to the enzymes contained in the plant cells and to bacteria and yeasts retained on the surface of the plant, and if immediately placed in a large heap, thus preventing quick evaporation, as in hay making, much heat is engendered. Should this fermentation be allowed to continue, putrefaction would occur and the material would become worthless except to return to the soil as a manure. The effect of the fermentation during the ensiling of fodder plants is to alter many of the compounds in the plants, such as converting part of the sugars to lactic and acetic acids, &c., which processes are of more interest to the scientist than to the practical stock-feeder. It is sufficient to state that, although the fermentation and heat thereby engendered soften and render perhaps more digestible the harder parts of the stems of the plants used, it does not increase the food value of the silage, while if left to go on too far it certainly lessens it. The object then in making silage is to check the fermentation as far as possible; this is effected by the exclusion of air, from which the oxygen necessary for the progress of fermentation is derived.

Sweet and Sour Silage.—These terms were applied to the material which had experienced a greater or lesser degree of fermentation before such had been arrested. Thus, if the progress of fermentation and consequent generation of heat is slow, more of the sugars will be converted into acids, forming a sour silage, while if the opposite to the case a sweet silage results.

Generally speaking, sour silage occurs in material that has not attained a greater degree of heat than 130 degrees Fahr. On the other hand, when fermentation is rapid and the space confined, a greater degree of heat is quickly reached when at 140 degrees Fahr. Lactic fermentation ceases, and at 160 degrees Fahr. all the organisms will have been destroyed and fermentation arrested until the temperature is lowered and air is allowed access to the fodder. At one time opinions were divided as to the merits of sweet and sour silage, thermometers being used to assist in the control of temperature in the mass, which was effected by alteration in pressure. Investigations however have shown that, except for horses, to which sour silage is injurious, there is little to choose between each in food value, while, if in making sour silage lactic fermentation is allowed to proceed too far, butyric acid will be formed, creating an objectionable smell and taste, as well as rendering the silage inferior. Nowadays there is no particular desire to make sour silage, and if definite rules in the construction of silos and the filling in of the material are followed, the fodder is conserved as silage in its best condition both in palatability and food value.

As previously mentioned, the exclusion of air is the necessary operation in successfully ensiling fodders. This is effected usually by compacting the mass by simple pressure, such as a quantity of earth or by chaffing into a container and tramping down, when, owing to the material sitting so closely, air is excluded and only a few inches on the top are exposed and wasted.

Silos and Silage.

Stack Silage.—Silage can be made by stacking the material and applying pressure either by mechanical means or simply by placing a quantity of earth or other heavy material on the top. Full particulars are given in a pamphlet issued by the Department of Agriculture, "Some Notes on Silage with Special Reference to Stacks," compiled by the Director of Agriculture, Mr. H. C. Quodling.

As, however, there is a greater loss of material in the making, due to exposure of all the four sides of the stacks, they are only recommended in emergency, such as when a maize crop fails for grain, when they should be used within a year of erection, though in the case of large stacks they may be effective for a longer period. For storage of fodder over some years, as a safeguard against dry seasons, they are not recommended.

Pit Silage.—A cheap form of pit silo, in which to conserve the fodder whole, is often made by excavating a trench with plough and scoop, in which it is recommended the breadth should not be more than half the length. Choice of a site will be made of a situation where rainwater will not penetrate from the top or seep in from below ground level, the crest of a rise being most favoured, provided excavation can be made to a suitable depth. The sides are cut plumb, while the ends are sloped upwards from the bottom, which should be as deep as will allow of the carts, with the material, being drawn in and out. About 60 cubit feet should be allowed as space for a ton of silage when calculating the size of the proposed excavation. When filling, the carts loaded with the material are drawn into the pit, where the material is tipped, successive loads being drawn and tipped over the fodder, thus compressing it until the pit is filled and the fodder heaped above the surface of the ground. The earth from the excavation is now placed on the heaped fodder to a depth of at least a foot, so sloped as to throw off the rain, and the operation is complete, except that a watch must be kept when settlement is taking place to see that no cracks that might let air in appear in the earth covering. On clayey soils, such as is common on the rolling downs, which in dry weather contract, forming deep cracks, this form of silo does not appear suitable, as air and water would thereby gain entrance to the fodder. On country where the soil does not crack they may be made. It is thought, however, where silage conservation is to be commonly practised, silos in which the fodder is chaffed will in the end prove the more economical.

Cylindrical Pit Silos.—In situations that will permit of the excavation of a cylindrical pit with smooth walls to a depth of from 20 to 30 feet, where the earth or decomposed rock will not fret away, and where water will not seep in, very cheap silos can be constructed. Beyond a collar at the top to prevent the surface soil breaking away, no further lining is required. This collar, preferably 4 or 6 feet in depth, can be made with sheets of corrugated iron bent to form a circle about 2 inches greater in diameter than the pit beneath its position. Bolted together in position, and plastered inside with a facing a little more than sufficient to fill the corrugation, of a mixture of two parts fine sand to one part of cement, when completed, the wall of the collar should allow the full depth of the wall of the pit to be plumb.

If considered advisable, the collar could be continued to make a complete lining for the pit, when a concreted floor would make a watertight compartment. It may be thought that a wall of this thickness would be too weak; the lateral thrust of silage when settling has been estimated as 350 lb. to the square foot where the depth of material is 26 feet. As the wall in question would have the backing of the solid earth, no effect would result from this pressure, while it could be expected to withstand any pressure of water from without.

Square pits are not recommended, as it is difficult to get compression and prevent air spaces in the corners, while the walls are very much less strong than when cylindrical.

Overground Tub Silos.—Where the underground silo cannot be economically excavated or where from other reasons one or other of such forms is undesirable, consideration perforce must be given to overground erections. Cylindrical forms are in all respects the best, not only in strength but in satisfactory filling, since the absence of corners allows the material to be evenly packed with the absence of air spaces, unavoidable at the corners of other shapes, while the settling of the material will be more even.

Such silos can be made of wood, wood and iron, or of reinforced concrete. Wood and iron silos have too short a life to warrant serious consideration.

Silos of wooden staves with stout iron hoops are serviceable, but the cost of the timber with transport charges to the holding, together with the painting occasionally of the outside walls and the dressing of the inside walls each time they are emptied, totals a cost in the vicinity of one of reinforced concrete. Wooden silos are liable to damage from white ants and fire while they have a life, against which reinforced receptacles are everlasting and practically indestructible.

On pastoral areas near or on the eastern coastal slopes, as well as in many parts of the Gulf districts, material for concrete is more or less easily procurable from creek or river beds, but on such areas on the rolling downs sand or gravel is usually unobtainable from such sources except at great expense in transport. A solution of the difficulty has been suggested in breaking up the pebbles or other stone available on or near to every holding in a stone crusher. When portion of the crushed material is put through a second time, with the crusher set to the smallest gauge, it is thought a sufficiency of fines would be secured to make up a suitable aggregate.

Plans and specifications of reinforced concrete silos of different sizes may be had gratis from the Department of Agriculture, and also, where payment of freights both ways and care in use is promised, moulds for certain sizes will be loaned without other cost.

Taking all things into consideration the reinforced concrete silo appears to be the most economical, and can be considered as a permanent improvement on the holding.

Sizes of Silos.—The size of a single silo will be governed by the number of stock to be fed. Whatever the type, a certain area must be exposed when the material is being fed. Silage quickly detriorates if exposed to the air for more than twenty-four hours, consequently it is imperative for best results that a thickness of 3 inches of the exposed surface should be removed daily; whole silage as fed from stacks may be calculated as weighing, roughly, 40 lb. per cubic foot, and chaffed silage as fed from containers as, roughly, 45 lb. per cubic foot. On pastoral areas, however, where large numbers of stock would be fed, this would be of little moment. Cylindrical silos preferably should not be of larger diameter than half the depth. The deeper the silo the greater the compression by the weight of material above, while with the smaller area exposed the less wastage there will be in fodder material.

In stack silos and excavated trench silos it was shown how air was excluded by pressure applied mechanically or by quantities of earth, which latter also helped in that direction.

In silos where the material is chaffed before filling in to containers with air-tight walls, it is evenly spread and trampled down to compact the mass, which in its chaffed condition will naturally sit closer than when fed in whole; ½-inch or ⅝-inch lengths are usual in chaffing. Silos should not be filled too quickly—it is usual to fill not more than one-sixth, preferably one-tenth, of the capacity daily—this allows of better settlement and of filling the receptacle more completely than if larger quantities were put in each day.

When filled with the chaffed material without topping with other material, if well trampled, some 6 to 9 inches can be expected to deteriorate, but if green grass is chaffed to cover a depth of 6 inches and wetted, it will form a close mat with the fungi developed excluding the air with practically no waste of the fodder beneath. Well-made silage can be expected to keep in good order until required; the period of storage after which the contents of the best type of silo commence to deteriorate has not yet been determined.

GRAIN CROPS.

The amount of rainfall, based on the average of a number of years, that may be expected during the growing season is a deciding factor when consideration is given to crops that might be grown for special purposes in any district.

In the districts devoted mainly to pastoral pursuits, the rainfall is insufficient on the average to allow maize to be grown successfully for grain. Of other summer crops the grain sorghum varieties alone are worthy of serious consideration for the production of grain for storage against times of fodder shortage, or, as previously mentioned, for present stock use or for human consumption. The value of maize grain is appreciated by reason of its general use, but that of sorghum grain is not so well known.

A comparison of the nutritive values will show that sorghum grain is very little inferior to maize in total food value, while in average protein content it is usually higher. The following analyses from Henry and Morrison's "Feeds and Feeding" will afford a useful comparison in pounds of digestible nutrients per 100 lb. grain.

Variety.	Proteins.	Carbohydrates.	Fats.	Total.	Nutritive ratio.
	Lb.	Lb.	Lb.	Lb.	1
Dent maize	7·5	67·8	4·6	85·7	10·4
Flint maize	7·7	66·1	4·6	84·2	9·9
Kafir sorghum	9·0	65·8	2·3	80·0	7·9
Milo sorghum	8·7	66·2	2·2	79·9	8·2
Feterita sorghum ..	9·3	66·6	2·5	81·5	7·8
Kaoliang sorghum ..	8·5	67·0	3·3	82·9	8·8

As protein is the most valuable part of a food, the extra amount in sorghum grain should more than compensate for the lesser quantity of the total carbohydrates in maize, and allow it to be sold at an equal price. It may be noted that in calculating the value of fat as carbohydrates, the quantity is multiplied by two and a-quarter. The sorghum varieties usually cultivated do not yield so well under a heavy rainfall, but compared with maize under a lighter rainfall and on poorer soil will give very much higher yields. At Roma a yield as high as 120 bushels per acre has been estimated, while at Pentland 81 bushels of sundried grain was estimated on soil that would not yield 20 bushels of maize. The cultivation of grain sorghums is exactly similar to that set out for saccharine or fodder sorghums. In feeding to horses or cattle, the grain being small should first be crushed, as much of it would otherwise not be digested. With sheep, however, mastication is better, and crushing not imperative.

Storage for a lengthy period, as with maize, could be effected in airtight corrugated iron tanks. These tanks, usually of 1,000 or 1,200 gallons capacity, are provided with a manhole with a close-fitting lid on the top for the reception of the grain, and a spout with close-fitting cover on the side at the bottom for emptying the grain as desired. When filling, the grain, which should be thoroughly dry, is poured into the tank and worked with a stick to fill the corrugations until the tank is full; the top of the tank is then lifted as far as possible, and the grain packed under, so that when the lid is put on the top of the tank is somewhat domed. The lids are now luted with putty or other suitable material to render them airtight, when the grain can be expected to keep in good feeding condition indefinitely.

Irrigation.—The extent to which irrigation can be practised will be limited by the supply and quality of the water available. On some pastoral areas a good supply is available from lagoons and running streams, or can be conserved by building dams across creeks which give only a small flow in dry times. On the Downs country, where the flowing bore drains have to water more than one area, it is frequently impossible to obtain a sufficiency to make irrigation worth while. There are, however, holdings where the supply is sufficient, if the quality allows, to irrigate areas up to perhaps 10 acres.

Quality of Water.—In running streams the water is almost invariably suitable for irrigation, yet that from artesian bores is sometimes unsuitable, due to excess of dissolved matter injurious to vegetative growth. Generally speaking, where the water is satisfactory for domestic purposes, it can be used in irrigation, but where there is any doubt an analysis with advice as to its value can be obtained from the Department of Agriculture for a fee of 10s. 6d. In sending samples clean bottles and corks should be used, and well washed with the water to be analysed before the bottles are finally filled, labelled with identification thereon, and sent securely packed to the Under Secretary, at Brisbane.

If desired special bottles for holding the water may be had from the Department on application.

CROPS TO GROW.

As irrigation, however practised, adds to the cost of production, when compared with that under a sufficient rainfall, it can only be seriously considered for crops of the greatest nutrient value which cannot be economically produced under the ordinary average rainfall.

Except legumes, such as cow peas and velvet beans, all the crops produced on the pastoral areas, under the wet season rainfall, for conservation as hay or ensilage will possess a wider nutritive ratio than is desirable for economic feeding; that is to say, that their protein content is insufficiently high in comparison with the carbohydrate content, necessitating the feeding of a larger quantity to each animal than is required to supply the requisite carbohydrates, thus wasting the excess of the latter.

The admixture of a fodder rich in protein, by which the proteins and carbohydrates can be supplied in the desirable proportions, will allow smaller quantities of the mixed fodder to be fed than would be imperative with the fodder in which protein was in short supply. This matter will be dealt with more fully later on in notes on Animal Nutrition.

As hay from the natural grasses, as well as from non-leguminous cultivated crops, is low in protein, it would be most desirable when the expense of irrigation is undertaken to grow a crop that will not only be palatable and rich in protein, but one that will give a good return.

Lucerne, aptly described as the king of all fodders, is not only high in protein content, but when once established will, with proper attention, last over many years, instances of areas producing good yields after being laid down for upwards of twenty years being not uncommon. The crop does not make quick growth under cold conditions, but with sufficient moisture in warm climates eight and nine cuttings are often made during the year, thus averaging one cut every six weeks.

It should be especially valuable on the pastoral areas of Queensland, as cuttings could be obtained under the natural rainfall of the wet season for probably five months of the year, and under light to heavy irrigation during the remaining seven months.

Field Work.

Soil.—Contrary to general opinion lucerne can be successfully grown on almost any kind of soil; there are two defects, however, that are prejudicial to growth that must not be lost sight of when choosing the site for sowing. The first is a soil constantly wet, or so badly drained that water will remain on the surface for two or three days after heavy rain or where water is permanent within 4 or 5 feet of the ground surface. The other condition is where there is too much acidity in the soil; this is often but not always associated with bad drainage, and can be overcome by attention to drainage and the application of lime.

Like many legumes lucerne thrives on a soil rich in lime, preferably of loose texture, such as an alluvial loam which will allow easy and deep penetration of the roots. The soil of the rolling downs possessing as it does a good lime content, frequently upwards of 1 per cent., should be very suitable when the crop is sown on a gentle slope to allow of satisfactory drainage. Very few pastoral holdings where water is available for irrigation will be unable to supply an acceptable area of soil suitable for the crop.

Preparation.—It is inadvisable to sow lucerne seed on land newly broken up; soil that has grown one or two crops previously will show a much better result, and still better if the crop immediately preceding was cow pea.

The soil prior to seeding should be well worked by ploughing, cross ploughing, and harrowing to a fine tilth, and will also be benefited by subsoiling a foot or so below the depth of the ploughing.

Manure.—The addition of animal excreta or other organic matter that will soon decay in the ground for the previous crop, will greatly improve the soil in fertility and mechanical character, while topdressings from time to time of a phosphatic fertiliser can be expected to prove profitable.

Sowing.—Drilling the seed in is a very satisfactory method, requiring less seed per acre and giving a more even distribution; where other work for such a seed drill is not called for, purchase is not warranted.

Broadcasting the seed is the usual practice; experienced sowers can secure a fair stand with 15 lb. per acre, but in general 20 to 25 lb. of seed per acre are recommended. If the seed is mixed with an equal bulk of sawdust, a more even distribution will be assured, but care must be taken to see that the mixture is thorough.

Sowing half the seed up and down and the other half across the field is often practised to ensure a more even distribution.

After the seed is sown the land should be rolled to cover the seed and to firm the seed bed. In Queensland the best time to sow the crop is towards the end of the wet season, March or April being indicated, when cooler weather is setting in. Earlier sowings are not advisable, as the young seedlings are apt to be scorched off under a very hot sun, and in addition will have to contend with the heavy weed growth usual in the hot months, while a heavy storm immediately after the seed is sown may wash much of it away. There should at this time be sufficient moisture in the ground to ensure germination and satisfactory growth until irrigation, if necessary, can be applied.

It is not considered a good practice to flood lucerne during the first six weeks of its growth; if the land has insufficient moisture and there is little likelihood of rain, a flooding of the land prior to sowing is advocated.

If a fair stand is not secured from a sowing it can be thickened by reseeding after a good discing or heavy harrowing following the first cut.

Harvesting.—Cuttings should be made, provided there is reasonable prospect of curing as hay, when the first flowers begin to show or a new growth is coming from the crowns. If before this time a weed growth is abundant, cutting of the area should be effected before any of these weeds have time to seed. Some growers prefer to cut when half the field is in flower. Cutting at the time recommended allows better retention of the leaves, while the protein content is also higher at that time. Further, nothing is eventually lost, as any additional growth is secured in the next cut. After every cut the crop should be well harrowed both ways, or if a disc harrow is available its use with discs set straight will be further advantageous. An attempt to pull up one of the plants by hand will convince the doubtful that the harrowing or discing can do no harm. Discing has the advantage of splitting the crowns, thus enabling them to send out more shoots, as well as of loosening the soil and cutting out any weed growth. The cutting of lucerne is invigorating to the plant, and should be promptly done when weeds are troublesome or when the plants show any yellowing, even if such cut is not worth recovering.

Curing Hay.—The greatest value in lucerne lies in the leaves, pointing to the necessity of care in handling during curing operations. As mentioned earlier, under hay making, the leaves if not killed too quickly transpire moisture from the stems, hence the advisability of cocking before wilting of the leaves has proceeded too far. Where the shed space is large and the quantity added to the stack at each cut not too large the cure could be completed there.

When Irrigation is Practised.

Irrigation.—Two methods of applying water in irrigation are possible—viz., by flooding and by spraying. In flooding it is essential to have the ground prepared before sowing the seed, whereby all inequalities are removed, humps being levelled and depressions filled, to assist towards an even application of the water. In flooding water is applied in two ways—by flowing in a thin sheet at an even depth over strips of ground with an even fall until a desired saturation has been accomplished, or by covering level areas with a sheet of standing water until sufficient has been absorbed, when the balance is drawn off, or by supplying the quantity desired to the area, around which check banks have been made. A large supply is necessary for irrigation by flooding. Where water is not available in large amounts, a system of spray irrigation will prove the most advantageous, and will not necessitate the careful grading of the land, as is required when flooding.

Several systems of applying water by sprays have been evolved, but that in which distribution through perforated pipes on permanent erections overhead is effected appears to be the most satisfactory. In this system the water is pumped through the small perforations as a spray to a distance dictated by the pressure from the pump. By a contrivance operated by the flow of water from the pump as it enters the spraying pipes, these are gradually turned half round and back again mechanically, thus allowing the water to be applied evenly on either side at the rate it will soak into the ground, dispensing with any need for constant supervision. The lines of pipes will be regulated by the area of the land to be irrigated. This system is economical in regard to water, and offers an additional advantage in its aeration and fall like rain, while it does not compact the soil as is usual in flooding.

Applications of Water.—The amounts of water to be applied in irrigation are determined by that actually taken up by the plant to produce a certain growth, that lost by surface evaporation from the soil, and that lost by running off the surface, and by under drainage. To go into details regarding these matters would need the preparation of a special article. The evaporation of moisture from the soil and by transpiration of the leaves will be greater when atmospheric humidity is low, and will be much greater on the rolling downs in dry weather than nearer to the coast.

Suitable applications will be determined by experience, but it is suggested that, without any rainfall, 4 inches per acre, roughly 90,000 gallons, would be a maximum to be applied for any cutting, while 2 inches, or about 45,000 gallons per acre, should afford satisfactory returns either as one application after cutting or half when cut and the other half two or three weeks later. Water should not be applied within two weeks of cutting. In districts where the winter is cold and growth slow, the application could be light enough to keep the plants healthy until warmer weather sets in, when heavier applications could be made. Where water was in short supply, light irrigations could be made during the dry months, so that the plants would be kept sufficiently vigorous to take full advantage of the rains during the months of the wet season.

On areas where a sufficient amount of water could not be spared to allow the application when desired being taken from the bore drain, the practicability of an excavation for storage of that amount, which could be spared daily, to allow of such application might be worthy of consideration.

Yields.—The amount of hay to be made from each cutting will vary according to seasonal conditions, quality of soil, &c., but under fair conditions, on reasonably fertile soil, an average of 15 cwt. of hay might be expected from an acre, or 4 tons upward during the year.

Other Crops.—Though other crops can be grown successfully under irrigation, none can compare with lucerne in profitable return, where conditions will allow its production.

Berseem.—In Egypt, Berseem or Egyptian clover is grown very extensively, yielding a crop quite as heavy and rich in nutriment as lucerne. It is, however, an annual, and grown only in the cooler months of the year, while as a hay it it more brittle and less suitable for storage than lucerne.

Berseem, however, has one advantage over lucerne in that it can be grown on soils in which while alkali is present in amounts that would be injurious to lucerne, indicating its possible value under irrigation from some of the more alkaline bore waters.

Sowings are made usually at the rate of 20 lb. per acre, similarly to lucerne, at the end of March or early April, when the first cutting may be made in eight or nine weeks, and others five or six weeks thereafter until September or October, when the plants may be expected to die out.

Berseem has not been grown to any extent in Queensland, but in the irrigated areas in the north-west of Victoria it has provided heavy cuttings; in America, under irrigation in arid areas, it has also yielded well, while, as previously mentioned, it is universally grown in Egypt.

There does not appear any reason why it should not do well in Queensland, especially under irrigation in winter, as then it makes a better growth than lucerne, but, except as a catch crop or on soil or with water unsuitable for lucerne, it is not recommended in preference.

PASTURE IMPROVEMENT.

The improvement of pastures may not be viewed as any safeguard in prolonged periods of dry weather, when growth of any kind without irrigation is an impossibility, yet many graziers will agree that, even under the influence of good seasons, there is room for improvement in this respect, and that a better pasturage will provide a stronger animal with greater vitality to face periods of food shortage.

Stock, when grazing, naturally select those growths most pleasing to their palates, which are also, as a rule, the most nutritious, neglecting those less palatable, generally of a coarser nature and mostly of lower nutritive value. The result may be expected in a greater reproduction of the latter at the expense of the former.

Instances may be cited on the coastal slopes of the spread of bunch spear, three-awned spear grasses (wire grasses), &c., and many weeds such as sida retusa, flannel weed, star burr, &c., whilst on the rolling downs the spread of feather top (*Aristida* sp.) is becoming a matter of some concern.

Pastoralists of forty to fifty years' experience have remarked on the change from the early years of settlement in the North, when fat cattle could be had all the year round, to the present when, under similar seasons, fats as a rule are only available during one portion of the year.

A suggestion of the prevalence of legumes as slender vines growing amongst the grasses in those early years, with a scarcity or total absence in recent years, has been agreed to very generally, both by those with lengthy experience with cattle on the coastal slopes and with sheep on the rolling downs of the West.

The value of the legume in pasturage is so well understood in the case of clovers, &c., in cool climatés, that the disappearance of these, which perform a similar function, may be held as largely, if not wholly, responsible for the change noted.

It was remarked previously that Flinders grass, being most palatable to stock after its seed was fully formed, instanced a provision of nature to ensure its reproduction. So with many legumes is the growth not so palatable when young as when the seed has matured or the plant has lost most of its moisture. Stock at first do not take kindly to green lucerne, while readily eating it as hay, and it is only when hungry or after they have developed an appetite for it that it is eaten readily. Heavy stocking, as well as scarcity of feed in dry seasons, has probably resulted in the consumption of these native legumes, such as species of Rhyncosia, Glycine, &c., once so common, before they have been enabled to mature their seeds, and thus provide for reproduction.

Pasture improvement is often effected by the application of fertilisers as a top dressing to the soil, but cannot be considered on large pastoral areas, as the expense could not be met by a sufficient increase in return. The fertility of land devoted to pasturage, on which stock graze, is so little depleted after many years as not to warrant the application of fertilisers, except where, in its original state, improvement might have been effected.

A consideration of improvement of the pasturage on large grazing areas is suggested in provision for adequate reproduction of existing good grasses and legumes, and the introduction of others. In either case the necessity would exist for annually locking up portion of the area until the desirable growths, either existing or supplied, had shed their seed. This would entail cutting up the area into different paddocks to allow of one being so treated each year, a proposition probably considered impossible by many.

The prosperity of the State is influenced by the returns from pastoral industries, so it must be considered that the pasturage is a national asset, and its deterioration or improvement a matter of great importance.

Length of tenure will be a deciding factor with a lessee when giving consideration to improvements in any direction on the holding, more especially in pasture improvement, where no provision is made for valuation of such at the termination of his lease. A suggestion has been made for clauses in the lease to compel improvements in this direction, and also in the conservation of fodder and the number of stock to be carried. Compulsion is ever unpopular and usually incites opposition in an endeavour to defeat its object. Probably provision for reward, by way of remission of portion of the rental, extension of tenure, or in other directions, would more readily meet approval, and result in a commendable attention being paid to those matters, which might be expected to lessen the losses of a dry period and increase the returns under normal seasons.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

THE FUTURE OF THE COUNCIL OF AGRICULTURE.

MINISTERIAL STATEMENT.

The Acting Premier, Hon. W. Forgan Smith, as President of the Council of Agriculture, made the following announcement to the Press recently:—

"As I have pointed out previously, it was found necessary in the initial stages of the movement, in view of the disorganisation of the agricultural industries, to establish the Queensland Producers' Association, of which the Council of Agriculture was the executive body, on an extensive basis. The principal of the many important functions of the Council under the initial legislation—'*The Primary Producers' Organisation Act of* 1922'—was the organisation of the marketing of primary products under the control of boards elected by producers. It was recognised that the advent of marketing boards involved the devolution of the Council's main functions, in that with the establishment of each such board, it was able itself to deal more efficiently with problems affecting producers in the industries involved; hence the several amendments of the initial legislation meant the curtailment of the Council's functions and the effecting of economies in so far as the central or parent organisation was concerned.

"In 1926 there were thirteen commodity boards in existence. These controlled between them primary products to the extent of 75 per cent. of the total value of Queensland's primary production (the calculation is based on figures supplied by the Registrar-General for the year 1925, and excludes the grazing industry products). Obviously, therefore, the bulk of the more important work for which the Council or central organisation was established was performed, and I, therefore, with the concurrence of the representatives of the various boards, introduced a consolidating measure known as '*The Primary Producers' Organisation and Marketing Act of* 1926' effecting amendments in, and amalgamating the Primary Producers' Organisation and Primary Products Pools Acts. This Act clothed the various commodity boards with greater powers, and provided for a further devolution of its powers by the Council of Agriculture, and also greater facilities for the organising of such of the rural industries as had not yet taken advantage of the opportunities offered them to secure control of their own affairs within the limits of the legislation provided. The result was an immediate saving of expenditure by the Council of more than £15,000 per annum.

"Foreseeing the possibilities of further curtailments of the Council's activities, I had the measure drafted on sufficiently broad lines to permit of such being effected without involving further legislative action. When, therefore, the Council, at a special meeting held on 1st April instant, decided upon a further devolution of its functions, involving the elimination of expenditure in the maintenance of a central organisation and the cancellation of the precepts issued on commodity boards some time ago, it merely reached a decision the Government had foreseen—one that does not require any alteration of the Act. The Council, of course, will continue to exist, but its operations will be reduced to a minimum, and such expenditure as is found necessary in this connection will be contributed *pro ratâ* by the commodity boards. Incidentally, the Council's decision means the abandonment of compulsory contributions to the "Queensland Producer" newspaper. The paper is to be continued, but in future it will depend upon voluntary subscriptions, the same as any ordinary commercial newspaper.

"Briefly, therefore, it may be said that with so many control boards operating in respect of the primary industries, in the formulation of schemes for the organising of the principal of the remaining unorganised sections of the industry and the provision of funds necessary in connection with the submission of same to growers, in the making of a number of efforts to organise the cattle-grazing industry, and in the knowledge that all the machinery exists in '*The Primary Producers' Organisation and Marketing Act of* 1926,' whereby unorganised industries are provided with facilities for becoming organised, the Council of Agriculture feels that it has, for the time being, practically done its job, and can do nothing more for any industry which that industry is not in a position to do for itself, and that in the circumstances it is no longer justified in maintaining a fairly costly central organisation.

"It may be remembered that in discussing the matter some time ago on the occasion of the introduction of amending legislation, I likened the Council to the scaffolding used in connection with the construction of a building. The building referred to was the commodity system of organisation that was being set up. Once the building had been erected, I stated, the scaffolding had done its work and could be removed. That is precisely what the Council's recent decision means—the scaffolding has been removed. All the material, however, is still on hand, and should the structure at any time need repair or alteration, the scaffolding can very easily be re-erected."

POULTRY HOUSING.

INTENSIVE LAYING SHEDS.

By P. RUMBALL, Poultry Instructor.

There are several systems of housing laying stock, but the intensive system should prove most attractive to the general poultry raiser.

Under this system of housing the birds are kept entirely under cover in fairly large sheds, and in relatively large numbers. This being so, strict attention has to be paid to the physical condition of the bird, and to the question of feeding. As the bird only has a very restricted space, 4 square feet per bird being about the correct area, exercise has to be promoted to ensure the birds being kept in good condition. This is done by having scratching material or litter, such as grass, straw, leaves, or chips strewn over the floor, to the depth of 4 to 6 inches, and all the grain portion of the ration being fed in it. This naturally promotes a good deal of scratching on the part of the bird in search of grains that have become covered, and it should be patent to all poultry raisers that the feeding of the evening grain should not be left until the day is drawing to a close. Many farmers are in the habit of allowing a good deal of range to their birds, with the consequence that they gather a fair amount of natural food, and naturally do not consume as much as birds kept entirely under cover. If at any time poultry breeders keeping birds under such conditions think it desirable, on account of the damage done by their poultry to crops, haystacks, &c., to change over to the intensive system, the question of feeding assumes a most important point; in fact, any person keeping poultry under these conditions must give the question of feeding the utmost consideration, as it is impossible for the birds to procure anything but what they are supplied with. The overlooking of this point by many poultry farmers has caused this system of housing to be condemned.

This system of housing poultry enables a greater number of birds to be kept on a given area than any other. It permits of birds being handled in large units, and therefore not only reduces the natural labour but goes a long way in reducing the cost of production, which is a big feature, especially in times of high-priced foods. It is also much easier to detect sick and unproductive birds in an area of, say, 400 square feet than is the case when large runs are used, and therefore the early disposal of these, a practice highly desirable, is facilitated. With this system also there is generally greater attention given to the questions of the construction of the houses and the numbers housed in a shed of certain dimensions. Both these questions play a very important part in the question of disease, and the development of stock. It is not uncommon to notice a house built to house at night fifty laying hens having sixty-five birds in it. To do this, possibly the perches have been placed closer together, and when it is suggested to the breeder that he is overcrowding, he states that they only sleep in the shed and he lets them out on free range during the day. Although it must be admitted that stock on free range will possibly put up with much severer conditions than those kept in pens, it is maintained that it does not matter how good the conditions are during the day, they will not overcome the ill-effects of overcrowding during the night. With the intensive system of housing, overcrowding is not noticed to the same extent; the breeder knows how many birds the shed was built for, and there is no point that can be raised in favour of going beyond this number.

Types of Intensive Laying Sheds.

There are several types of laying sheds, the shape of the roof being the principal point, but as the majority of poultry raisers have to do the erection of their own sheds the lean-to type will prove most acceptable. The illustration shows the cross section of a shed, 20 feet deep, and of indefinite length. This shed can be built in sections of 20 feet, and provision made for additions as required, each section holding 100 laying hens.

The cross section shows a veranda, which commences just under the rafters in front. This veranda serves to prevent a good deal of rain beating into the house from the front, and by not going right to the top of the roof allows a free circulation of air. If it is desired the roof could be extended by 3 feet and the veranda not used, but in that case the height of the shed in front could be a little bit less. Ventilation is also provided for at the back, the iron going from the floor level to the bottom of the 6-inch rafter. This allows a 6-inch space right along the back of the shed between the battens which carry the iron at the back

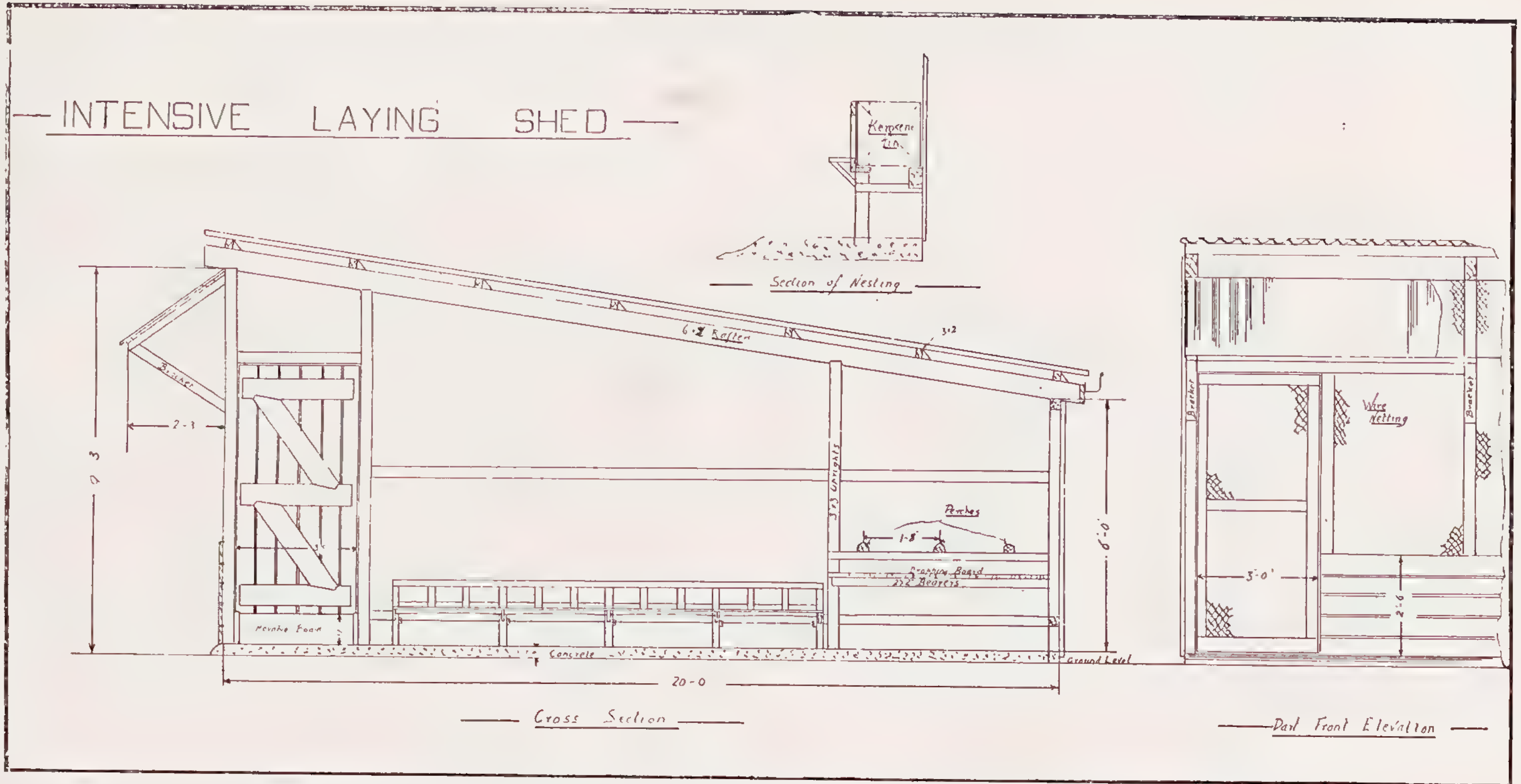


PLATE 103.—SHOWING END SECTION AND PART FRONT ELEVATION OF INTENSIVE LAYING SHED.
End Section, with the exception of door and battens to carry the iron, should be erected every 10 feet in a shed of these dimensions.

and the roof. This space is protected to some extent from the driving influence of the wind by guttering being placed on the rafters, which extend beyond the back wall, but further protection for the birds from cats, &c., should be made by netting this space.

Materials.—The shed should be built with good, sound hardwood posts, although where desired solid, sapped bush timber could be used for uprights, but the average builder would find sawn timber easier to handle. All other frame work should be sawn timber, that coming in contact with the ground hardwoods, and the balance pine. The dimensions of the timber are shown in the cross section, and as the building is of goodly dimensions it would not be advisable, on the plea of economy, to use lighter material. The walls and roof should be of iron, and also the wind break in front, although timber, if cheaper, could be used.

The Site.

Site of House.—In commencing to erect a building upon the intensive system, it being a large building and of a permanent nature, the site chosen must receive due consideration, and, as many poultry raisers start in a small way, provision should be made for extensions.

In addition to the foregoing, although it is recommended to concrete the floor, the position chosen should be well drained, and, if the building is to be erected on relatively flat country, the floor should be raised several inches above the surrounding country, and well rammed to provide a solid foundation.

Aspect.—The house should face north or north-east. A northerly aspect permits of the maximum penetration of the sun's rays into the house during the winter, when it is desirable, and the minimum during summer; also a good deal of our continuous rains come from a south-easterly direction.

The Layout.

General Fittings.—In the cross section a door constructed of timber is shown, while the front elevation shows another of netting. Although this shed is built for the purpose of keeping the birds entirely under cover, it frequently is desirable to let the birds out into small runs during cleaning operations, or it may be that, in a long section, it is desirable to go into a pen direct. This is only possible when front doors are provided. The door in the end section permits a person feeding &c., going from pen to pen direct, and, for the small cost in labour and material, both doors should be provided when the building is first constructed.

The perches, three in number, are placed along the back of the shed extending the full length. Under the perches is a dropping board. The advisability of this or otherwise is left to the individual breeder. If it is not to be cleaned daily, it should not be provided, but for the breeder who uses it there is a ready market for pure poultry manure, while, at the same time, he keeps his litter clean for a longer period. Another system by which the droppings may be kept from mixing with the scratching material is by placing timber, say, 6 inches in front of the front perch the full length of the building. This timber would need to be at least 18 inches high, and it may be as well to cover the whole area with netting to prevent the birds from getting in among the droppings. This pit, however, would need to be cleared out fairly frequently to prevent offensive odours, as there would be nothing to absorb any moisture. With the dropping board the birds have the full floor to scratch over, but a sharp lookout must be kept for red mite, as it provides additional harbour for them.

The nests are shown supported on a framework on the side of the building. These are kerosene tins on their sides. Two-thirds of each side is cut out. This provides a top which assists in keeping clean nests, and by both sides being cut the excessive heat is reduced. These should be placed at the coolest end of the building. Even although nests are provided many birds will persist in laying under them or in some old corner. If this is the case, the nests could be placed on the ground, as it is as well to induce the birds to make use of them to keep the eggs as clean as possible. Drinking and feeding receptacles are left to the breeder's own device. Some may be able to make use of some form of automatic water system, others may have to depend upon the kerosene tins. Some breeders may use dry mash hoppers, while others feed a wet mash. The principal feature is to provide ample water and sufficient feeding space for your stock. It is better to overdo both these features than to economise in this direction.

MENACE OF THE POULTRY TICK.

A PEST CONCERNING ALL POULTRY RAISERS.

By P. RUMBALL, Poultry Instructor.

The poultry tick is the most serious pest confronting the poultry industry in Queensland to-day; despite this fact, however, the majority of breeders whose premises are not infested give it no consideration.

This certainly does not assist in eliminating the danger of the tick being distributed from farm to farm, nor does it assist in its eradication.

Mr. Rumball describes how the tick is spread from farm to farm in the following article. Some of these ways may be controlled by the breeder, but the distribution of the tick by wild birds is outside the province of the breeder, and for this reason alone every poultry raiser should acquaint himself with the habits of the tick and the method of eradication, not only to protect himself, but also that he may be in a position to assist and advise his neighbour.

Eradication of the poultry tick in Queensland will be greatly facilitated by all poultry breeders interesting themselves in the question. The present article is a revision of previous notes by Mr. Rumball, which have already appeared in the "Journal".—ED.

Poultry keeping, which is one of the most valuable adjuncts to general farming, is frequently severely handicapped in many parts of Queensland by the presence of the Poultry Tick (*Argas persicus*). Very little good would be done in trying to explain how the pest was introduced. It is here and has gradually spread over a large expanse of country. In many of the infested areas it is not uncommon to meet farmers who have had their flocks almost depleted, and others who have disposed of their one-time profitable flocks on account of the ravages of this pest. A knowledge of the general habit of the tick, precautions necessary to take against its introduction, and methods of eradication are the means by which poultry may be kept successfully.

PLATE 104 (Fig. 1).—POULTRY TICK AND EGGS.

Hosts.

Fowls appear to be preferred as hosts by the tick, although turkeys, ducks, geese, and pigeons are also attacked. This preference is probably due to the more restful and regular habits of fowls at night than that of other kinds of poultry. Wild birds are also known to harbour ticks. Such infestation has come, no doubt, by the close association with infested poultry yards.

Life and Habits.

The egg of the tick, as shown in Fig. 1, is very small and is of a brownish colour. It is found in the crevices of the woodwork of the houses, perches, and sometimes adhering to feathers, &c. This egg hatches in the course of two to three weeks. Nuttall states the period at from eleven to thirteen days, but probably in cold weather the period is considerably longer.

The young or seed tick, as shown in Fig. 2, has only six legs, white or greyish in colour and very difficult to see. As soon as their covering has hardened they make their way to a host, generally by crawling up the legs of the birds, and attach themselves as shown in Fig. 3. They remain here for a period varying from four to ten days, swelling considerably, and appear as bluish-black spots on the body of the bird.

Fig. 4 shows a young seed tick which has fed and left its host. It has altered considerably in appearance. This seed tick then seeks some secluded spot to rest and moult.

Fig. 5 shows an ideal home for the tick. They will also be found under the bark of trees, cracks in perches, and any similar spot which offers concealment. In searching for the tick one is guided by the darkish spots around cracks in the woodwork of the buildings. These spots are caused by the excreta of the tick. The moulting period takes four to nine days. After moulting the tick presents a somewhat different appearance, having eight legs. It now only feeds at night. The meal is taken rapidly, and long before daylight it is safely hidden away in its retreat. This process is repeated (usually three times) until matured. The adults vary

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PLATE 105 (Fig. 2).—SEED TICK BEFORE FEEDING.

considerably in size, large ones being nearly half an inch in length. After another feed the adult female is ready to lay. The poultry tick varies in this respect from the ordinary tick, as she may lay as many as eight batches of eggs of 20 to 100 before death.

Longevity of Poultry Tick.

The fowl tick may have a long life, even when separated from its natural host. Newman, F.E.S., in studying this insect found that a single isolated female lived for two years three months, while in a group one female lived four years and five months. The males were comparatively short-lived. The writer has found ticks thriving in poultry sheds in Queensland where fowls have not been kept for nearly two years. It will, therefore, be seen how impractical it is to merely shut up a fowl-house for a year or so with the hope of extermination by starvation.

Effect on Poultry.

From the foregoing it will be seen that during the day the adult tick is under cover, principally in the roosting quarters, cracks in the timber, nest boxes, old bags, or even between sheets of galvanised iron where it overlaps, and the young or seed tick is attached to the fowl. Its effect on fowls is not confined to the loss of blood. The most serious trouble is caused by the transmission of an actual blood parasite.

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PLATE 106 (Fig. 3).—SEED TICK ATTACHED TO FOWL.

This parasite induces a fever which either causes the fowl to die or leaves it after a severe illness to recover and become immune to further attacks. This immunity frequently leads farmers to under-estimate the havoc that can be wrought by the poultry tick, and they become indifferent to its presence.

The symptoms of fowls suffering from tick fever are rise in temperature, listlessness, frequently a loss of appetite, restlessness and distress, ruffled plumage, blackness and shrinkage of comb, and some symptoms of paralysis. Diarrhœa is nearly always present, and owners frequently conclude that their birds are suffering from cholera. When these symptoms present themselves, a thorough search should be made for tick.

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PLATE 107 (Fig. 4).—A YOUNG TICK WHICH HAS FED AND LEFT ITS HOST.

From Poultry Farming in New South Wales.]

PLATE 108 (Fig. 5).—PIECE OF OLD SPLINTERED WOOD INFESTED WITH FOWL TICK.

Combative Measures.

Prevention of infestation should be the aim of poultry keepers who are free of tick. Strict examination and isolation for a period of ten days of all stock purchased assures that when the new birds are placed among the flock they carry no seed tick with them. Burning or spraying will deal with the isolation crate. All crates, egg boxes, or material brought on to the poultry section should be subject to the same rigid examination. Particular care should be given to the examination of crates returned from market, as it is possible that in transit ticks may travel in search of a host from infested crates to clean ones.

The fact that a very little portion of the life of the tick is spent on the fowl, while the infestation of the houses may last for years, naturally causes one to direct his efforts to the treatment of the sleeping quarters of the stock.

Many flocks have no shelter other than trees, and the proper treatment of these is almost impossible. Some of the poultry sheds used are also impossible to treat, every piece of timber being a natural home. Good housing accommodation therefore facilitates eradication. Where the trees and existing infested houses are of no value, a fire is the most economical and effective method of treatment. If the trees are valued for shade purposes they can be securely fenced off and the fowls induced to sleep in the quarters provided.

A start should be made in dealing with infested houses by carefully removing any surplus boxes, boards, and other harbourage, and if of little value make a bonfire of them. When the house is thoroughly cleared of rubbish, spray the entire inside, taking care to get into every crack and crevice, also between the iron where it overlaps. Thoroughly treat all fittings in a similar way, and, in case any ticks have been dislodged and are lying on the floor, give that a spray as well.

The number of sprayings necessary is largely dependent upon the construction of the buildings, and the thoroughness with which the work is done, but three sprayings should always be given at intervals of about five days. These subsequent sprayings will kill any seed ticks that may drop off infested stock from time to time. Where the stock have been accustomed to roost on various parts of the farm it would be well to keep a look-out for the reappearance of the tick for some years, as certain birds laying or roosting away may collect ticks and bring them home to the regular quarters.

Spraying Mixture.

Various spraying mixtures have been tried from time to time, but probably the handiest and one that is very efficient is kerosene emulsion made in the following way:—Take 1 gallon of water, boil in it 1 lb. of good household soap; while hot add 1 gallon of kerosene, stir well until thoroughly emulsified, then add another 8 gallons of water. Use this mixture freely, for it is both cheap and effective.

MT. GRAVATT EGG-LAYING COMPETITION.

The Egg-Laying Competition for 1926-27 terminated on the 31st March, and although no individual or pen score was sensational, the results of many pens and individual birds may be considered highly satisfactory and encouraging to the several owners.

Prize list:—

SECTION 1.

Pen of Six Hens.

	Score.
First—J. J. McLachlan	1,472
Second—P. A. Gooch	1,462
Third—	
Mrs. R. E. Hodge	1,432
R. C. J. Turner	1,432

Winter Test.

(Highest number of eggs laid by pen from commencement of test until 31st July):—

First—E. V. Stuckey	483
Second—S. L. Grenier	465

Single Hen.

First—J. J. McLachlan	279
Second—Mrs. R. E. Hodge	278
Third—J. E. G. Purnell	277

SECTION 2.

Pen of Six Hens.

First—E. Walters	1,464
Second—W. H. West	1,456
Third—Jas. Hutton	1,392

Winter Test.

First—E. Walters	491
Second—W. D. West	479

Single Hen.

First—H. Cutcliffe	289
Second—Jas. Hutton	277
Third—W. D. Melrose	274

The following are the individual results from the 10th April, 1926, to 31st March, 1927:—

SECTION 1—Light Breeds.

Name.	A.	B.	C.	D.	E.	F.	Total.
J. J. McLachlan	180	226	275	239	273	279	1,472
G. Pitt	271	265	213	199	253	265	1,466U
P. A. Gooch	250	250	250	235	219	258	1,462
Mrs. R. E. Hodge	254	255	240	206	199	278	1,432
R. C. J. Turner	246	260	243	212	195	276	1,432
W. and G. W. Hindes	248	247	175	258	244	237	1,409
J. E. G. Purnell	169	207	208	278	268	277	1,407
E. V. Stuckey	231	200	256	187	259	271	1,404
M. F. Newbury	238	230	234	253	250	197	1,402
S. L. Grenier	218	223	247	199	246	249	1,382
J. Columbine	228	236	200	224	245	233	1,366
G. Brasch	202	200	264	243	258	189	1,356U
W. Wakefield	242	157	226	233	255	230	1,343
W. E. Woodwood	262	234	229	248	232	134	1,339
Sunrise P. Farm	270	255	165	197	211	228	1,326
A. W. McMurtrie	181	259	246	253	202	179	1,320
Geo. Marks	181	247	182	248	266	190	1,314
J. Earl	239	195	260	228	196	183	1,301U
L. Anderson	259	241	248	189	187	167	1,291
H. T. Fraser	177	156	184	251	225	273	1,266
J. Harrington	209	225	214	220	157	221	1,246
E. W. Ward	230	241	144	212	171	246	1,244
B. Driver	217	259	140	250	165	203	1,234
G. Hanlon	229	192	221	234	70	250	1,196
A. S. Walters	235	123	191	215	251	162	1,177
H. P. Clarke	187	238	211	188	165	165	1,154
W. J. Boston	159	221	224	252	270	..	1,126
G. W. Cox	223	158	219	102	238	183	1,123U
T. H. Craig	259	175	209	191	119	162	1,115
J. Franklin	145	178	142	214	189	241	1,109U
H. Cutcliffe	158	230	246	169	142	164	1,109U
M. F. Marsden	195	160	218	94	180	193	1,040
R. M. Moore	148	106	155	41	138	113	701

SECTION 2—Heavy Breeds.

Name.	A.	B.	C.	D.	E.	F.	Total.
E. Walters	256	232	277	229	242	228	1,464
W. H. West	227	271	245	236	237	240	1,456
J. Hutton	257	223	277	150	220	265	1,392
Mrs. Gallagher	234	273	198	231	235	210	1,381
J. Potter	229	261	243	229	235	183	1,380
H. Cutcliffe	247	257	202	168	289	201	1,364
J. Columbine	158	247	257	234	214	234	1,344
Eclipse P. Farm	189	287	165	223	278	193	1,335
Mrs. Potter	201	191	224	264	191	240	1,311U
W. T. Jones	288	206	195	176	174	261	1,300U
W. R. Wilson	241	235	176	223	166	224	1,298
G. Rogers	202	186	193	242	235	217	1,275
W. and G. W. Hindes	203	259	215	164	223	144	1,208U
R. Burns	152	193	233	199	239	184	1,200
J. J. McLachlan	198	238	163	195	214	183	1,191
W. J. Smith	192	236	203	194	135	231	1,191
P. A. Gooch	175	256	206	146	154	218	1,155
W. D. Melrose	155	189	68	163	261	274	1,110U
E. A. Smith	196	181	209	154	172	117	1,029
H. C. Thomas	241	153	130	112	128	187	951
E. C. Stead	206	177	138	154	126	145	946
E. W. Ward	131	170	172	144	158	114	889U

"U" indicates that the average weight of eggs per dozen was under the standard of 24 ounces.

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ANIMAL NUTRITION.

WITH SPECIAL REFERENCE TO MAINTENANCE IN DRY SEASONS.

By N. A. R. POLLOCK, H.D.A., Northern Instructor in Agriculture.

Since the whole of the nourishment to sustain life and to build up the bodies of all animals is derived from the food and water they consume, it follows that, in the case of herbivorous animals, the quality of the food supplied as pasturage or otherwise should be a matter deserving the closest attention of the stock raiser.

All graziers are aware, from practical experience, that the many different kinds of grasses, legumes, and herbage that occur to form the pasturage on every holding throughout the State, vary in palatability and food value at different stages of their growth, some being palatable only in early growth, becoming rapidly unpalatable after flowering, others becoming palatable after the flowering period is reached, whilst others, comparatively few in number, are more or less palatable at all stages of their growth. Palatability thus referred to is that naturally existing when selection is possible, for through scarcity or other causes an appetite may be developed for growths previously distasteful, and in some cases for those that prove injurious, such as Zamia. The value of a plant in the pasturage lies in its palatability and digestible nutrient content, the measure of the former being frequently an index to the degree of the latter. A good illustration may be seen in the rapid advance made by stock when feeding on young succulent pasturage, as compared with the same pasturage at a later stage of growth.

What Analyses Reveal.

Analyses of plants and animal bodies, as is to be expected, reveal the presence of the same elements in each, though not in the same relative proportions or in exactly the same conbinations, consequently an understanding of the quantities of these elements in daily requirement by the animal for growth, fattening, milk production, &c., or maintenance in good health in any season must be of great assistance, if not essential to success, in every branch of animal husbandry.

The elements combining to form the structures of plants and animals are carbon, hydrogen, oxygen, nitrogen, sodium, potassium, phosphorus, calcium, magnesium, sulphur, iron, silicon, fluorine, and chlorine. As previously remarked these elements do not exist in the same relative proportions on the two types, animals usually containing more nitrogen and phosphorus than plants, while certain of the other elements only occur in very small quantities, in some cases being confined to the fluids and juices, where their presence is doubtless necessary for the performance of various functions.

The more important chemical compounds found in plants and animals are classified as:—Nitrogenous compounds, or crude proteins, carbohydrates, fats or oils, mineral salts or ash, and water. Excepting water, these are regarded as groups in which largely the same chemical elements are combined, but not necessarily in the same proportions. The fat or oil of a plant is never identical with that of an animal, and the oils of various plants, such as olive or castor oil, are as different as butter and suet, yet they are all fats. Sugar and starch are each composed of carbon and water, yet in different combination, and are both carbohydrates. Similarly the proteins or albumenoids, which are included in the nitrogenous compounds of plants, are not identical with those of animals, but are composed of the same elements.

Proteins are the nitrogenous compounds, or compounds in which nitrogen is the most important element; of the plant proteins about 16 per cent. is nitrogen. In addition to this element proteins are composed of carbon, hydrogen, and oxygen, and also contain small quantities of phosphorus, sulphur, potassium, and the other mineral salts mentioned. White of egg, lean meat, and the casein of milk are examples of practically pure proteins. Blood, muscles, and nerves not only consist largely of protein, but require it in the food of the animal to make good the wear and tear of life, and to provide for growth and development. Just as nitrogen is an essential element in the food of plants, in the form of ammonia, so it is an essential element in the food of animals, in the form of protein.

Carbohydrates are compounds composed of carbon, hydrogen, and oxygen, or carbon and water, as the proportion of hydrogen to oxygen is always 2 to 1, as in water. Sugar and starch are common examples which, with certain other related products, constitute the greater part of all dry plant substances.

Fats or Oils are similar to carbohydrates, being composed wholly of carbon and water, but are classified differently, owing to the proportion of carbon being so much higher. In expressing the value of these as carbohydrates, the percentage in the analysis is multiplied by 2¼, as it is held an equal quantity is so much more heat-giving than of ordinary carbohydrate, such as starch.

The province of the carbohydrate in the food is not only to assist in the building up of the frame, but to provide the energy and heat of the body.

Mineral Matter or Ash is the residue obtained when the plant is burnt, and is termed the inorganic matter. Except for such matter as may have been lodged on the plant, as dust or mud, inorganic matter is a misnomer, since the elements have been taken into the plants in a solution in the same manner as the elements of the volatile compounds that passed off in burning. Mineral matter is found in all parts of the animal's body, especially the frame, and is as necessary for perfect health and development as other forms of food.

As a general rule most fodders provide all the mineral matter required for growth and maintenance when fed in suitable rations, so it is rarely considered in the calculations of foods to provide a required nutritive ratio. There are times, however, when mineral matter is in insufficient supply, in which case it is either supplied with the food or as a lick, reference to which will be made later on.

Digestible Nutrients.—Of the totals of crude protein and carbohydrates, including fats, obtained in the analysis, not all are entirely digestible, hence, in order to obtain the true nutritive values, the digestible amounts can only be considered. By careful feeding tests in which the food and excrements therefrom were carefully weighed and analysed, the actual amounts digested and made use of were arrived at. Numerous such tests with different classes of animals at various ages with many different fodders allowed fairly accurate estimations of the proportion of digestible nutrients to be obtained; a coefficient of digestibility was thus secured for very many fodders, which could be applied to others of similar character.

Nutritive Ratio.—The relative proportions of digestible crude protein to combined digestible carbohydrates and fat is termed the nutritive ratio, and expressed as one part of proteins to so many parts of carbohydrates. In combining digestible carbohydrates and fat for this purpose, the percentage of fat is multiplied by 2¼ and added to the carbohydrates, the total then being divided by the percentage of digestible crude protein. As an example, lucerne hay is shown as averaging a content in digestible nutrients of 10.6 per cent. crude protein, 39 per cent. carbohydrates, and 0.9 per cent. fat. Multiplying 0.9 by 2¼ the result is 2.025, which, added to 39, gives a result of 41.025; this divided by 10.6 results in 3.87, which is near enough to be stated as 3.9. So the nutritive ratio of lucerne hay would be set down as 1:3.9. This is termed a narrow nutritive ratio. An example of a very wide nutritive ratio will be seen in the analysis of wheaten straw, which is given as containing in digestible nutrients 0.7 per cent. crude protein, 35.1 per cent. carbohydrates, and 0.5 per cent. fat. Working out in the same manner as shown in lucerne hay, the nutritive ratio is found to be 1:51.7. A nutritive ratio as wide as this might be expected in many pasture grasses that have shed their seed.

Scientific Feeding.

Balanced Rations.—Scientific feeding tests have demonstrated the necessity for the supply in the daily ration of particular quantities of digestible proteins and carbohydrates in relative proportions, varying according to the use to which the animal is put. Thus the ratio of protein to carbohydrates will alter for the young, growing animal, the mature animal yielding milk, the animal fattening, the animal doing work, as in the case of the horse, and the animal at rest, while the quantities of each to be supplied in the daily ration will be influenced by its size or weight.

Desirable nutritive ratios as set out in late compilations of feeding standards range roughly from 1:4 to 1:6 for animals yielding milk and young animals growing and fattening; from 1:6 to 1:8 for fattening mature animals and for horses at work; and from 1:8 to 1:12 for animals at rest or for maintenance. When the animal is fed with an ill-balanced ration, that is, when the ratio of protein to carbohydrates is narrower or wider than that required, waste occurs, for only those portions necessary are used, *e.g.*, if in feeding the ration called for is 1 part protein to 6 parts carbohydrates, and a feed containing 1 part to 16 is supplied, it follows that a greater quantity must be consumed to obtain the necessary protein, with consequent wastage of the carbohydrates not required. This is an example of a wide ratio, such as occurs in many grass hays. A narrow ratio is such as lucerne before bloom, which is expressed as 1:2 to 1:3, in feeding which a waste of protein would occur.

With this understanding the economy of a properly balanced ration is apparent.

In all animals, and more especially in ruminants, a certain amount of distension is necessary to ensure proper digestion. Concentrates, such as grains, meals, and oilcakes, can provide the requisite amount of both proteins and carbohydrates, but roughage, in the form of grass, chaff, or hay, is a necessary adjunct in giving the necessary amount of dry matter set down, while in ruminants the grass or hay is further necessary to assist in the regurgitation of the food when chewing the cud. An excellent publication dealing very fully with all matters pertaining to animal nutrition, together with analyses of a multitude of foodstuffs, and tables of feeding standards, will be found in "Feeds and Feeding," by Henry and Morrison, which is regarded as the standard text-book on the sbuject, and from which all copies of analyses herein given have been extracted. A study of this book, which should be in the hands of every stockowner, will give a better understanding of the conditions under which the best success in animal husbandry can be attained.

Pastures.

Pasturage Values.—The analyses of pasture grasses at different stages of growth show a widening of the nutritive ratio from as low as 1:3 in the very young growth to 1:16 and wider when the same grass is matured and old. In the case of legumes, the same widening of the nutritive ratio does not occur, as that ranges from 1:2 to 1:6, and only in rare instances to 1:7, for which reason their value is apparent.

All graziers have noted the beneficial effects of pasturage in young growth on their stock, in growth, fattening, and milk production, which were less marked when that same pasturage had grown older. While the young succulent growth, being laxative, would act medicinally after stock had previously been feeding on dry feeds, the rapid advance cannot be attributed to other than the greater nutritive properties reflected in the desired proportions of proteins to carbohydrates prevailing at the stage of growth.

In a study of the life history of a plant, it is found that the first efforts are concentrated on establishment and enlargement; at this period all the elaborated material, as fast as formed, is transferred to the growing parts, that they may be built up and established. As the plant approaches maturity its energies are changed from growth to reproduction; first come the blossoms and then the young enlarging seeds or fruit, in which is transferred much of the sugars and proteins, with certain mineral matter in a very concentrated form that were previously, to a large extent, diffused throughout the plant. It will thus be seen that the mass of the plant, stems, branches, and leaves, possesses, in itself, greater nutriment before seeds are formed, and very much less when those seeds have matured and fallen off.

While the grass is in early growth the nutrients contained therein are easily digested; as the plant grows, the woody fibre, analogous to the skeleton of animals, increases and hardens, and the digestibility of the contained nutrients becomes lowered, while in palatability the plant, usually very acceptable in the young growth, becomes less and less so as it grows older, until, in some cases, it becomes distasteful.

The low value of the pasturage, when old, is therefore due to the preponderance of carbohydrates and the lowering, to a great extent, of the proteins that were present in its early growth. Where legumes, in any stage of growth, are present in quantity, the necessary proteins would be supplied; their absence, in most pastures, can be held responsible for the failure of stock to do well on dry pastures at any time.

Feeding in Dry Times.—In dry seasons, when there is sufficient dry grass to supply the necessary carbohydrates, the feeding of a food rich in protein is indicated in quantity greater or less according to whether progress or maintenance is required. This could be supplied by a legume hay, such as lucerne, cow pea, velvet bean, &c., or by a concentrate, such as linseed, peanut, or certain other oilcakes, seeds of beans or peas or even some slaughter-house by-products, such as meatmeal, &c., which stock will sometimes take to.

In very dry seasons, when the pasture is in insufficient supply or is so old and indigestible as to be regarded as almost valueless, a call is made for a food supply containing the full amount of nutriment necessary. This could be supplied in grass hay, if made when the grasses contained their full food value. Hay from the legumes, and ensilage, or mixtures of either, while concentrates, such as mentioned previously, or grain, such as maize, or seeds of beans and peas could be added.

A Basic Ration.

Maintenance Rations.—A ration may be described as the amount of food that is to be fed to an animal during the day of twenty-four hours, whether fed all at once or in portions at different times during that twenty-four hours. A maintenance ration would be one that would furnish sufficient but not more of each nutrient than is necessary for maintenance, so that it will neither gain nor lose weight.

The quantities of proteins and carbohydrates considered necessary for maintenance have been worked out for various farm animals, and are set out in several tables of feeding standards, of which those of Wolff-Lehmann are perhaps the most widely known.

It may be interesting to know that the first of the tables of feeding standards was published by Dr. Wolff, a German scientist, in 1864, and that these appeared annually in the Mentzel-Lengerke Calendar, with such occasional modifications as were indicated from the results of research work until 1896, when Dr. Lehmann, of the Berlin Agricultural High School, became associated with their production, with further modifications until 1907, since which they have been subjected to still further modifications up to the present. Other tables of feeding standards, such as Armsby's and Kellner's, have been arrived at from different scientific viewpoints, but there is no very great diversity between the standards laid down in any of the later tables published.

These feeding standards were compiled from data obtained in cold, or at best temperate, climates and are held there as only approximately correct. In tropical or sub-tropical climates further modifications might possibly be found necessary, but not, it is thought, in an increase of the quantities to be fed daily.

Feeds and Feeding.

In "Feeds and Feeding" the authors publish a table of modified Wolff-Lehmann feeding standards, which they have compiled after consideration of the results of recent scientific work in live stock feeding.

The amounts as set down for 1,000 lb. live weight of the different animals to be fed for maintenance daily are:—

—	Dry Matter.	Digestible Crude Protein.	Digestible Carbohydrates.	Nutritive Ratio 1.
	Lb.	Lb.	Lb.	Lb.
Cattle	13·0—21·0	0·6—0·8	7·8—9·6	10·0—16·0
Sheep	20·0—26·0	1·4—1·6	10·6—12·4	7·5—8·0

Naturally, in the feeding tests, under which these quantities were decided upon, the animals were maintained in the same good condition in which they started throughout the test.

It is generally known that an animal can maintain health and a certain amount of strength on a starvation diet, provided water is in sufficient supply, by calling on the reserves built up within the body, for such time as those reserves will last, so that to bring an animal through a dry period alive and healthy, accurate feeding of the amounts set out, though desirable, is not absolutely essential, provided the animal was in good condition at the start.

It will be observed the amounts set are for animals per 1,000 lb. live weight, so that in making calculations for maintenance the average weight of the animals in store condition must be taken as so many thousandths of the amount required. For example, if a bullock is estimated as of 500 lb. live weight, then five hundred thousandths, or one-half of the amounts indicated, would be needed. If the average live weight of merino sheep in store condition was taken at 50 lb., then one-twentieth is indicated as the minimum for each animal.

In feeding foods of poor quality the capacity of the animal has to be considered, for if, to obtain the necessary amount of a particular nutrient, such as protein, a quantity larger than the animal can conveniently consume is indicated, it would be imperative to reduce that amount, and to add a concentrate or other food rich in the desired direction.

The labour in supplying daily the amount of food necessary is also a matter for consideration.

The capacity of a bullock is approximately eight times greater than that of a sheep, so that reasonable limits for the consumption of dry roughage, such as hay, might be set down as 20 lb. and 2½ lb., respectively, each day—amounts which would be held as impossible to supply economically to any large number, and which stress the desirability of fodders being conserved with their highest nutrient content.

In most cases the call for fodder supply will be to supplement the existing dry pasture, in which there would be sufficient dry matter and carbohydrates, but a deficiency in protein.

Where there was no pasturage available, the quantities of dry matter, protein, and carbohydrates would need to be supplied.

The following analyses may be taken as substantially correct for such foods as can be conserved on the holding, or which may be purchased as a supplement:—

—	Dry Matter.	Crude Protein.	Carbo-hydrate.	Fat.	Nutritive Ratio 1.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*Mitchell grass hay ..	88·0	3·0	46·37	0·7	15·9
*Flinders grass hay ..	88·0	3·3	43·45	0·5	13·5
Good bush hay	92·5	2·8	46·6	0·6	25·2
*Sudan grass hay.. ..	85·0	5·8	43·7	0·4	7·7
Liberty millet hay ..	85·7	5·0	46·0	1·8	10·0
*Jap millet	85·0	3·5	51·2	1·06	15·3
Cow pea hay	90·3	13·1	33·7	1·0	2·7
Velvet bean hay	92·8	12·0	40·3	1·4	3·6
Lucerne hay	91·4	10·6	39·0	0·9	3·9
Lucerne, green	25·3	3·3	10·4	0·4	3·4
Sorghum ensilage.. ..	22·8	0·6	11·6	0·5	21·2
Linseed oil cake	90·9	30·2	32·6	6·7	1·6
Peanut oil cake	89·3	42·8	20·4	7·2	0·9
Cow pea seed	88·4	19·4	54·5	1·1	2·9
Velvet bean seed	88·3	18·1	50·8	5·3	3·5
Sorghum grain	87·3	7·5	66·2	2·6	9·6
Maize	89·5	7·5	67·8	4·6	10·4
Kafir grain	88·2	9·0	65·8	2·3	7·9
Feterita grain	89·2	9·3	66·6	2·5	7·8
Kaoliang grain	90·1	8·5	67·0	3.3	8·8

*These hay values were calculated from the analyses of the green materials.

Examining the analyses of the hays it will be found that they are all high in dry matter content, so we may dismiss consideration of the supply of that as unnecessary.

What amount, therefore, will be advisable of proteins and carbohydrates, respectively, in the ration each day for the maintenance of cattle averaging 500 lb. weight, or of sheep averaging 50 lb.?

Referring to the quantities previously set out, we will find half of that designed for the 1,000 lb. ox will be 0.3 to 0.4 lb. protein and 3.9 to 4.8 lb. carbohydrates, while for the 50 lb. sheep, one-twentieth of that for 1,000 lb. weight, will be .07 to .08 lb. protein and .53 to .62 lb. carbohydrates.

To find the amount of fodder to supply a specified quantity, a simple sum in proportion is required, *e.g.*, 100 lb. bush hay contains 2.8 lb. crude protein, what amount will be required to give 0.3 lb? $(100 \times 0.3) \div 2.8 = 11$ lb. roughly. Thus 11 lb. bush hay will give 0.3 lb. protein, but how much carbohydrates? One hundred pounds bush hay gives 46.6 lb. and 0.6 lb. fat, which latter is multiplied by $2\frac{1}{4}$, and the result added to the carbohydrates to make a total of their full value; thus $46.6 + (0.6 \times 2\frac{1}{4}) = 47.95$, say 48. Then if 100 lb. yields 48 lb., what will 11 lb. give? $(11 \times 48) \div 100 = 5.28$ lb.

So if we feed 11 lb. bush hay to a bullock, we will supply the .3 lb. protein demanded and 5.28 lb. carbohydrates, which latter is 1.38 lb. more than required, and which would be wasted when fed.

Working in the same manner, we find that 3 lb. of lucerne hay would yield .3 lb. protein, but only 1.23 lb. of carbohydrates, which is 2.67 lb. less than required. To supply the quantity for 3.9 lb. carbohydrates, $9\frac{1}{2}$ lb. of hay will be required, entailing a loss if fed of enough protein to do two more animals.

Obviously, a mixture of the two feeds would provide the most economical ration. Thus:—

1 lb. of lucerne hay will give .1 lb. protein and .41 lb. carbohydrates.

7 lb. of bush hay will give .196 lb. protein and 3.36 lb. carbohydrates.

The total nutrients of this mixture would be .296 lb. protein and 3.77 lb. carbohydrates, which is very close to that required.

As there will always be some dry grass available, such a mixture could be calculated as just sufficient for the maintenance of a beast of about 500 lb. weight.

As very dry pastures have a very low protein content and comparatively high carbohydrate content, the graziers' concern would be to supply the necessary protein, which would be more easily effected with 3 lb. of a legume hay than with 11 lb. of bush hay. For sheep, it will be noted the protein required is proportionately greater than for cattle, largely owing to the amount of protein demanded for the production of wool—which, freed of moisture, grease, and dirt, is practically pure protein.

To supply the necessary protein, .07 lb. daily, for the 50 lb. sheep, it would be necessary to supply 2½ lb. of bush hay, or .66 lb., which is 10½ oz., of lucerne hay, or .24 lb., which is roughly 4 oz., of linseed oil cake. This quantity of bush hay would give 1.2 lb. carbohydrates, which is .67 lb. more than is required; the lucerne hay would give .27 lb., about half the requisite quantity, while the linseed oil cake would give .12, or a little less than a quarter of that required.

As was shown in the case of cattle, more economical feeding would result with a mixture of a food rich in protein added to a smaller quantity of bush hay. Thus 1 lb. bush hay yields .028 lb. protein and .48 lb. carbohydrates, 6½ oz. lucerne hay yields .042 lb. protein and .16 lb. carbohydrates, so that the mixture would yield .07 lb. protein and .64 lb. carbohydrates. The 6½ oz. of lucerne hay providing .042 lb. protein could be substituted by 2¼ oz. linseed oil cake, 1⅗ oz. peanut oil cake, 3⅗ oz. cow pea or velvet bean seed, 9 oz. maize, 8 oz. grain sorghum, and so on, though with some of these the carbohydrate content of the mixture would be slightly higher than was necessary.

The quantity of conserved fodder to carry over a specified number of stock for a stipulated time can be worked out approximately from these figures. Assuming 4,480 sheep were to be fed, the daily requirements of bush hay would be 2 tons, of legume hay 1,820 lb., which latter could be substituted by 630 lb. linseed oil cake, 448 lb. peanut oil cake, 1,008 lb. legume seed, 2,520 lb. maize, or 2,240 lb. sorghum grain.

For a possible feeding period of 200 days stacks of bush hay, aggregating 400 tons at 20s. per ton, and of legume hay, aggregating 163 tons at £2 per ton, would be necessary, a total cost of £726, to which must be added the cost of distributing to the stock. Allowing 17s. 6d. per day for an extra man, the cost for 200 days would be £175, making a total of £901, or 4s. per head, which is a reasonable figure for the cost of feeding a sheep for 200 days.

The quantity of fodder thus indicated will appear very large, especially if a greater number of sheep had to be provided for. It would not be necessary to conserve this quantity every year, nor would the period over which feeding would be advisable, except very rarely, extend as long as 200 days. A certain amount stored annually would soon aggregate sufficient to provide for any period of exceptionally light rainfall.

The cattle-owner will, doubtless, decide that it will not be economically possible to conserve and feed hay to his herd in a dry time, since where hundreds of tons are required for sheep, thousands would be required for cattle. With cattle particularly, the drought losses fall most heavily on the breeders. On most runs the frontages to water are soon eaten out, requiring a greater distance to be travelled daily to water as the pasturage is eaten further back; the weaker animals, feeling the strain of the journey to water, allow longer intervals between drinks, which further weakens them, resulting frequently in their inability to free themselves from the soft or boggy soil at the water's edge after drinking, where they perish.

While it would not be feasible to provide fodder for the whole of a large herd of cattle, the profitability of a supply to the breeders segregated within a reasonable distance of water should be worthy of serious consideration.

Fodder Values.

Digestibility of Fodders.—Where the proportion of proteins to carbohydrates forms a suitable nutritive ratio, digestion is more easily effected than when either preponderate; while excess of carbohydrates means a poorer digestion and loss of the excess of that nutrient in the fæces, an excess of protein fed for a length of time is apt to impair the health of the animal, as well as preventing full assimilation of the nutrients demanded.

Where the fodders supplied contain a high proportion of woody fibre, such as in old dried-up pastures, digestion is interfered with, while the slower passage of this undigested matter through the bowels lessens the capacity of the animal for further food, to such an extent that though sufficient nutrients may be present, the quantity necessary to supply same is greater through this cause than the animal can consume daily. An aggravated condition due to an excessive quantity of indigestible matter in dry foods is termed dry bible or impaction of the omasum, in which the digestive tract becomes paralysed, and death ensues if relief is not given.

Succulence.—The greater progress of animals feeding on young succulent pastures than on those more matured is due, not only to the better balance of the nutrients, but to their succulence and easier digestibility, which allows a greater quantity to be consumed daily with a consequent assimilation of greater nutriment. Succulence in a food, especially in a dry time, renders it more appetising.

Silage.—The value of silage lies not only in the food value it possesses but in its succulence. The analysis given of sorghum ensilage shows a wide nutritive ratio, indicating the addition of a fodder rich in protein to obtain the best results from feeding. Silage made from a mixture of sorghum and cowpeas or velvet beans should give a more satisfactory balance of nutrients. As the sorghum silage analysis shows a moisture content of 67.2 per cent., it necessarily follows that a greater quantity must be fed daily than is suggested in hays or other dry fodders, where the moisture content is 15 per cent. or lower. The great value of silage is in its succulence, through which digestion is assisted and the appetite increased. Sheep-breeders are aware of a higher lambing percentage when the pastures have a certain succulence than when they are dry, also of the better progress of ewe and lamb when this same succulence obtains.

In the North-Western sheep areas it is rarely that the pasturage is good both at the time of joining ewes and rams and when the lambs are dropped; consequently, mating is usual between September and November, when the pastures are at their worst, so that the lambs will appear between February and April, when the pasturage is most certain to be good. Joining during these dry months does not result in as high an average lambing percentage as is desired. Flushing the ewes by feeding to them silage with other nutritious fodder some few weeks before joining with the rams could be expected to result in a more successful breeding over a shorter period, while the better nourished animals should produce stronger and better lambs.

An additional value of silage would be found in an occasional supply to ailing sheep or those that were not doing well on other fodders, such as are usually set apart in dry times in the "hospital paddock."

Change of Diet.—As with the human being, change of diet is appreciated by animals, a better progress being maintained when the fodders are from a mixture of plants than from one or two only. Occasional changes, while still maintaining the supply of the necessary nutrients, will act as a stimulus to appetite.

The choice of the grazier will be limited, unless purchase is made, to those crops which can be profitably grown on the holding. While bush hay, from its ease of production, can be expected to provide the bulk of the fodder, legume hay should also be conserved to provide in combination the desired nutritive ratio in a ration not too large, for easy supply or for the capacity of the animal. In addition, silage from its succulence, is very valuable, while the seed of cowpeas or velvet beans, and the grain of sorghums, should be especially useful by way of change or for use when flushing ewes.

The feeding standard for the maintenance of cattle and sheep at the weights indicated must only be looked upon as approximate. Animals of the same size or weight can be expected to vary in their power to assimilate nourishment from the same quantity of food.

Since the chief deficiency in dry pasturage and grass hays is protein, the aim in feeding should be principally directed to its supply, of which the amount set out as the daily requirement should not be lessened. Where work beyond the maintenance of the animal is demanded, such as in the production of milk or the nourishment of the fœtus, a greater supply of nutrients, especially in proteins, is necessary, towards which silage, legume seeds, linseed oil cake, and grain offer advantages.

MINERAL REQUIREMENTS.

As previously mentioned, the requirements of an animal in mineral matter are, in most localities, sufficiently met by a good, mixed pasturage or other fodder, in which the necessary amounts of digestible nutrients are contained. The composition of the ash of various plants, however, differs somewhat when grown under equal conditions of soil and climate and during stages of growth, while there are further differences in that of the same species when grown on soils of unequal fertility, and in good and bad seasons, for which reasons mineral matter is sometimes deficient in the feed. Cattle raisers are all aware of better bullocks, not only in size and quality of beef, but in earlier maturity, being raised in one district than in another, while sheep men can instance higher prices being secured for wool produced in one particular district over that produced by sheep of similar breeding in another district.

The composition of the ash of plants, though containing the same elements, differs in the proportion of these elements from the ash of animals. The percentage of ash in the animal will vary according to its age and condition, the amount of mineral matter in the bones or skeleton being proportionately much greater than in the other parts; so that the percentage of ash decreases as the animal fattens.

According to Lawes and Gilbert, of the Rothhamstead Experiment Station, England, a bullock half fattened contains 4.66 per cent. of ash, while a fattened bullock contains 3.92 per cent. ash; similarly a store sheep will contain 4.36 per cent., while a fat sheep will contain 3.45 per cent. This ash will contain lime, phosphoric acid, potash, soda, magnesia, silica, iron, &c., of which some 80 per cent. will be comprised of lime and phosphoric acid, in the approximate proportions of 41 and 39 parts, respectively, while potash will represent about 4.8 per cent., soda about 4.5 per cent., magnesia about 1.4 per cent., with other constituents in lowering quantities to a trace. The preponderance of lime and phosphoric acid is due to the bones being very largely composed of these, in combination as a calcium phosphate. The necessity for the supply of these mineral substances is thus very apparent; it is not only in bone formation, however, that their presence is essential, for, in common with the other mineral elements found in the animal's body, the vital processes cannot satisfactorily go on in their absence.

Lime and phosphoric acid forming, as they do, some 80 per cent. of the mineral matter of the animal's body, necessarily are required in greater quantity in the food. In some districts, notably those where stock thrive best on the natural pastures, the soil supply is sufficient to allow the requisite amounts to be obtained in the pasturage; in others, however, phosphoric acid and lime are in poor supply, when the shortage of one or both is reflected in a smaller size of the matured animal, longer period in reaching maturity, or in malformation of the bone, brittle bones, and, in general, loss of tone and vigour.

Instances of the difference in the mineral content of plants can be cited in the excess of lime in legumes over non-legumes, and in the layer proportion of phosphorus in the seeds of cereals, &c., showing in the latter a loss of phosphorus from the plant when the seed has been shed.

While animals obtain mineral matter from their food, they also find a source of supply, frequently in the water they drink. An instance of the value of dissolved mineral matter in the drinking water was reported as far back as 1878, in the Austrian "Quarterly Review of Veterinary Science," where cattle suffered from fragility of bones and general unthriftiness when drinking from a spring of pure water, but when supplied from a second spring, which contained in solution carbonate, sulphate, and phosphate of lime, as well as chlorate of magnesia, though only in small quantities, the animals recovered; being changed back to the pure water, the trouble reappeared, to disappear again when the mineralised water was next brought into use. It was noted that stock partook more freely of the mineralised water than they did from the pure stream.

Mineral Craving.—The deficiency of one or more of the necessary constituents in an animal's food creates a craving through which the appetite becomes perverted, allowing substances to be consumed that normally would not be touched, an example of which is bone chewing. Instances of natural licks are not uncommon in cattle country, where, over a number of years, cattle consuming the earth at particular spots have made appreciable excavations. Analyses of the earth from these spots have revealed small quantities of lime, magnesia, potash, &c., which, no doubt, was the incentive for the licking of the soil at those spots. On the coastal country, cattle eating species of the zamia plant—burrawong in New South Wales and zamia in Queensland—develop a disease commonly known as rickets. In the early days of settlement this trouble was unknown, but the habit of eating portions of the plant gradually spread, until cattle affected with rickets caused thereby are now common in districts where the plant grows freely. A pastoralist relates that on a holding in the Mackay district there was no trouble until 1888, a very dry year, when the cattle took to eating the zamia and have been following the practice since, with consequent prevalence of rickets. In very dry years stock eat many growths that in ordinary seasons they will not touch, although there may be plenty of dry grass available. Such an appetite is evidently caused by a craving or demand of the system for something wanting in the pasturage, especially during extra dry periods.

While a perverted appetite, in odd instances, may be created by another cause, it is considered that the craving caused by a deficiency of one or more of the necessary mineral elements in the food must be held as responsible. Weight is lent to this view from the fact that, where mineral matter in the form of a lick is provided, stock partake of it less freely, if at all, when the pasturage is young and mineral content good, but more and more freely as the pasturage becomes older or in times of drought, when it is known the mineral content is in lowest supply.

Deficiencies of mineral matter in the pasturage or other fodder grown on the small cultivated holding are met by the application of fertilisers to the soil, a system that offers no attraction on the large pastoral holdings.

The addition of mineral matter to the food has proved very effective in feeding tests, but this also is impracticable on the large holding.

A supply through the agency of the drinking water is only possible where stock obtain their supply from troughs. Here the necessity to use a water soluble phosphate would add to the expense, while, at the same time, waste would occur, in the animal being forced by thirst to imbibe more than the system demanded. It remains, then, for consideration to be given to a means whereby the animal can obtain a supply, as it feels the need, in which connection a mixture of the necessary matter with an attractive base is suggested.

Licks and Their Values.

Licks.—It has been customary for ages past to supply horses, cattle, and sheep with salt, in the form of a lick; pure salt is a combination of sodium and chlorine, both of which are found to be contained in the body of the animal, the former expressed as soda forming something like 4.5 per cent. of the ash, while the latter is found in considerably less quantity than 1 per cent.

Salt alone cannot be regarded as supplying the most necessary of mineral matter; rather may it be viewed as a condiment, which increases the palatability of many foods, and as an aid to digestion. The appetite for salt varies with the season, and also on different classes of country. Scientists have disagreed as to the measure of importance in which the supply of salt should be regarded, but all admit a certain amount is beneficial. Excessive consumption of salt is injurious, and at times proves fatal.

In the form of a lick, where stock can help themselves, a nausea is created before too much is taken, and it is only where a mixture is made with a food sufficiently palatable to defeat the nausea otherwise obtaining that an excess is taken, and harm results. As a base for a lick, in which other mineral matter can be supplied, the attraction of salt commends it.

The analyses of the ash of animals would suggest the supply of the mineral substances which occur in largest quantity therein, such as lime and phosphoric acid; a combination of these as a calcium phosphate, either as phosphate rock or as sterilised bone, of course ground up finely, offers the most satisfactory and economical means of supply.

Licks composed of calcium phosphate and salt have proved very beneficial, and have been effective in overcoming brittleness of bone and other evils, due to a lack of these mineral matters in the soil, and consequently in the pasturage grown thereon. Henry, in an informative article on "The Influence of the Mineral Constituents of Food on Animal Health," in the New South Wales "Agricultural Gazette," for December, 1925, points to the supply of lime and phosphorus having a beneficial effect on reproduction, as well as in countering other ill effects, due to their deficiency in the soil.

Other mineral matter found in the bodies of animals, such as potash, magnesia, iron, and sulphur are not usually added to a lick in any quantity; all fodders generally containing sufficient for the animal's requirements.

Sulphate of iron, which has tonic properties, is generally advised in the proportion of 1 to 2 per cent.

Potash, though rarely appearing in the formulæ for stock licks, might be given consideration in those specially compounded for sheep, since it occurs largely in the suint of wool or sweat of that animal; the lustre of wool is also held to be due to the potash consumed in the food.

Recent scientific research has shown the value of iodine as a prophylactic in goitrous conditions when added to a lick as potassium iodide in the proportion of 5 oz. to 100 lb. of the lick; it has also been suggested as of value in promoting fecundity.

In compounding a lick the important constituents will be calcium phosphate, either as sterilized bonemeal or ground rock phosphate. The quantity of salt for the base should be just sufficient to attract the animals.

At first it may be advisable to use 75 per cent. of salt until the animals become accustomed to the taste of the other material, after which the quantity could be reduced to 60 per cent., 50 per cent., or 40 per cent., and the amount of phosphate correspondingly increased.

A satisfactory lick might be composed of:—

	Per cent.
Sterilized bonemeal or ground rock phosphate	25–60
Common salt	73–38
Sulphate of iron	1
Chloride of potash	1

In mixing the ingredients to form a lick, it is important that they should be in a fine state of division and thoroughly incorporated to form a homogenous whole; continuous turning over with shovels on a smooth floor and passing through screens several times offers a satisfactory means to this end.

Proprietary Licks.—Several licks put up ready for use are on sale at various prices, some of which, judged by analyses made by the Agricultural Chemist, are unduly high. The following prices were quoted in Brisbane during February, 1927, either f.o.r. or f.o.b.:—

	£	s.	d.
Ground Nauru phosphate rock, 38 per cent. phosphoric acid	7	10	0 per ton
Sterilized bonemeal, 22 per cent. phosphoric acid	10	0	0 per ton
Refined salt	10	0	0 per ton
Sulphate of iron	0	15	0 per cwt.
Chloride of potash	0	14	6 per cwt.

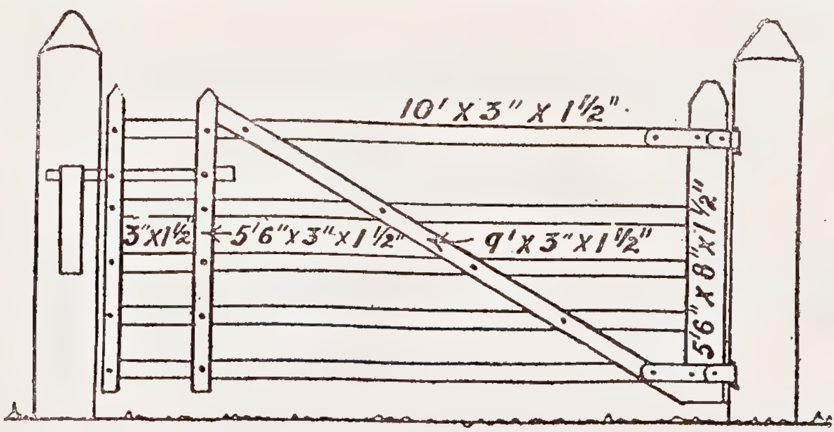
It will be observed that ground Nauru phosphate rock, while containing 16 per cent. more phosphoric acid, is also £2 10s. per ton cheaper than sterilized bonemeal.

Crude salt will be just as effective as refined salt, and probably much cheaper.

Consideration of these prices should convince stockowners that home-mixed licks, while proving as effective as any, will be the most economical.

FARM GATE.

Mr. D. Wass, manager for Messrs. H. E. Kater and Son, of Egelabra, Warren, New South Wales, furnished a year or two ago plan and particulars of a farm gate, which is herewith produced. The specifications are: Two uprights of 8 inches x 1½ inch colonial pine, 5 feet 6 inches long; four uprights of 3 inches x 1½ inch oregon, 5 feet 6 inches long; five bars of 3 inches x 1½ inch oregon, 10 feet long (or length of



gate required); two stays of 3 inches x 1½ inch oregon, 9 feet long (or longer, according to length of gate); one matlock handle for latch; nineteen bolts, each 4½ inches x ⅜ inch; six bolts, each 5 inches by ⅜ inch; two hinges, each 18 inches eye and hook, to suit gateposts. The main gates on Egelabra are 12 feet long, but the plan can be used for any length of gate required. The substantial posts are well braced with sleepers.—"Australasian."

BUILDING TIMBERS.

By C. J. J. WATSON, Queensland Forest Service.

When the right man fills the right job the highest efficiency may be expected. The principle, every man to his own job, is well recognised in business with regard to individuals, but is often disregarded in the building trade with regard to timbers. Careful consideration is given to a man's qualifications before he is placed in a position; in the same way a timber should be fully qualified for the position which it is to occupy.

Individual timber species have "character" as much as men, and the advantages and disadvantages of this should be considered before use. Two sides of the problem must be studied—firstly, the requirements of the job, and secondly, the suitability of the timber for the job. Builders know what qualities are required, but much uncertainty exists as to the right timber to use. This opinion has been formed by observation of the timbers placed in different parts of buildings now under construction in Brisbane.

By summarising the qualities of local timbers it will assist in their selection for different uses. Desirable qualities in timber for various building purposes are discussed herein, and a complete specification of building timbers is also added.

DURABILITY OF TIMBERS.

In Ground.

Durability in the ground is an essential quality in all timbers which are required to be placed wholly or partially under the soil, as in the case of house stumps, piles, sills, telegraph poles, and fence posts. The durability of a timber cannot be judged from its outward appearance or internal structure, but from experience only. Many hard, heavy woods are not at all durable in the ground, while some softwoods, which do not appear durable, give good service. Two such examples are Cypress Pine (*Callitris* sp.) and Grey Teak (Beech) (*Gmelina Leichhardtii*). Probably the most durable of all timbers in the ground is Grey Ironbark (*Eucalyptus paniculata*). Any timber which will not last at least fifteen years in the ground should not be used.

In Weather.

Timbers in exposed positions, such as weather boards, veranda posts, railings, and steps, must be of a durable nature. Timbers which are durable here may fail from some cause when placed underground. Again experience is the best teacher, and it has shown that Red Cedar (*Cedrela australis*), a softwood, is very durable in the weather. Timbers which are durable in the ground are almost always durable above ground. A life of thirty years should be required from timbers of this group. Pines should not be exposed to the weather when much more durable hardwoods are available.

Indoors.

When timbers are used indoors the same high degree of durability is not required, provided that the wood is always dry and well aired. Pine which will last only a few months unprotected in the weather will last a lifetime inside. English Oak has been known to last over 500 years under cover, and there is no reason why our more durable hardwoods should not last over a thousand years under similar conditions. The presence of stagnant, damp air provides the best condition for the development of rot in timber.

Under Water.

Timber is often used under water, as in wells and boat-planking. Under such conditions the wood decays most rapidly at the water-line. Pure water does not rot timber, but preserves it by preventing the attacks of destructive fungi. Where the water rises and falls on the timber, and especially if dirty, rot quickly sets in, and under such conditions either a very durable timber must be used or the timber must be properly protected from the water by paint, varnish, or similar covering.

Hoop Pine boat-planking will last for many years if kept properly painted, even though the boards become saturated with water, but if rain water is allowed to enter the inside, and the boat hatches are kept closed, the stale, damp air inside will rapidly cause the timber to rot.

Borer Resistant.

Certain timbers are insect resistant on account of certain chemicals contained in the wood. This is a very valuable quality in places where white ants or borers are common. Cypress Pine (*Callitris* sp.) is never attacked by white ants unless the timber is partly sapwood or rotten heartwood. Other hardwoods are not relished by white ants. This increases their value for fencing posts, telegraph poles, and similar underground work. Some timbers are particularly liable to borer attack, and should be handled with great care. Sapwood is always more attractive to borers than heartwood, and wherever possible should be cut off.

The sapwood of Black Bean (*Cantanospermum australe*) is particularly relished by borers, and that of Spotted Irongum (*Eucalyptus maculata*) is also a favourite. The Tulip Oaks (*Tarrictia* sp.) and Blush Cudgerie (Maiden's Blush) (*Euroschinus falcatus*) are timbers which become quickly riddled with small borer holes if care is not taken in stacking. The She Oaks (*Casuarina* sp.) provide the favourite home of the large white borers.

To prevent borer attack stacks should be kept well aired and in a dry condition while seasoning, and all sapwood should be removed.

Teredo Resistant.

All timbers which are used below water-line in tropical tidal rivers are attacked to some extent by the teredo (*Teredo navalis*). The point most attacked is at low-tide level. Turpentine (*Syncarpia laurifolia*) and Swamp Box (Mahogany) (*Tristania suaveolens*) are teredo resistant if used with the bark intact. Should the bark become rubbed off they are subject to attack. Cypress Pine (*Callitris* sp.) and Brown Pine (*Podocarpus elata*) are also teredo resistant to some extent even when sawn. All other timbers should be sheathed.

Fire Resistant.

Timbers which are fire resistant are valuable for important structural work, such as country bridges, telegraph poles, and fencing. Turpentine (*Syncarpia laurifolia*) practically holds pride of place amongst all Australian woods for resistance to fire. In this respect Turpentine has a decided advantage over Ironbark, which is very inflammable. Telegraph poles of Ironbark are often burnt through by grass fires which do not damage Turpentine poles. Red Satinay (*Syncarpia Hillii*), which is a firm cabinet wood, is also extremely fire resistant, and is suitable for the manufacture of fireproof doors.

STRENGTH OF TIMBERS.

Strength is a very desirable quality amongst structural timbers. Strong timbers can be used in smaller sizes than weak ones, and thus save space and also timber. When a weak timber is used in a structure, much cross bracing and strutting is required to give it sufficient strength. By using strong timbers a much simpler design can be constructed.

Strength can be defined as the resistance to fracture under a load, but the load can be applied in several different ways.

Tensile.

Most of our hardwoods have ample tensile strength, and where failure occurs it is usually found to be due to bending or shearing. All our local hardwoods will withstand a heavy tensile stress, but Grey Ironbark (*Eucalyptus paniculata*) is at the head of the list. A common example of a structural member under tension is a wall brace.

Crushing.

Crushing stress may be applied on the end grain (cross-section of the wood fibres) or long grain (longitudinal section of the fibres). Local hardwoods offer a very high resistance to crushing. An example of crushing on end grain is the top of a column or post carrying a load. Long columns fail by bending rather than by the crushing of the fibres. Crushing on long or side grain is seen when a joist rests upon a support with a load above.

Bending.

Most failures in structures occur either as the result of members bending and fracturing, or shearing along the fibres. Thus a timber which can carry a heavy load under a bending stress is a very useful one. Beams or girders carrying loads are subjected to a bending stress. Cantilever beams require to be specially strong, because in these the principle of leverage is brought into operation. Although many are very strong, brittle timbers are not favoured for use under bending stresses, because they give little warning by bending before complete fracture. Such a timber is Red Irongum (Blue Gum) (*Eucalyptus tereticornis*).

Grey Ironbark (*Eucalyptus paniculata*), with an average modulus of rupture of about 20,000 lb. per square inch, is the strongest of local hardwoods in bending, and is the most suitable timber to use in any place where a heavy load has to be carried. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*) is also a very strong timber, but is not equal to Grey Ironbark.

Where the spans are short, as in ordinary dwellings, most of the common hardwoods are suitable. Rose Gum (Flooded Gum) (*Eucalyptus saligna*) has only a little over half the strength of Grey Ironbark.

Hoop Pine and Bunya Pine (*Araucaria* sp.) are very strong timbers of the Pine family, and are much stronger than Kauri Pine (*Agathis* sp.) or Cypress Pine (*Callitris* sp.). Oregon Pine is only five-sixths as strong as Hoop Pine.

Shearing.

Shearing may take place either across or along the fibres. Failure from the shear across the fibres seldom happens in practice, as the fibres exert an enormous resistance to fracture in this direction. Failure from shear along the fibres or splitting off is much more common. Tough timbers are best fitted to resist this. Boards of fissile timbers shear or split along the fibres to the end when nailed near the end, but tough woods do not do this. Tough hardwoods which resist shearing along the grain are Grey Ironbark (*Eucalyptus paniculata*) and Red Irongum (Blue Gum) (*Eucalyptus tereticornis*). Grey Blackbutt (*Eucalyptus pilularis*) and Red Messmate (Red Stringybark) (*Eucalyptus resinifera*) are generally fissile. Timbers with interlocked fibres best resist longitudinal shearing, and almost all local hardwoods are much harder to split across the growth rings or radially than parallel to the growth rings or tangentially.

Torsion.

Torsional or twisting stresses are very common in practice, especially when buildings are subjected to wind pressure. This combines tensile, crushing, and shearing stresses. Tough, strong, straight-grained timbers are best suited to resist torsional stresses. Grey Ironbark (*Eucalyptus paniculata*) is the strongest local timber for this purpose. All the other local hardwoods are quite strong enough for ordinary building purposes. Hoop Pine (*Araucaria Cunninghamii*) is much tougher and will stand a much greater twisting stress than Oregon (*Pseudotsuga Douglasii*).

OTHER TIMBER CHARACTERISTICS.

Hardness.

Hard timbers are more difficult to work, but they resist wear much better than softwoods. Timbers for such work as wharf-decking, paving blocks, unprotected stair-treads, and flooring should be as hard and tough as possible to resist wear. They must also be very durable, and not liable to rot. Only the best of hardwoods should be used in usch places.

Toughness.

Tough timbers are also difficult to work, but are indispensable for positions where resistance to splitting is required, such as in the naves and felloes of wheels, and stem-posts of boats. Toughness in timber also prevents splitting of boards during nailing operations, and holds nails more securely. The arrangement and cohesion of the wood fibres are responsible for the degree of toughness in the wood.

Softness.

Joinery and cabinet woods must be fairly soft to permit of easy and economical working. Only in rare cases, as in Red Cedar (*Cedrela australis*) and Grey Teak (Beech) (*Gmelina Leichhardtii*), are very soft woods durable in the weather. Softwoods are often tough but seldom very strong in bending, and should not be relied upon for strength. Softness is not a good quality in flooring, because it becomes disfigured and quickly worn.

Close Grain.

Close-grained woods are less liable to splinter under wear than those which are open-grained, and are also more impervious to water. Close-grained timbers are cheaper to paint or polish, because they present a smoother surface and require less material to fill the grain.

Colour and Figure.

Timbers with a pleasing colour or figure are more valuable for cabinet work, but make little difference in structural timbers, except in fancy flooring. Colour and figure do not indicate durability, while ripple-figured woods are seldom very strong in bending. Some timbers, such as Red Messmate (Red Stringybark) (*Eucalyptus resinifera*), with a pleasing colour, have become more highly regarded than they deserve, when the important factor of durability is fully considered.

Effect on Nails.

Some timbers, generally those of a greasy nature, do not rust iron. This is a feature which is very useful in structures in which a large number of nails or screws are used, or where iron fastenings are used. The iron is never weakened by corrosion. Two woods of this type are Crow's Ash (*Flindersia australis*) and Yellowwood Ash (*Flindersia Oxleyana*).

Greasy Woods.

Greasy woods are usually very durable in the weather. These also wear smoothly, and finish with a very slippery surface suitable for dance floors. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*), Tallowwood (*Eucalyptus microcorys*), Crow's Ash (*Flindersia australis*), Yellowwood Ash (*Flindersia Oxleyana*), and Leopard Ash (*Flindersia collina*) are timbers of this type.

SEASONED TIMBER.

A building which is constructed throughout of fully-seasoned timber is much more valuable to its owner than one made of unseasoned timber, because it is more durable and will give a longer life with little expense in repairs; it is stronger and has a better appearance through the absence of faulty points and cracks, and will not damage floor coverings through the raised edges of boards. The little extra cost of obtaining and working the harder timber is more often offset by the many advantages.

The advantages of seasoned timber may be summarised thusly:—

Extra Durability.

The wood does not crack or shrink and open the joints to let in the weather and hasten decay. It is particularly important that the rain should not find its way through the external sheeting, through bad joints, and attack the soft pine lining.

The timber is much less subject to decay if placed in the house in a dry state. Dampness is the greatest aid to decay, especially in badly aired places.

Dry timber holds paint and varnish better, and the timber is well protected from the weather.

Frequent expensive repairs due to decaying parts are unnecessary.

Strength.

The building is stronger, and thus less liable to damage by storms, owing to well-fitting joints and sound timber. Joints which fit when the timber is unseasoned will show wide gaps within a few months. Seasoned timber does not change its shape or shrink.

Appearance.

When fully-seasoned timber is used, no open joints are visible in the railings, veranda flooring, or outside walls of the building; all the outside V-jointed lining boards are close together and do not show the tongues, all mitred joints are close, and no cracked, twisted, or warped boards are seen. Everything looks well made. This greatly increases the value of the house from the point of beauty.

Damage to Flooring Coverings.

Seasoned flooring boards do not curl up at the edges, and greatly increase the wear on the linoleums and carpets at these places.

In using seasoned timber in a building the carpenter has the advantage of handling lighter timber, of which he can carry more super. feet to the ton, and so cheapen his cartage. Half-seasoned pine and unseasoned hardwood will weigh about 1 lb. more for every super. foot handled. When the building is completed the carpenter has the satisfaction of knowing that he has made a good job, which does him credit, and has no fears that the timber will shrink within a few months and ruin his good work.

PART I.—HARDWOODS.

(a) For Use in the Ground.

(House blocks, fence posts, sills, piles, &c.)

1. Grey Ironbark (*Eucalyptus paniculata*).
2. Narrow Leafed Ironbark (*Eucalyptus crebra*).
3. Red Leafed Ironbark (*Eucalyptus sideroxylon*).
4. Broad Leafed Ironbark (*Eucalyptus siderophloia*).
5. Red Bloodwood (*Eucalyptus corymbosa*).
6. Yellow Stringybark (*Eucalyptus acmenioides*).
7. Yellow (Gympie) Messmate (*Eucalyptus clœziana*).
8. Red Irongum (Blue Gum) (*Eucalyptus tereticornis*).
9. Grey Irongum (Grey Gum) (*Eucalyptus punctata*).
10. Grey Irongum (Grey Gum) (*Eucalyptus propinqua*).
11. Tallowwood (*Eucalyptus microcorys*).
12. Yellow Ironbox (Yellow Box) (*Eucalyptus melliodora*).
13. Grey Ironbox (Gumtop Box) (*Eucalyptus hemiphloia*).
14. Black Ironbox (Thozet's Box) (*Eucalyptus Raveretiana*).
15. Crow's Ash (Teak) (*Flindersia australis*).
16. Hickory Ash (Cairns Hickory) (*Flindersia Ifflaiana*).
17. Turpentine (*Syncarpia laurifolia*).
18. Swamp Box (*Tristania suaveolens*).
19. Western Cypress (*Callitris glauca*).
20. Coast Cypress (*Callitris arenosa*).

Note—

No. 5 should not be sawn on account of prevalent gum veins.
No. 18 is brittle and weak and should only be used in large sizes.
Nos. 19 and 20 are semi-hardwoods and will not carry a very great load.
Nos. 3, 12, 13, and 19 are mostly inland species.
No. 14 occurs at Mackay and No. 16 in North Queensland.
All timber should be matured and free from sapwood.
Ironbark should be preferred where great strength is required.

(b) For Use Above Ground in the Weather.

(Veranda posts, railings, exposed flooring, steps, weather boards, &c.)

Timbers as for (*a*), with the exception of Red Bloodwood (*Eucalyptus corymbosa*), Swamp Box (*Tristania suaveolens*), and Turpentine (*Syncarpia laurifolia*). Western and Coast Cypress (*Callitris glauca* and *arenosa*) may be used for external sheeting only when other hardwoods are difficult to obtain. These are not strong. The following may also be included:—

21. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*).
22. Lemon Irongum (Lemon Scented Gum) (*Eucalyptus citriodora*).
23. Grey Blackbutt (*Eucalyptus pilularis*).
24. Red Messmate (Red Stringybark) (*Eucalyptus resinifera*).
25. White Blackbutt (White Stringybark) (*Eucalyptus engenioides*).

Note.—All timbers should be fully seasoned before use.

(c) For Use when Protected from the Weather.

(Plates, bearers, joists, studs, braces, &c.)

Any timbers as for (B), with the addition of:—

26. Rose Gum (Flooded Gum) (*Eucalyptus saligna*).
27. Turpentine (*Syncarpia laurifolia*).
28. Brush Box (*Tristania conferta*).
29. Rose Satinash (Red Eungella Gum) (*Eugenia hemilampra*).
30. Yellow Satinash (*Eugenia gustavioides*).
31. Grey Satinash (White Eungella Gum) (*Eugenia* sp.).
32. Pink Satinash (Water Gum) (*Eugenia Francisii*).
33. Red Satinay (Fraser Island Turpentine) (*Syncarpia Hillii*).
34. Spur Mahogany (Spurwood) (*Dysoxylon Pettigrewianum*).

Note.—All timbers should be fully seasoned before use. Nos. 26 to 33 shrink much more than usual in seasoning, and must be dry before use. Bearers, &c., carrying very heavy loads should be of ironbark.

(d) Fancy Hardwoods and Semi-Hardwoods for Indoor Polished Floors.

24. Red Messmate (Red Stringybark) (*Eucalyptus resinifera*).
26. Rose Gum (Flooded Gum) (*Eucalyptus saligna*).
21. Spotted Irongum (Spotted Gum) (*Eucalyptus maculata*).
11. Tallowwood (*Eucalyptus microcorys*).
15. Crow's Ash (Teak) (*Flindersia australis*).
35. Yellowwood Ash (Yellowwood) (*Flindersia Oxleyana*).
36. Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
37. Rose Mahogany (Rosewood) (*Dysoxylon Fraseranum*).
34. Spur Mahogany (Spurwood) (*Dysoxylon Pettigrewianum*).
38. Miva Mahogany (Red Bean) (*Dysoxylon Muelleri*).
29. Rose Satinash (Red Eungella Gum) (*Eugenia hemilampra*).
33. Red Satinay (Fraser Island Turpentine) (*Syncarpia Hillii*).
39. Rose Marara (*Weinmannia lachnocarpa*).
40. Red Tulip Oak (Red Crow's Foot Elm) (*Tarrietia peralata*).
41. Black Bean (Beantree) (*Castanospermum australe*).

Note.—Nos. 21, 11, 15, and 35 are of a greasy nature, and are specially suitable for dance floors. It is most important that all of these timbers be seasoned for at least one year before nailing down. Quarter-sawn boards shrink less and keep their shape better than others.

PART II.—SOFTWOODS AND SEMI-HARDWOODS.

(a) Rafters, &c., Under Roof.

(B class containing sound knots and stain not seriously decreasing the strength of the timber.)

1. Hoop Pine (*Araucaria Cunninghamii*).
2. Bunya Pine (*Araucaria Bidwelli*).
3. Western Cypress (*Callitris glauca*).
4. Coast Cypress (*Callitris arenosa*).
5. Kauri Pine (*Agathis Palmerstoni*).
6. Kauri Pine (*Agathis microstachya*).
7. Kauri Pine (*Agathis robusta*).
8. Brown Pine (*Podocarpus elata*).
9. Black Pine (*Podocarpus amara*).
10. Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
11. Rose Walnut (*Endiandra discolor*).
12. Red Satinay (Fraser Island Turpentine) (*Syncarpia Hillii*).
13. Blush Walnut (Hard Bolly Gum) (*Beilschmiedia obtusifolia*).
14. Grey Walnut (Hard Bolly Gum) (*Beilschmiedia elliptica*).
15. Oak Walnut (Corduroy) (*Cryptocarya corrugata*).
16. White Walnut (Purple Laurel) (*Cryptocarya obovata*).
17. Rose Gum (Flooded Gum) (*Eucalyptus saligna*).
18. Grey Sassafras (*Doryphora sassafras*).
19. Grey Sassafras (*Daphnandra aromatica*).
20. Grey Sassafras (*Daphnandra repandula*).
21. Yellow Satinash (Water Gum) (*Eugenia gustavioides*).
22. Grey Satinash (White Eungella Gum) (*Eugenia* sp.).
23. Rose Satinash (Red Eungella Gum) (*Eugenia hemilampra*).
24. Spur Mahogany (Spurwood) (*Dysoxylon Pettigrewianum*).
25. Red Carrobean (*Weinmannia Benthami*).
26. Yellow Carrobean (*Sloanea Woolsii*).
27. White Ash (*Flindersia pubescens*).
28. Silver Ash (Bumpy Ash) (*Flindersia Schottiana*).

Note.—Nos. 5, 6, 9, 15, 19, 20, 21, 22, 23, 24, and 27 occur in North Queensland.

(b) Internal Sheeting.

First-class timber from species under Softwoods and Semi-Hardwoods (A), to which may be added the following timbers, which are mostly lighter, softer, and weaker.

27. Yellow Cheesewood (Leichhardt Tree) (*Sarcocephalus cordatus*).
28. Cherry Alder (Water Myrtle) (*Eugenia parvifolia*).
29. Blush Butternut (Sarsaparilla) (*Alphitonia franguloides*).
30. Rose Butternut (N.Q. Bolly Gum) (*Blepharocarya involucrigera*).
31. Silver Quandong (Blue Fig) (*Elæocarpus grandis*).
32. Brown Quandong (*Elæocarpus coorangooloo*).
33. Grey Quandong (*Elæocarpus ruminatus*).
34. Grey Teak (Beech) (*Gmelina Leichhardtii*).
35. Grey Teak (Beech) (*Gmelina fasciculiflora*).
36. White Silkwood (Putts Pine) (*Flindersia acuminata*).
37. Brown Bollywood (Bolly Gum) (*Litsea reticulata*).
38. Brown Bollywood (Bolly Gum) (*Litsea ferruginea*).
39. Brown Cudgerie (Mango Bark) (*Bursera australasica*).
40. Blush Cudgeria (Maiden's Blush) (*Euroschinus falcatus*).
41. Pencil Alder (Pencil Cedar) (*Ackama Muelleri*).
42. Rose Alder (Feather Top) (*Ackama quadrivalvis*).
43. Yellow Siris (Yellow Bean) (*Albizzia* sp.).
44. Oregon Pine (Douglas Fir) (*Pseudotsuga Douglasii*) (U.S.A.).

Note.—All timbers must be seasoned before use. No sapwood should be allowed in boards on account of the risk of borer attack.

Nos. 27, 29, 30, 32, 33, 35, 36, 38, 42, and 43 occur in North Queensland.

(c) Indoor Flooring (Covered).

Timbers as for (B) class containing sound knots, stain, and minor defects not affecting the strength of the timber.

Oregon Pine edge grain only.

(d) Special Softwoods for Joinery, Mouldings, Skirtings, Turnery, &c. (Under Cover).

In addition to the Pines Nos. 1 to 2 and 5 to 9 under (*a*).

Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
White Ash (*Flindersia pubescens*).
Silver Quandong (*Elæocarpus grandis*).
Grey Teak (Beech) (*Gmelina Leichhardtii*).
Grey Teak (N.Q. Beech) (*Gmelina fasciculiflora*).
White Silkwood (Putts Pine) (*Flindersia acuminata*).
Laurel Silkwood (Mazlin's Beech) (*Cryptocarya oblata*).
Brown Bollywood (Bolly Gum) (*Litsea reticulata*).
Brown Bollywood (Bolly Gum) (*Litsea ferruginea*).
Pencil Alder (Pencil Cedar) (*Ackama Muelleri*).
Rose Alder (Feather Top) (*Ackama quadrivalvis*).
Yellow Siris (Yellow Bean) (*Albizzia* sp.).
Maple Silkwood (Maple) (*Flindersia Brayleyana*).
Rose Silkwood (Silkwood) (*Flindersia Pimentelliana*).
Silky Oak (Bull Oak) (*Cardwellia sublimis*).
Silky Oak (*Grevillea robusta*).
Satin Oak (*Embothrium Wickhami*).
Red Cedar (*Cedrela australis*).

(e) Special Durable Softwoods, Suitable for Sashes, Fascia Boards, Mouldings, Sweeps, &c., Exposed to Weather.

Red Cedar (*Cedrela australis*).
Grey Teak (Beech) (*Gmelina Leichhardtii*).
Grey Teak (Beech) (*Gmelina fasciculiflora*).
Rose Walnut (Pidgeonberry Ash) (*Cryptocarya erythroxylon*).
White Silkwood (Putts Pine) (*Flindersia acuminata*).
Yellow Siris (Yellow Bean) (*Albizzia* sp.).
Silky Oak (Bull Oak) (*Cardwellia sublimis*).
Silky Oak (*Grevillea robusta*).
Satin Oak (Pine Oak) (*Embothrium Wickhamii*).
White Ash (*Flindersia pubescens*).
Silver Ash (Bumpy Ash) (*Flindersia Schottiana*).

CHICORY.*

Chicory (*Cichorium intybus*) is a perennial plant grown mainly for its roots which, after roasting and grinding, are used as an adulterant in coffee. In some regions it is also grown as a fodder crop. There are several varieties in cultivation, the commonest being Brunswick and Magdeburg. Being a perennial and with a long tap root, chicory is liable to become an objectionable weed if escaped from cultivation.

Climate.

The climatic requirements of chicory are somewhat similar to those of sugar beet, temperate regions with a good summer rainfall being most suitable for its cultivation. At present the chief centres in Victoria for the production of chicory are French Island, Phillip Island, and Hastings.

Soils.

Prefers a deep, free, easily-worked sandy loam with an open and well-drained subsoil. Will also grow well on poorer soils; but, owing to the very high costs per acre involved in raising this crop, it would be inadvisable to attempt its cultivation on any but the most suitable soil. As a good tap root is desired the plant must be able to root deep so that waterlogged areas and soils with an impervious hard pan near the surface are unsuitable unless such faults are corrected.

Preparation of the Seed Bed.

The land should be ploughed as deeply as possible in August or early September, and then harrowed down to a very fine tilth, resembling an onion bed. As the seeds take some four or five weeks to sprout, it is necessary that the land should be very clean, otherwise weeds are liable to overtop or smother the young plants.

Seeding.

The most suitable time for sowing in Victoria is usually during late September or October. The seed should be sown in drills 16 to 18 inches apart, and as shallow as possible, not deeper than ½ to ¾ of an inch. About 1 to 1½ lb. of seed per acre will be required.

When the plants are an inch or so in height they should be carefully thinned out in the drills, one plant being left to about every 5 or 6 inches. As soon as weeds appear, hoeing must be commenced. During summer weeds are kept down and the surface of the soil kept loose by means of the wheel or hand-hoe. The hoeing should be quite shallow, only deep enough to lift the weeds and loosen the surface. No cultivation is given after March.

Manures.

Like other root crops, chicory responds well to potassic and phosphatic fertilisers so that heavy dressings of potash and superphosphate will give greatly increased yields. Nitrogenous manures tend to develop the leaves at the expense of the roots and should therefore be avoided.

Harvesting.

The crop ripens about July, but digging usually starts in May on account of the time taken to harvest the crop, one man being able to lift an acre of roots in about ten days. The method of lifting usually employed is to run a light furrow along each row, thus exposing the roots, which may then be dug out with strong forks and laid in rows. The next process is "topping," the green tops being cut off with a sharp knife, and the roots thrown into heaps. The "tops" are much relished by stock, and are preferred to any other kind of forage. The roots are then thoroughly washed either in wooden vats or revolving root-washing machines. To dry the roots it is necessary to cut them into the thinnest possible slices, after which they are slowly dried in special "chicory kilns."

The average return of dried chicory on Phillip Island is, approximately, 1 ton per acre, though some growers have secured as much as 3 tons of dried chicory. To obtain such a yield, 11 tons of green roots are required.

As the local market for dried chicory is a limited one, intending growers would be well advised to make some arrangements with the merchants to take their crop at a fixed minimum price before committing themselves on a large scale.

Price of seed in Melbourne, 4s. 6d. per lb. Quantity per acre in drills, 4 to 5 lb. Price in Brisbane for last two years, £40 to £45 per ton. Duty on imported chicory, £28 per ton.

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* Reprinted from the "Journal of the Department of Agriculture of Victoria," October, 1921.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this section, unless otherwise stated, has been taken from the "International Review of Agriculture," published at Rome by the International Institute of Agriculture.

How to Give Women a Taste for Country Life.

Congrès international d'orientation professionnelle féminine. Bordeaux (France), 23-26 September, 1926. Bordeaux, 1926.

The International Congress on Vocational Direction for Women met at Bordeaux from 23rd to 26th September last, and was attended by representatives of numerous organisations and eminent persons interested in the problem. The origin of this Congress was the recognition of the fact that workers should be enabled to enter the occupations best suited to their capacities, thereby ensuring a greater advantage to the community owing to improvement in output, as well as to the individual who is thus occupied in accordance with his or her own bent and aspirations. A practical policy has been outlined and important inquiries undertaken on the subject in Germany, France, Belgium, the United States, England, Great Britain, Czecho-slovakia, &c.

The desirability of working along these lines in connection also with the agricultural occupations has been recognised, as appears from a special resolution passed at the recent Congress. This resolution takes into consideration the serious menace to agricultural prosperity involved in any distaste for country life on the part of women or girls, and on the other hand the fact that for the child in the country districts there is a natural bias towards rural occupations, which has only to be fostered and encouraged in the school, and urges:—

(1) That the spirit and the methods of the rural school shall be so conceived as to give the girls a direction and bias towards household and rural occupations;

(2) That instruction in household management, frankly rural, should be given to all girls in country districts between the ages of sixteen and eighteen, and that such instruction should be assigned so as to impart ideas and practical knowledge of a kind likely to make them good farm housewives and to counteract any tendency towards migration to the cities; all types of farm household management schools are to be recommended; wherever possible, however, preference is to be given to the school at a fixed centre, supplying continuous instruction and with a farm attached;

(3) That farmwomen's clubs or circles should be established and developed, which, together with lectures, competitions in professional skill, and other methods of diffusing interest and rousing the spirit of wholesome rivalry, will contribute to the further training and vocational development of the rural housewife.

The Higher Training Institute of Farm Household Management at Laeken.

DE VUYST, Paul: L'insegnamento dell'economia domestica nel Belgio. From the "Bullettino dell'Agricoltura," Milan, No. 15, 1926.—Sixième rapport annuel sur l'Institut Normal Supérieur d'Economie Ménagère Agricole. Domaine d'Hossegem. Laeken, 1925-26. Renaix, 1926.

In order to promote the higher teaching of farm household management in Belgium the Institut Normal Supérieur d'Economie Ménagère Agricole has been founded at Laeken.* It is intended for girls of over seventeen who have completed an intermediate school course. The object in view is not merely the training of teachers and responsible mistresses of intermediate grade, but also to equip the daughters of large landowners and cultivators on a large scale for rural life and for Belgian social rural activities. The aim of the Institute is, definitely, to train selected elements for the work of raising, by teaching and example, the general moral and social level of the country districts. In the sixth year of working, the courses were taken by 180 girls. The annual average number of pupils in the last four years was 75. Of the 75 registered in 1925-26, 8 came from families of large landed proprietors, 32 from families of cultivators, and 35 from other families. As regards place of origin, 64 came from villages, 9 from provincial towns, and 2 from the large towns. There were 60 applications for the 25 vacancies for students in September last.

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*On the subject of the teaching of farm household management in Belgium, see the article published in the January-March 1923 number of the "International Review of Agricultural Economics."

Of those who qualify as teachers of farm household management, the majority devote themselves to teaching in the State schools and in the non-State supported schools, or do farm work on the home farm.

Constant improvements are being introduced into this branch of teaching by means of the Institute, its scientific methods, the conferences, and experimental work which it organises, and all its new departures in various directions. Its reputation stands high in other countries, as appears from the frequent visits made by foreigners and from the fact that the courses are attended by numerous foreign students. The organisation and working are the subject of study by many specialists.

THE DAIRY INDUSTRY.

DEPARTMENTAL AID.

The Acting Premier and Minister for Agriculture (Hon. W. Forgan Smith) referring to a recent statement of the chairman of the Warwick Co-operative Association Limited, that the Government's promise to assist dairymen whose herds had been depleted by the drought had not been given effect to, has supplied the following information:—

The chairman's statement is quite incorrect and it would appear that he does not fully understand the position. The chairman, according to the Press reports, objects to all applications from dairymen being treated on their respective merits, and states that the Government promised to grant loans for the purchase of dairy stock on the sole security of the stock so purchased. It is obviously true that all cases have been considered on their merits, and this is in accordance with the wishes of the recent deputation to me on the subject by representatives of the Queensland Dairy Companies' Association.

During the discussion at that time it was indicated by me that where a dairy farmer's assets were already mortgaged to a private bank or other mortgagee, the farmer should in the first place seek additional assistance from such mortgagee towards restoring his dairy herd, as the further advance would be for the protection of the mortgagee in helping the farmer to meet his obligations to him for interest and repayment of his original loan.

Perhaps this explains the chairman's reference to a loan having allegedly been refused by the Agricultural Bank because the applicant was not already a client of the bank. It may be added that where further assistance has been refused by the present mortgagee the Agricultural Bank is still dealing with such cases on their merits, and in some instances has taken over the private mortgage debt to enable it to make a further advance available for the purchase of dairy stock.

The following is an extract from a letter sent by me to the Association following the deputation:—

> "As to granting loans to individual dairy farmers, the Agricultural Bank Act, as already explained to the deputation, contains sufficient provision to meet the situation. Through the channels of the Agricultural Bank the Government has already given special consideration to applications of settlers generally for assistance necessitated by the recent drought, and in that connection about £70,000 has been granted during the past year; this sum includes many loans for the purchase of dairy stock. The bank will continue to give special consideration, on their merits, to applications of this nature; provision has already been made for dealing urgently with these cases in priority to all other business, so that assistance may be rendered as quickly as possible."

Many applications have been received during the last few weeks and special endeavours have been made to see that no suitable and deserving case has been refused assistance. Some propositions submitted have been quite unsuitable, but even herein certain cases assistance has been offered provided a suitable guarantee were forthcoming. In some cases with assets already mortgaged it has been found that even the dairy stock applied for from the Agricultural Bank would be included in the security held by the present mortgagee.

In satisfactory cases loans have been approved for dairy stock on the security of the stock to be purchased notwithstanding the chairman's assertion to the contrary.

In conclusion, I desire to repeat that the Agricultural Bank is making special efforts to assist in every suitable case.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

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

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1927.	Mar., 1926.
North Coast.	In.		In.	In.
Atherton	9·08	26	6·48	5·62
Cairns	18·06	45	9·72	6·81
Cardwell	16·25	53	8·18	7·62
Cooktown	15·37	51	7·97	5·03
Herberton	8·17	40	6·27	4·59
Ingham	15·78	35	8·59	8 76
Innisfail	26·33	46	20·08	17·43
Mossman	18 07	14	10·37	8·71
Townsville	7·61	56	3 03	1 78
Central Coast.				
Ayr	6·77	40	3·48	1·60
Bowen	5·72	56	3·39	2 84
Charters Towers ...	3·65	45	4·35	0·36
Mackay	12·11	56	18·44	8 10
Proserpine	11·92	24	23 00	9 96
St. Lawrence ...	5·67	56	2·22	2·29
South Coast.				
Biggenden	3·93	28	8·24	1 98
Bundaberg	5·33	44	10·56	2·84
Brisbane	5·78	76	7·88	1·93
Childers	4 74	32	6·88	1 74
Crohamhurst ...	11 74	35	22·78	4·87
Esk	4·86	40	7·08	2·56
Gayndah	3 17	56	4·45	1·43
Gympie	6·21	57	17·01	3·45
Caboolture	7·65	40	14·21	2·95
Kilkivan	3·90	48	11·29	1·03
Maryborough ...	6·19	55	7·75	3·41
South Coast—continued:	In.		In.	In.
Nambour	9·32	31	18·24	3·94
Nanango	3·35	45	7·94	1·54
Rockhampton ...	4·71	40	5·66	1·58
Woodford ...	8·01	40	16·46	2 12
Darling Downs.				
Dalby	2·73	57	4·85	3·44
Emu Vale ...	2·45	31	3·82	0·35
Jimbour	2·55	39	6·40	0·94
Miles	2·67	42	5·85	1·37
Stanthorpe ...	2·69	54	3·00	0·47
Toowoomba ...	3·83	55	5·20	0·79
Warwick	2·58	62	2 05	0·70
Maranoa.				
Roma	2·73	53	1 06	0·80
State Farms, &c.				
Bungeworgorai ...	1·68	12	1·54	1·38
Gatton College ...	3·33	27	2·88	2·33
Gindie	2·61	27	6·51	0·46
Hermitage ...	2·33	20	2·56	0·46
Kairi	8 66	12	4·75	7·70
Sugar Experiment Station, Mackay	11·08	29	14·53	9·36
Warren	2·63	12	3·60	2·03

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 1926, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

MAMMITIS.

By MAJOR A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

Under this heading may be included all derangements of the udder which are accompanied by inflammatory changes.

Of all the domesticated animals, the cow suffers most from this complaint, due to the extraordinary development of the mammary glands, as compared with those of the original type. Increased secretory power is accompanied by increased blood supply and glandular tissue, but a decreased resistance to disease.

Mammitis may be divided into two broad classes—(1) simple, (2) specific.

In the first class would be included all those forms in which the primary cause is mechanical, such as injuries, cold, insect stings, overstocking, irregular or improper milking. In these cases the onset of the disease is ushered in with local inflammation, in the area affected. This may be a portion or the whole of a quarter, or even one or more quarters may be involved. Should the affected area be extensive, there will also be constitutional changes, such as rise in temperature and loss of appetite. The local inflammation induces congestion, with the accompanying symptoms of heat, pain, hardness, and cessation of normal milk secretion. The secretion from the congested area is watery, and acid in reaction. This acid fluid, coming in contact with the normal milk in the teat duct, causes it to curdle, and the milk from that quarter will contain clots of curdled milk. Should proper attention be given to the case at this stage, the disease is arrested, and recovery quickly follows. First give a good active purgative, such as 12 to 16 oz. Epsom salts, mixed with a quart of warm water. To this mixture add a cup of treacle and a dessertspoonful of ground ginger, and give as a drench. Local treatment consists of hot foments to the part, and frequent milking. Fomentations to be of value must be long continued—at least two hours once or twice daily.

If treatment has been omitted at this stage, pus-forming organisms invade the inflamed area, gaining an entrance through the milk ducts. The affected area is now an ideal breeding-place, and they multiply very rapidly. Fluids drawn off at this stage will contain pus (matter) in addition to the curdled milk.

In the blood stream are certain cells called Phagocytes whose function is to destroy invading bacteria. These Phagocytes collect in and around the affected area. If they are not sufficiently numerous to destroy the bacteria, they cluster in the surrounding tissue and prevent the spread of the invading organisms. But during this time the toxins produced by the bacteria have caused a breaking down of the cellular tissue, which, when mixed with the toxins, has a debilitating action on the organisms, which lowers their vitality. To further neutralise the action of the bacteria, certain substances known as Opsonius or Antibodies appear in the blood stream and collect around the affected area and eventually destroy the invaders. The organisms having been destroyed, the temperature of the part is reduced, but the presence of the pus produced by their activity still remains and acts as a mild irritant. Should it be small in quantity, it is absorbed into the system, but where the accumulation is considerable, an abscess is formed.

Should the seat of the abscess be deeply surrounded by tissue, the fluid portions are absorbed and a fibrous capsule develops around the remainder. Should the abscess be near the surface, an external opening is formed and the contents evacuated, and the broken-down tissue is replaced by non-secreting tissue. Occasionally the abscess breaks into a milk duct, and the pus can be drawn through the opening in the teat.

During what may be termed the secondary stage of the disease—that succeeding bacterial invasion—hot fomentation is of pronounced value, as it assists in reducing temperature by relaxing the tissues, and also induces a freer blood supply to the part. Should pain be severe, apply a mixture of equal parts of belladonna liniment and soap liniment. Should the weight of the organ cause distress, support it by a broad bandage about 2 feet wide, in which four holes have been made for the teats. Place the teats in the holes, and pass the ends over the loins, tying sufficiently tightly to support the weight of the udder.

In the second class, called Contagious Mammitis, in which the invasion of specific organisms is the primary factor, there are no constitutional symptoms, and very little local inflammation. The first indication of the presence of the disease is the decrease of normal milk in a quarter or quarters, and the presence of a brownish watery fluid. Rarely is there any curdling of the milk, or pus in the milk. As the disease progresses the quarter shrinks and becomes hard and fibrous, and eventually dries up.

In this disease, treatment consists of irrigation of the affected area with mild antiseptic solutions by gravitation. Take a small glass funnel and about 7 feet of small rubber tubing. Fit one end of the tube to the funnel, and to the other end attach a small milk tube. After careful sterilisation, insert the milk tube into the teat, using care not to injure the lining of the duct. Then, holding the funnel about the level of the cow's back, pour the fluid into it. In the funnel should be a loose pad and sterilised cotton wool to act as a strainer. After the quarter has been distended to its full capacity, remove the milk tube. Massage the quarter carefully, and then draw the fluid off by ordinary milking. Repeat this treatment daily.

Care must be exercised in the selection of the disinfectant for injection, as those which are acid in reaction or have a tendency to coagulate albumen are unsuitable. Normal salt solution made by dissolving one teaspoonful of table salt to the pint of boiled water is of value, or boracic acid 3 per cent. solution.

Quite recently a new method of treating these cases has been placed on the market. The treatment is easily applied, acts quickly, is not expensive, and proves very satisfactory in cases of recent development. The treatment consists of introducing into the system of the patient a vaccine prepared from the various organisms which produce the disease. It is injected with an ordinary hypodermic syringe beneath the skin, usually behind the shoulder. It is supplied in small bottles containing two doses of 2 c.c. each, the second of which is injected about forty-eight hours after the first. In cases of recent origin, two doses are usually sufficient to effect a cure. Treatment is obtainable through this Department, or direct from the Stock Experimental Station, Yeerongpilly.

In dealing with Contagious Mammitis, the infectious nature of the disease must be borne in mind. All affected animals should be removed from the herd, and if possible the person who treats them should not milk the healthy cows. As in small dairies this is not practicable, then these cows should be treated after milking is finished, and care should be taken to thoroughly cleanse the hands immediately after treatment. All fluids drawn from an affected cow should be collected in a vessel and then buried.

LIFE HISTORY OF THE BOT FLY.*

Oestrus Equi. (*Gastrus Equi. Gastrophilus Equi.*) is the largest bot-fly of the horse; length 6 to 7 lines. The body is hairy, yellowish-brown with black, white, or yellow spots; the abdomen has a reddish tinge spotted with black. The wing has near its middle a transverse black band, and black spots at its extremity.

These are common in America, and in Europe, Asia, and Africa. The female has her abdomen prolonged into an ovipositor, by means of which she lays her eggs from June to October, mainly on the legs of solipeds, during the heated hours of the day. Following the horse, she poises opposite the point selected, her ovipositor curved forward beneath the abdomen, darts to the spot, deposits her egg, and instantly flies back. This is repeated again and again, and the long hairs of the fore limbs (forearm, carpus, and metacarpus) are literally covered with eggs.

The *egg* is dull white, conical, and cemented by the button at its apex to a hair. In twenty-four hours it hatches out, and the embryo, crawling under the hairs, creates an itching which leads the horse to lick or bite the part, and the embryo adhering to the damp tongue is taken in and swallowed. The embryos just about to escape from the ovum are taken in by the tongue at the same time.

An *embryo* on reaching the stomach at once attaches itself by its buccal hooks, and especially to the left sac. It is then the size of the egg from which it escaped, and of a blood-red colour, but in the course of the next winter and spring it undergoes three moultings, becoming larger on each occasion, and changing to a yellowish-brown colour.

The *mature larva* (*bot*), as found in the stomach in spring and early summer, measures 7 to 9 lines in length, has a yellowish-brown colour, and is formed of a series of ten rings; all excepting the two last are furnished with a closely-set row of spines directed backward. The ninth ring has a few short spines at the side only. The rings, which in the embryo were soft and fleshy, are now firm and resistant. Many reach maturity from May to October and pass out with the fæces, showing little disposition to hook themselves on to the intestine in their course. They remain in the manure or burrow in the earth, and in twenty-four hours the envelope becomes hard and horny, the stage of *nympha* having been reached.

In thirty to forty days, according to the temperature, the *nympha* opens and the perfect fly escapes.

* From Law's "Veterinary Medicine."

PIG CLUBS.

THEIR IMPORTANCE AND VALUE IN QUEENSLAND AGRICULTURE.

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

Much of the information contained in these notes has already appeared in the Journal, and the whole will be incorporated in an illustrated pamphlet, "Pig Clubs for Queensland Scholars," which will be available for issue shortly, free of cost to those interested. Application for copies of this and other extracts from the Journal should be made to the Under Secretary, Department of Agriculture and Stock, Brisbane.—ED.

Upon his return from America some years ago, Mr. J. D. Story, I.S.O., Public Service Commissioner, Queensland, brought with him complete plans and details of the American and Canadian Home Project Scheme, which includes Pig and Poultry, Calf, and Garden Clubs, and many others of similar nature adapted to one or other of the varying conditions and environment associated with agriculture there, as well as here in Queensland.

The scheme was duly considered and arrangements were made for the work to be taken over by the late Mr. J. C. Stubbin, then Instructor in Agriculture in the Department of Public Instruction, Brisbane. With the appointment of the writer as Instructor in Pig Raising in the Department of Agriculture and Stock a year or two later, the control of the Pig Club Scheme was transferred to this Department, and was included in the activities attendant upon the organisation and development of the pig industry. The early growth of the scheme was slow, and was fraught with numerous difficulties and hindrances, for not only were many of the teachers and children entirely in the dark as to the objectives and possibilities of the scheme, but in many instances the parents were entirely averse from anything new, experimental, or progressive, and to schemes which many of them seemed to think were "fool stunts" doomed to failure.

The Americans and Canadians experienced similar difficulties in the early days of development there, but, as in the case of our own clubs, they forged ahead, and by dint of solid and continuous work, and with the enthusiastic support of the children have won the day. From very uninteresting proportions here several years ago the scheme has developed until to-day there are more than forty clubs in operation, a dozen or so more in process of formation, with three instructors, Messrs. Shelton and Bostock, of the Department of Agriculture and Stock, and Mr. F. E. Watt, of the Department of Public Instruction, employed in the organisation and development of the administrative side of the project, and numerous head teachers and assistant teachers following the work up and attending to the internal organisation of their own local or district clubs.

The Scope, Objective, and Development of the Pig Club Scheme.

In the United States of America, in Canada, in Great Britain, and in other countries, some thousands of extremely practical and profitable Pig Clubs are in operation, and a deep and wide-spreading interest has been displayed among the younger generation of farmers in the development of this branch of the Home Project Scheme.

It has been shown that in the countries named the boys and girls are being trained and are actively engaging in the most modern phase of pig raising, a training that has proved of the greatest value to these youthful farmers and to the pig industry in the countries in which they reside and operate.

Experience in Queensland has already shown that interest has been stimulated, and that where Pig Clubs have been in operation the conditions under which pigs are kept have been very considerably improved, a result in itself that most assuredly justifies the nominal expenditure involved in taking up these schemes. In the United States, Pig Clubs will be found in operation in almost every county and small centre in Kansas, Iowa, Missouri, and other hog raising centres. These include clubs for both pork and bacon pigs, for breeding sows, and for sow and litter, and in numerous instances club members have competed successfully in the "Ton Litter" scheme of which the American pig farmer is so proud.

In New South Wales, the Pig Club Scheme is included in the organisation known now as the Junior Farmers' Club Council of New South Wales, a scheme being developed on a very extensive basis and with immense possibilities for future extension. In Victoria and the other States, and in the Dominion of New Zealand, considerable interest has been aroused, and the Home Project Scheme is being widely discussed. Thus it will be seen that it is a movement of world-wide proportions; a movement in which all young Queenslanders should be intensely interested.

PLATE 109 (Fig. 1).—GATHERING OF PARENTS, CHILDREN, AND OFFICIALS AT THE MAPLETON DISTRICT PIG CLUB FETE, NOVEMBER, 1926.

Standing at the table addressing the gathering is Councillor J. T. Lowe, Chairman of the Maroochy Shire Council; on the right and immediately next to the Chairman is Mr. J. D. Story, I.S.O., Public Service Commissioner, Q., who has been largely responsible for the introduction of this modern system of Home Training. At the table also is the Instructor in Pig Raising (Mr. E. J. Shelton). Department of Agriculture and Stock. The Club Members are seated on the ground in front of the official party.

Pig Club Leaders and Organisers.

It will be necessary in the development of the Pig Club project here that Pig Club leaders be appointed to control this work and to co-operate with the State Instructors in Pig Raising, with the organisers, and with the head teachers of Rural and State schools in initiating clubs in the various agricultural and dairying centres throughout the North.

In America, for instance, the work is supervised by the Boys and Girls' Pig Club Department through a State Club leader, who is employed co-operatively by the United States Department of Agriculture and the State Agricultural Colleges; these officials plan details of the work, and put them into operation through assistant State leaders or specialists in club work, who have direct charge of the live stock club work promoted by the colleges. In many centres the detailed work is carried on locally by the County Farm Bureau (an organisation similar to our local producers' associations) as a definite and very important part of its programme. In centres where Pig Clubs are to be introduced for the first time, the county agent (known as district agents here formerly, and more recently as district secretaries and organisers) secures a local leader who helps to enrol the members and to organise the clubs, while in communities where the Farm Bureau has not yet been organised other agencies are made use of, such, for instance, as county superintendents, Chambers of Commerce and Agricultural instructors. Most of the work, however, is in organised centres having a Farm Bureau or similar association. The local leaders' duty is to encourage boys and girls and to help in an advisory capacity in giving instructions *re* feeding, preparing for shows, and in record keeping. Arrangements are also made for members to meet once a month at least to give attention to club matters, and at these gatherings, which are conducted on social lines, business problems are discussed and suggestions brought forward; thus the meetings are interesting and helpful, and are a pleasure and stimulant to both members and staff. As a progressive step, club tours, picnics, camps, &c., are arranged, and in general the whole scheme is approached as worthy of the utmost consideration and attention. The club motto is especially applicable to our conditions here, viz., "To make the best better."

PLATE 110 (Fig. 2).—THE SOCIAL SIDE OF A PIG CLUB FETE.

View of the Ice Cream and Soft Drinks Stall, the Fancy Work Tables and Stall, and the Refreshment Booth at the Mapleton District Pig Club Fete.

An endeavour has been made in the organisation of Pig Clubs to interest not only the Girls and Boys but the Teachers, the Parents and Relatives of the Members and of other district children as well as the commercial community. These stalls did good business, they were an added attraction and financially were quite a success; withal they added considerably to the value of the function from a community point of view.

Enthusiasm, loyalty, and service are the three outstanding features in the organisation. Up to the present, however, matters have not progressed to this stage in Queensland, though on numerous occasions lantern lectures on various aspects of pig raising have been a feature of the work, together with round district tours when an official inspection of the various animals competing in the competition formed part of the outing. On these occasions both club members, the head teacher of the State school, and the Instructor in Pig Raising have been present. These homely visits are much appreciated, and are certainly a source of inspiration to the children. They are equally interesting and encouraging to the club leaders, and have been the means of encouraging the different competitors to try and do better than their neighbours in preparing their exhibits for exhibition and sale.

PLATE 111 (Fig. 3).—ONE OF QUEENSLAND'S MOST ENTHUSIASTIC AND SUCCESSFUL PIG CLUB MEMBERS TOGETHER WITH HIS PARENTS, MR. AND MRS. A. ALFORD, OF TRAVESTON, Q.

Several of the Alford boys are members or ex-members of the Pig Club scheme. The parents and the older members of this family came to Australia as immigrants some years ago from a remote part of England, where their future was anything but bright, and where the prospects for the family were almost nil. They are now successful farmers, keenly interested in better pigs, and their children are enthusiastic workers in the Home Project Scheme and have already won several prizes at Pig Club contests. They are largely interested in the Tamworth breed of pigs and its crosses, and have a registered stud of excellent quality animals that have also been successful prize winners at Brisbane, Nambour, Pomona. and Gympie shows.

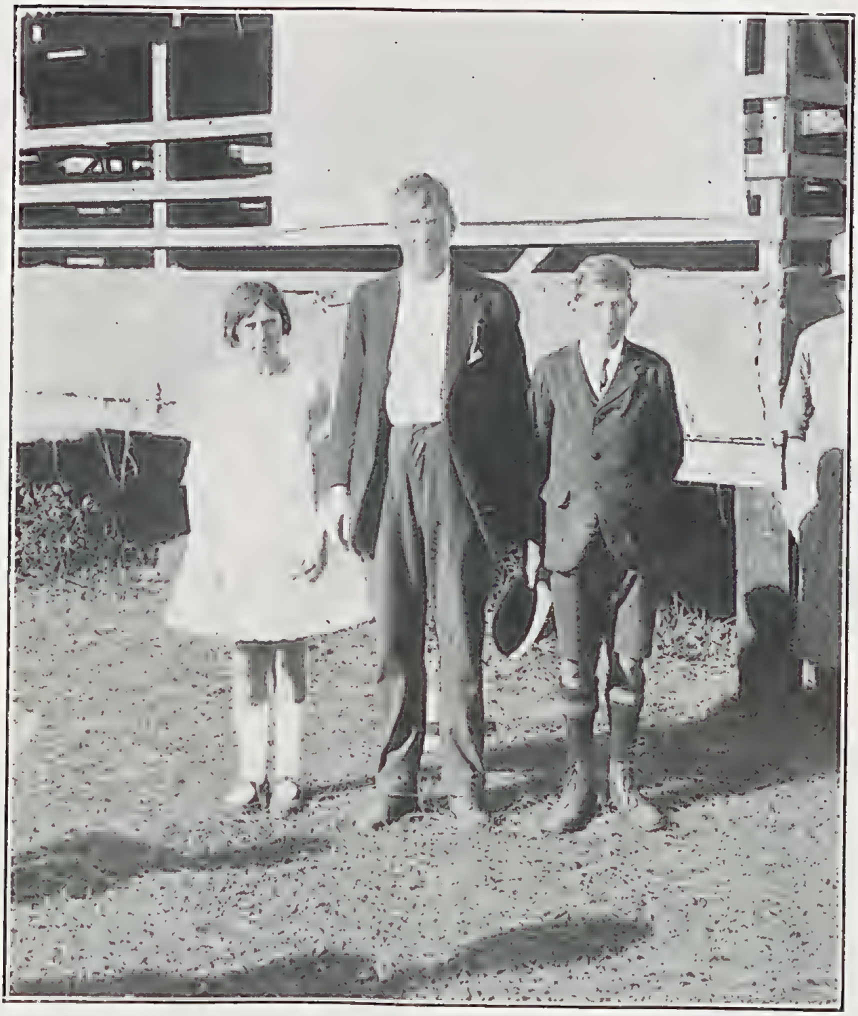

PLATE 112 (Fig. 4).—NELLIE AND SAM SELLICK, WITH MR. SELLICK, ENTHUSIASTIC WORKERS IN THE PIG CLUB SCHEME ON THE NORTH COAST OF QUEENSLAND.

These two club members have also been successful in demonstrating that girls and boys can work together for the betterment of the industry and in the interests of the Home Project Scheme.

These photographs are not inserted to boost any particular club member, but to illustrate the type of children interested, together with other members of their household, where this is possible. Mr. Sellick is quite as enthusiastic as his children, and he is a successful farmer, marketing numerous good quality porkers and baconers every year. The family live at Yandina, the children attending the Yandina State School.

PLATE 113 (Fig. 5).—ENTHUSIASTS IN PIG CLUB WORK.
A group photograph taken at a North Coast Pig Club Fete.

PLATE 114 (Fig. 6).—PIG CLUB MEMBERS, BOTH SENIOR AND JUNIOR.
All enthusiastic, intelligent, and capable workers for the benefit of their Club, their district, their State, and their country.

PLATE 115 (Fig 7).—GIRL AND BOY PUPILS AT THE NORTH ARM PIG CLUB'S FETE, NOVEMBER, 1926.

The group includes a number of Pig Club members and enthusiasts, listening to an address at the presentation of prizes.

PLATE 116 (Fig. 8).—MEMBERS OF THE JARVISFIELD PIG CLUB IN THE AYR DISTRICT, NORTH QUEENSLAND.

Their pigs were exhibited at the Ayr Show and created considerable interest and enthusiasm.

Additional Features.

In all club work two principal objectives must be steadily kept in the forefront. First, it is the intention to demonstrate per means of these competitions that there is "Profit in Pigs"; and secondly, that the industry is an interesting and remunerative one well worthy of recognition and of taking up on sound commercial lines. The educational feature is also constantly stressed so that members may the more fully realise that their work in the club means more than the making of money and winning of prizes; for it is important that they should be given opportunities to co-operate in community enterprises and programmes of work which are always best carried out on truly co-operative lines.

Through Pig Clubs the American boys and girls have been taught to look upon the community and its problems not from the mere selfish point of view, but with a spirit that makes for general improvement. The spirit of service and citizenship thus engendered is one that the younger generation can apply all through their lives.

From the industry standpoint it is hoped members here will realise more fully than ever before the necessity of proper care and attention and of improved methods of feeding and housing. Records of the kinds and amounts of food used and the cost or value of same, together with details as to the time spent on the work, are to be kept by club members, and in due course these are to be formulated and presented for the inspection of all concerned in the organisation of the clubs. From a perusal of the essays appended to this article it will be found that quite a number of these features have become impressed upon the young members' minds.

PLATE 117 (Fig. 9).—LEADING THE PIG TO THE SHOW.
A spell by the wayside and light refreshments.

The Extent of the Work.

To show the extent of the work overseas and indirectly the possibilties here, it is interesting to note that recent reports indicate that boys and girls' Pig Clubs owned or managed approximately 1,800 pigs at a profit to themselves of more than 30,000 dollars—this in Kansas (U.S.A.) alone, with 107 clubs and 980 members. Since this report came to hand, other and later reports indicate a much more extensive development, with the formation of many more clubs and club functions. A special feature of the work there is that the members are taught and encouraged (as they are taught and encouraged here) to fit their animals for the show ring, with the result that large numbers of Club Pigs have been shown at local, county, and State fairs, and generous prizes have been won, many times in competition with adult breeders. Club members conduct many valuable demonstrations in this way, and this has stimulated others to better things. Some of the phases demonstrated (and it is along these lines that we in Queensland are working) include the value of balancing the ration, the importance of pasture and forage crops for pigs, costs of pork production, use of self-feeders, care of the brood sow—especially prior to and at farrowing time—care of the litter from birth onwards, proper selection and judging of animals, disease prevention, treatment, and control.

One striking example of this latter phase is in inaugurating new methods in the prevention of worm infestation in young pigs. In this connection it is on record that the United States Department of Agriculture worked out one efficient system by which worm infestation could be prevented, but farmers have been slow to put it into practice or to realise its advantage. For this reason club members in about twelve counties in Kansas were selected to take up demonstration work on these lines. The work was carefully supervised and records kept, and in due course a complete treatise is to be issued showing the nature of the experiments, results, &c. Other demonstrations are conducted in a similar manner. There is a wide field for work in this direction in Queensland, for though in general the health of the pigs in this State compares more than favourably with that of pigs in other States and countries, there is ample scope for reducing the losses and for stamping out the many diseases to which pigs are subject here.

The Pure Bred Scheme.

A feature of Pig Club work is to encourage the use of pure bred breeding stock on farms generally throughout the State. The stock which are to be introduced and used in these clubs will, it is hoped, be retained as the foundation of many new herds; in some instances the stock will be retained on their own farms by club members and their people, in other instances the animals will be disposed of to neighbouring farmers either by auction or private contract. In this way the

PLATE 118 (Fig. 10).—ANOTHER EXHIBIT EN ROUTE TO THE PIG CLUB CONTEST.

The pig was too heavy for its young owner.

whole industry should benefit, though this is necessarily a slow process in an immense State like Queensland. Nevertheless, the State is, after all, only a collection of communities so that as in other parts of the world we are starting at a logical place in the improvement of the herds.

Rules of Membership.

Membership in Pig Clubs is not necessarily confined to any particular class of boys or girls. If required, the membership may be arranged into classes.

(*a*) For school pupils up to the age of fourteen.

(*b*) For pupils whether still attending school or over the age of fourteen.

The rules require that each contestant raises his or her own pig to not more than six months old in the case of bacon pigs, or as arranged in porker classes or classes for stud sow with litter or stud boar. In each case the member must feed and attend to the animal and be entirely responsible for its management and exhibition; this usually requires that the pig be housed and fed apart from any other pigs on the farm unless the member is actually caring for all the pigs kept. Each contestant is required to keep a record on forms to be provided (a notebook may also be kept as an aid to writing the essay) containing any points of interest such as the animal's name and breeding, its purchase price and details of purchase, date pig was purchased or entered the contest, its actual live weight at time club commenced operations; the nature and quantity of feed used, notes *re* bedding, cleanliness of sty and of animal; the number of days fed, the name, quantity and value of food grown, including crops such as pumpkins, sorghums, maize, lucerne, sweet potatoes, waste fruit, &c.; the animal's weight at end of contest, gain in weight per week or month, market value at current rate per pound when ready for market, profit gained as a result of the transaction; notes *re* the health and well being of the club pig and of other pigs on the farm, class of sty, its size, situation, aspect, approximate size of grazing area, and any other information available.

Where convenient the pigs are to be exhibited at the local or district show, where arrangements will be made for the housing of animals, for judging, &c. If at all possible, contestants are to attend the show and care for their animals there also.

The following scale of points has been drawn up for use in club work, and, if at all possible, will be strictly adhered to in every club initiated.

PLATE 119 (Fig. 11).—ONE OF THE PIG CLUB MEDALS.

Illustrating the type of gold or silver medal included in the prize list at many of the Pig Club contests. Other prizes include pure-bred pigs and other stock, books, trophies, ribbons, and cash.

PIG CLUB AWARD CARD.

Points will be awarded as follows:—

	Possible Points.	Points Awarded.
1. Type and quality of animal selected	15	
2. Rate of increase in weight of animal	10	
3. Cost of production; the use of home-grown foods being an important consideration	15	
4. Sanitation, condition of pig sty and grazing area ..	10	
5. Health of animal, freedom from parasites (lice, &c.)	5	
6. Interest shown in management of the animal by the club member	10	
7. Arrangements for marketing, exhibiting at Show, &c.	5	
8. Essay on "How I selected, fed, managed, and Exhibited my Pig"	10	
9. Market value of animal. Actual live and estimated dressed weight and value per pound to be taken into consideration	10	
10. Order of Merit in Prize List at Show	10	
Possible	100	
Total Points Awarded.		

When Pig Club members have competed in the first instance with a young sow pig, arrangements may be made at the end of the competition for this sow to be entered in a sow and litter club, this competition to be continued into the following year, but this is only possible where sufficient inducement offers and up to the present has not been adopted; this contest it will be found requires much more skill, care, and attention than that required in fattening a pig for market, important and all as is this latter feature of the work.

It will be seen, therefore, that the Pig Club movement has much to commend itself to the children of farmers who are interested in the raising of more and better pigs, for it aims first and foremost at educating the children and at giving them an intensely practical acquaintance with the many and varied aspects of the breeding and management of pigs. That Pig Clubs can be initiated and carried through successfully has now been demonstrated on so many occasions in this State, and the keen, intelligent interest taken in them by the junior farmers has been so pronounced, that it can be definitely stated the movement is here to stay.

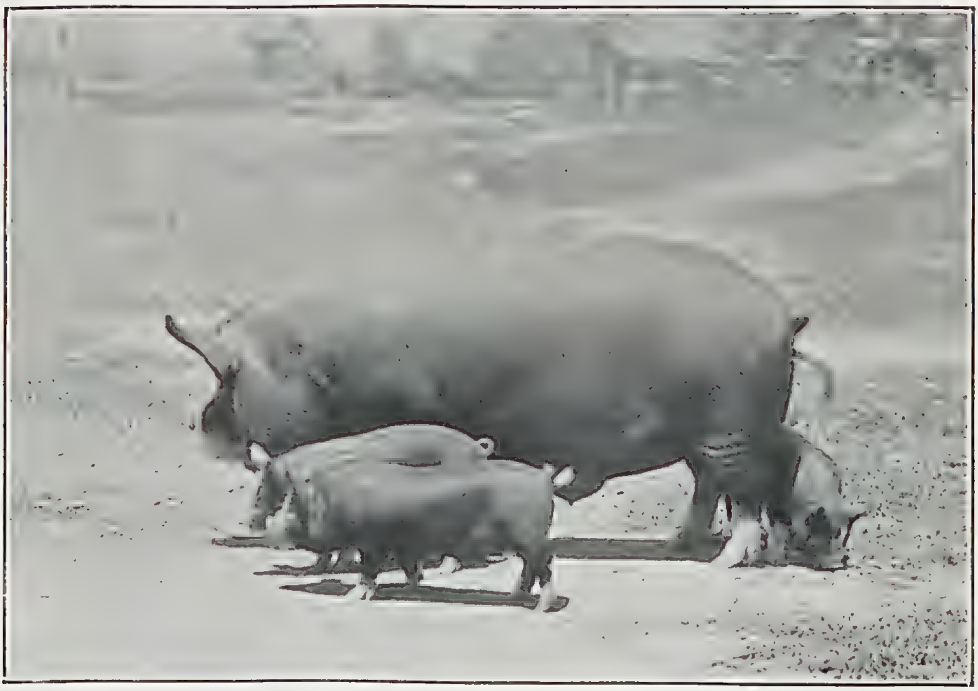

Plate 120.—A Pretty but Unprofitable Litter.

Unless breeding sows produce large, thrifty litters of pigs, freely, regularly and consistently they are less profitable than they should be. There is no reason why a well bred, well cared for breeding sow should not produce two litters per annum of at least eight pigs in each litter; the first litter being produced when the sow is about fifteen months old (*i.e.*, allowing for mating at eleven months old or thereabouts), and for the sow to be productive for seven years. Sows, even when they are eight years old, frequently produce satisfactory litters. It is recommended, however, that the sow be culled and fattened for the butcher or bacon factory after having passed the eighth birthday as the teeth usually fail at this age, and the sow is unable to hold her own among other sows in the herd.—E. J. Shelton, Instructor in Pig Raising.

PLATE 121—SETTLERS FROM OVERSEA MAKING GOOD.—THE WALLACE FAMILY, OF KINGSTON.

Mr. T. M. Wallace, Manager, Kingston Pig Farm, arrived with his family from Ireland a couple of years ago. They are now well established in this State and are proud to call themselves Queenslanders.

PLATE 122.—AN ENTHUSIASTIC YOUNG FARMER FROM OVERSEA, GEOFFREY WALLACE, OF KINGSTON.

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.

PIG RAISING PAMPHLETS.

A series of illustrated pamphlets on the subject of Pig Raising are now available for distribution, gratis, on written or personal application to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane, Queensland, as under:—

Feeding and Management of Pigs, &c.

"Feeding Pigs; Stock Foods" (this pamphlet by the Agricultural Chemist deals generally with the subject of stock foods, feeding, &c.). Other Pig Raising pamphlets refer to Flushing the Breeding Sow, Dentition of the Pig, Pigs for Profit, Early History of the Pig, Weaning the Pig, Ton Litter Contests, How to Make a Pig Net, Gestation Chart.

Breeds of Pigs.

The Berkshire, Tamworth, Large Yorkshire, Duroc-Jersey, Poland-China, Gloucester Old Spot, and Middle Yorkshire.

Other breeds are being dealt with now and their special qualifications featured; these pamphlets will be available shortly; they form a useful and attractive series.

Housing and Accommodation of the Pig.

A series of pamphlets on the construction of sties and provision of paddock accommodation for pigs give details in regard to housing and accommodation, useful types of fencing, concrete feeding floors and troughs, convenient crates. This series is being added to from time to time, is well illustrated with photographs and drawings, and should be in the hands of every farmer.

Marketing Pigs in Queensland.

Several pamphlets deal with the subject of Marketing, Care in Handling of Pigs in Transit, Motor Transport of Pigs to Market, &c.

Further articles on this subject are in course of preparation, and will be available in pamphlet form later.

Pig Clubs for Boys and Girls.

The Pig Club pamphlet, descriptive of the organisation and development of pig clubs, is now in course of preparation, and will, it is hoped, shortly be available for distribution. When available, copies may be obtained with any other information relative to the pig club scheme on application to the Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane, or from the Organiser and Instructor in Agriculture, Department of Public Instruction, Brisbane. A pamphlet is also available dealing with the subject of Young Judges' Competitions at Agricultural Shows, Hints to Young Judges, Judging Pigs, &c. This is issued gratis.

Diseases of the Pig.

Pamphlets dealing in a general way with diseases are available, and with Administration of Medicine to Pigs, Diarrhœa or White Scour, Tick Paralysis in Pigs, Sterility or Barrenness in Pigs; A Peculiar Disease of the Ear of the Pig, Hairlessness or Goitre. Leaflets on Profitably Feeding Iodine to Pigs and on other subjects are also available. They carry much useful information.

Castration of Pigs.

This pamphlet is now in the hands of the Government Printer and will be available shortly. Every farmer should secure a copy of this publication. It is also available gratis on application.

The "Queensland Agricultural Journal," issued monthly, carries a regular series of articles on Pig Raising and other branches of agriculture. It costs to farmers but one shilling per annum to cover postage on twelve issues. If not already a subscriber, write for a sample copy and order form.

Answers to Correspondents.

Dip Construction.

R.R. (Sexton)—

The matter of the construction of your dip was referred to the Department of Public Works, and the following is a copy of a memorandum by the Chief Architect thereon:—

The first and cheapest remedy to try and stop the leaks is to get some dry powdered red lead and mix to a putty consistency with water (not oil) and fill in the cracks therewith with a putty knife or similar instrument. Cracks are not to be chiselled out beforehand.

If this remedy fails, a second attempt may be tried by lining the inside of the dip to the height of water level with Val de Travers asphalt put on in two layers to finish ½ inch thick. If this is done I suggest that your correspondent get into communication with Mr. C. L. Sadgrove, A.M.P. Building, Edward street, Brisbane, who is the agent for this material. The cost of this is about 11s. or 12s. per sup. yd. in Brisbane, but, of course, would cost more at Sexton. If your correspondent would forward to Mr. Sadgrove a plan of his dip, giving dimensions, he would probably get a firm quotation for the work to be done.

Mango Chutney.

W.C. (Cleveden, N.Q.)—

Under the Health Act no preservative is allowed in chutney, although in tomato sauce and tomato chutney sauce 2 grains of salicylic acid are allowed per lb. There is no need for preservatives in chutney, and your plan of allowing the chutney to ferment in a barrel prior to bottling is correct. The fermentation, however, should be completed much before three months, two or three weeks should be sufficient, then reboil and bottle hot. Well stoppered the chutney should keep for years. According to the Agricultural Chemist's taste the chutney has a good flavour, but is rather hot.

Angora Goats.

W. F. (Benarby)—

The trouble with the Angora goat in Queensland is that for some quite unaccountable reason, the general public will not eat goat mutton. Personally, I cannot tell the difference, excepting that good goat mutton is more delicate in flavour. I defy anybody to know the difference, when properly cooked, between good goat mutton and good sheep mutton. However, the prejudice exists and it must be considered.

Mohair of the best is worth at most about 2s. 6d. per lb. Low-grade mohair very much less. The best weight is about 5 to 6 lb. per fleece. The goats, too, are very capricious with their young. They are liable to forget them within an hour after they are born. When once they take to the kids they are excellent mothers. I would not advise any man who has even decent sheep country to go in for Angoras.

SHEEP AND WOOL.

Following are selected replies to correspondents by the Instructor in Sheep and Wool, Mr. W. G. Brown, in the course of the month.

Lamb Losses.

M.A.C. (Toogoolawah)—

After a dry season and when excessive wet conditions follow there are always bad conditions for any grazing animals. From your description of the symptoms it seems to me that the animals are suffering from a dietetic trouble, caused by either over-eating or eating some of the deleterious weeds which spring up in a season like this. Apparently the animals have not passed the cud into the fourth stomach. This may mean impaction caused by the eating of the dry feed prior to the rain. Impaction is known by hard masses of food being found in the third stomach or bible. A drench of linseed oil (raw) in milk will help, or a drench of Epsom salts, ½ oz. to 4 oz. of water, often relives it. Are the animals chewing the cud?

Worms in Sheep.

A.R. (Undulla Creek)—

Your letter of the 21st March came duly to hand, and in regard to information *re* worms in sheep, "The Farmers Sheep and Wool in Queensland" Bulletin has been forwarded.

Your young sheep are the ones that are in danger; the two-tooths and the lambs especially so, and, although the 250 aged ewes seem to be doing well, you must not take it from that that they have not the worms, and that was shown when you killed the old ewe and found worms in her. Drenching with the Departmental drench can be repeated once every seventh day until the sheep get back to their usual health, which is shown by the dark-pink skin. It is quite certain that in the wormy season such as we are having now, that one drench is certainly not sufficient. You can not only drench a second time, but you can drench until further orders. Please understand that arsenic is a tonic, and if carefully administered will not injure the sheep in any way. Be very careful in the mixing of the drench and also in the administration that the animals are not knocked about. If you require further information than is given in the Bulletin, please write.

Sheep Suffering with Blight.

A.C. (Canungra)—

The Chief Inspector of Stock, Major A. H. Cory, advises that it is probably ordinary blight from which the sheep are suffering. He recommends 6 grains sulphate zinc 6 oz. water to be syringed into the eyes night and morning. I would be glad to learn the effect of this treatment.

Stomach Worms.

J. McP. (Tipton)—

This correspondent's first question is: "Does the stomach worm or blood worm get the arsenic through the blood of the drenched sheep he feeds on?" The very latest authority states that the action of arsenic on the worms is not understood. It is certainly not taken from the blood, as in some experiments I made some years ago, I drenched the sheep and fifteen minutes later killed the sheep and found many of the worms dead. It is probably absorption through the membranes that they are killed.

Second question: "Does the worm get it direct—that is, does the poison go direct to the fourth stomach and not into the big paunch?" Liquids generally pass over the paunch (rumen) and go directly through the second and third stomachs to the fourth or true stomach. The ruminants or cud-chewing animals have the power of diverting food from the rumen into the other stomachs. If an animal be watched while chewing the cud, it will be noticed that a ball of food is brought into the mouth and when chewed passes down the gullet, but not into the paunch again.

Third question: "Please send the full history of the tapeworm, and does he feed on the blood of an animal?" The full life history of the tapeworm in sheep is not known. One outstanding fact, however, is known, and that is, there must be a secondary host in the case of *Taenia Expansa* (sheep tapeworm); it must have access to a dog. Without a dog there can be no tapeworm. A tapeworm lives principally on the food which passes through the alimentary canal, taking all the nutriment. Sheep thus die, literally of starvation. The worm is not a bloodsucker. Please understand that arsenic in suitable doses is one of the best of tonics. Whether the chemist is right or not, I have used the arsenic and Epsom salts, and have seen it used by others for over thirty years. I certainly would not use soda as a solvent. If the drench be prepared according to directions it will be found that the arsenic is quite dissolved. Medical men assure me that Epsom salts has the property of delaying the action of the poison, and thus it is more likely to kill the worms than if soda be used as a solvent. The late Mr. John Mathison, manager of St. Ruth, used this drench for very many years, so did Archie McLeod, of Bon Accord. I believe the arsenic and Epsom salts to be the best of all, and I have tried many. "The Farmers' Sheep in Queensland" Bulletin, which gives full particulars of the drench, has been forwarded.

BOTANY.

The Government Botanist, Mr. C. T. White, F.L.S., addressed the following replies to correspondents in the course of the month. They are selected from a heavy mail because of their general interest.

Panicum distachyum—"Indigo."

J.S. (Woombye)—

The grass is *Panicum distachyum*, very common in Queensland during the summer months, providing a good amount of leafy forage. It is most abundant along railway embankments, or in fact anywhere where the land has been broken. It is an annual, and makes good hay. We have not heard a common name applied to it.

The plant you take for an Acacia is *Indigofera hirsuta*, a species of "Indigo," a common weed in Queensland. It is sometimes looked upon with suspicion, but we have noticed stock eat it freely without any ill effects following.

A Suspected Fungus.

F.T. (Charters Towers)—

The fungus you describe is probably *Lepiota dolichaula*, a tall, white mushroom sometimes attaining a large size. This species has been suspected at different times of causing losses among young stock both here and in New South Wales, and on this account we have always looked upon the plant with suspicion. There is no royal road enabling one to tell if a mushroom is poisonous or not; in some genera we know that all the species are dangerous, in others only some. Apart from these, the only way to find out is to cook and taste discreetly.

Crude Papain.

N.S.T. (Wooloowin)—

Your inquiry concerning a substance obtained from the papaw whilst green was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—"Crude papian is the dried milky juice of the papaw fruit. Green and half-ripe fruit are pricked with a fork-like instrument and the dried drops of juice are collected afterwards. This crude papain, if collected in a damp atmosphere, decomposes very quickly by becoming mildewy, and therefore the collection can only be made during very dry weather. Papain is made by a complicated chemical process from the crude papain, hence the high cost.

A Common Weed *(Polanisia viscosa)*—"Tick Weed."

J.L. (Townsville)—

1. *Polanisia viscosa.* A member of the Capa family (Capparidaceæ), sometimes called "The Yellow Spider Flower," a very common weed in Northern and Central Queensland. It stretches through North Queensland and the Northern Territory to Asia, and in India, that land of teeming millions, it is reported that—"The seeds are sold in the bazaars, where they are used by the natives in their curries. They are also used medicinally, powdered and mixed with sugar to expel intestinal worms, and externally as a rubefacient in the form of a poultice, bruised with vinegar, lime juice, or hot water, for the same purposes as a mustard plaster. The whole plant has a sharp taste not unlike mustard, and in some parts of India is known as 'wild mustard.' It is sometimes easten boiled with red peppers and salt." We have never heard a local name applied to it.

2. This bore neither flowers nor seeds, and in the absence of such, identification is really only guess-work. I think it is *Achyranthes aspera*, sometimes known as "Tick Weed," on account of the seeds which are borne in long terminal spikes sticking to clothing, &c. It has a wide range through Queensland to Asia, and is not known to possess any poisonous properties. In India the plant is reputed medicinal, principally as an external application to bites, stings, and sores.

"Myrtle"—"Cannon Ball Tree"—Pandanus.

C.A. (Darwin, Northern Territory)—

1. *Mimusops Elengi* var. *parvifolia.* "Myrtle." The Australian plant is recorded as *Mimusops parvifolia* R.Br. in the "Flora Australiensis" and "Queensland Flora," but H. J. Lam, one of the Buitenzorg men who has recently monographed the Sapotaceæ of the East Indian region, reduces it, and we think rightly so, to a variety of the widely distributed *M. Elengi.*
2. *Carapa moluccensis.* Cannon Ball Tree. E. D. Merrill, lately Director of the Bureau of Science, has adopted the older generic name *Xylocarpus.* He distinguishes two species, *X. granatum,* that grows in the mangroves, and *X. moluccensis,* that grows on sandy foreshores, but we always have difficulty in separating the two as far as Australian and Papuan material goes.
3. *Pandanus* sp. Was very pleased to get these specimens. I thought at first it was *P. spiralis,* the species asked for, but it seems to me to show differences. I am sending leaves and a few drupes to Professor Martelli, Florence, for identification.

Central-Western Plants Identified.

J.E.T. (Longreach)—The specimens proved to be:—

1. *Solanum esuriale.* Wild Potato.
2. *Bassia quinquecuspis.* "Bindey-eye" or "Spiny Roly Poly."
3. *Trianthema decandra.* Hog Weed.
4. *Andrachne Decaisnei.* An annual Euphorbiaceous plant very plentiful in Central Queensland after the summer rains. Properties unknown.
5. *Phyllanthus* sp. Family Euphorbiaceæ. Specimen scarcely good enough to distinguish the species. The genus Phyllanthus is represented in Queensland by a number of species; many are common in western pastures, but none is known to possess any harmful properties.
6. *Mollugo Glinus.* A plant of the family Ficoideæ. It has a wide distribution over the tropical and sub-tropical regions of the world.
7. *Atriplex* sp., probably *Atriplex semibaccata.* Commonly known in Western Queensland as "Salt-weed."
8. *Kochia* sp., *Kochia brachyptera.* A "Cotton Bush."
9. We cannot place this satisfactorily. We should say it is evidently the young growth of a species of Bassia. Could you get specimens further advanced?
10. *Salsola Kali.* Roly Poly. This plant in one form or another is very widely distributed over the warmer regions of the globe. So far as I know, it has not been recorded as poisonous in any way. In its flowering stage stock, particularly horses, nip off the young shoots, and do well on them.
11. *Neptunia gracilis.* Yellow-flowered Sensitive Plant.

The Chenopodiaceæ are not generally regarded as harmful except that many of them cause bloat rather severely. However, you rule this out, also solanine poisoning, so I am afraid we can help you but little regarding the specimens sent. Our knowledge on these matters in anything like a definite way is very limited.

Bowenia Fern.

C.J.R. (Brisbane)—

The specimen from Rockhampton and popularly known as the "Bowenia Fern" is *Bowenia spectabilis.* It is not a true fern, but a plant of the "Cycad" or "Zamia" family. There are only two species of Bowenia known, and both are natives of Queensland—not being found elsewhere. One of these is a common plant in the North—Cairns, Atherton, and elsewhere; the other confined, so far as known, to the Byfield region, near Rockhampton. All plants of the "Zamia" family are regarded as poisonous to stock, but the poison is apparently destroyed by heat. In this way the natives used the seeds of some species ground into flour as food, and in Western Australia the pith of the stem of the common species is sometimes grated, boiled, and fed to pigs, calves, and poultry. The plants are very ornamental and make good pot or bush-house plants.

Lantana crocea.

INQUIRER (Brisbane)—

The dark flowering Lantana referred to as overrunning parts of North Queensland is *Lantana crocea.* It is known to produce a disease in cattle known in Queensland as "Pink-nose." Feeding tests have shown that the ordinary Lantana (*L. camara*) can also produce the disease, but the general opinion is that the dark flowering kind (*L. crocea*) is much more virulent.

Candle Nut.

A.C.H. (Caboolture)—

The specimen is the Candle Nut (*Aleurites moluccana*), a native of North Queensland, but with a wide distribution through Malaya, New Guniea, and the Islands of the Pacific. It is often planted in Southern Queensland as an ornamental tree, and is a rapid grower. The nut is sometimes eaten, but is rather a dangerous one, as at times is causes severe purging and gastric trouble.

Asthma Plant—Red Caustic Creeper.

V.C. (Gympie)—

The larger weed is *Euphorbia pilulifera,* the Asthma plant. The dried herb, used as a tea, in many cases gives great relief to persons suffering from asthma. The smaller weed is also a member of the genus Euphorbia, it is *Euphorbia prostrata,* the Red Caustic Creeper. The stems, when cut, exude a milky sap, which is sometimes applied to sores.

Western Plants Identified.

E.J.T. (Charleville)—

The package sent contained one specimen in leaf only of what we take to be Fuschia Bush (*Eremophila maculata*). It is probable this is the cause of the trouble. Many sheep men affirm that this plant is a wholesome fodder. We know very definitely, however, that the leaves contain a prussic-acid-yielding glucoside, and if eaten in quantity by sheep on an empty stomach might easily cause severe losses. The presence or absence of the glucoside and its amount apparently vary a good deal, and what controls the formation of the glucoside we do not know.

One specimen of *Portulaca oleracea.* Pig Weed. Causes bloat in hungry stock.

Two specimens of a small legume—only very young growth—I think *Neptunia gracilis.* Sensitive plant.

One specimen of *Rhynchosia minima,* a small legume, and a useful forage.

Three specimens of *Boerhaavia diffusa,* the Tar Vine. A useful forage herb.

One specimen of *Trichinium semilonatum.* Pink Heads. A useful forage herb.

One specimen of *Atriplex Muelleri.* Salt-bush. A useful forage.

Three specimens of some plant of the salt-bush or salt-weed family, too young to determine specifically. These are wholesome fodders, not known to be poisonous.

One specimen of *Commelina* sp. (Scurry Grass). Not known to be harmful in any way.

One specimen of very young growth only, but apparently not one of our known poisonous plants—I should say one of the Boraginaceæ or Convolvulaceæ. Not of any great consequence.

"Onion Couch."

R.G. (Maleny)—

We were pleased to receive the specimens of grass forwarded with you letter of 11th inst. as they confirmed a previous identification of "Onion Couch" (*Archenatherum avenaceum* var. *bulbosum*). This grass is very common in England and Europe and is naturalised in North America and other places. It is genrally looked upon as a rather useful grass in the mixed pasture, but stock do not relish it by itself or when old. It has the great disadvantage of being a pest in cultivation; its underground tubers or bulbils making it like "Nut Grass," "Johnson Grass," and similar plants very difficult of eradication. These records on the Blackall Range are the first of the grass in Queensland.

"Thorn Apple"—"Wild Tobacco."

J.C.G. (Mount Pelion, N.C.L.)—

The specimen with the prickly pod is *Datura stramonium*, commonly known as "Stramonium" or "Thorn Apple." It is a very widely distributed weed over the globe. In the United States it is known as "Jimson Weed"; all part of the plant, particularly the seeds, are poisonous. The weed is generally avoided by stock, but several cases have come under our notice where the plant has been harvested along with lucerne and other crops and the resultant chaff fed to horses with fatal results. It is quite a common weed in Queensland. The plant with the greenish-yellow berries and large leaves is a species of Solanum, either *Solanum verbascifolium* or *S. auriculatum*, but the specimens were black and rotten when they reached us. The former has white, the latter lavender or light purple flowers. Both species are very common weeds on scrub farms throughout coastal Queensland and are familiarly known as "Wild Tobacco." The plant belongs to a dangerous family, the Solanaceæ, but the berries are eaten by poultry and birds without ill effects following.

Poisonous Fungus.

C.N. (Buderim Mountain)—

Your specimens of fungi arrived in very bad condition. Fungi, as soon as they begin to die, are apparently attacked by certain flies the maggots of which soon reduce the fungus to a putrid mass. As far as we could make out, however, one of those sent seemed to be *Lepiota dolichaulos*, a large toadstool with white gills, stem, and a white cap flaked with brown. Little is known of this, but it has been suspected before of poisoning stock, as the following account from the "Agricultural Gazette of New South Wales" for December, 1902, will show:—

"*A Suspected Case of Fungus Poisoning.*—The following note on this case is published, as it is thought it might be of interest to stock owners, some of whom may have had similar cases which have not been brought under the notice of the Stock Branch. The cases occurred on Mr. M. H. Blaxland's farm on the Tweed River, and the Department is indebted to Mr. Blaxland for a full account of the symptoms. The first case occurred late in March, when a cow, after being affected for about ten days, died. No post-mortem examination was made. Ten days later there was a fall of rain, followed by a great crop of toadstools, and several cows became affected. Treatment with a purgative was successful in most cases, but two resisted treatment until removed to a paddock free from toadstools; they then rapidly recovered. The symptoms were general drowsiness, eye dull, belly tucked up, some evidence of abdominal pain (as shown by moaning and swishing of tails), rapid falling off in condition, slight constipation in most cases, but in one dysentery. The cattle were seen eating the toadstools, so precautions were token to destroy by trampling them down, when the cattle ceased to eat them. Since that time there have been no further cases. Specimens of the toadstool were submitted to Mr. Maiden, the Government Botanist, and Mr. Cheel, one of his assistants, reported it to be *Lepiota dolichaulus* (Berk and Br.), and stated that there was no previous record of its possessing poisonous properties. However, the evidence obtained against it in the present instance is such as to cause it to be regarded with considerable suspicion, but further information and opportunity to investigate fully are necessary to definitely determine the point."

Stink Grass *(Eragrostis major).*

F.M. (Tara, *viâ* Dalby)—

The grass is *Eragrostis major*, the Stink Grass. The local name arises from the fact that it gives off a strong odour—though perhaps not unpleasant—particularly after dew or rain. When young it is eaten freely by stock, but soon develops seed, matures, and becomes rather hard and unpalatable. It is an annual grass only observed to any extent during the summer months. It is mostly seen in cultivation paddocks, along railway lines, &c., though not, of course, confined to such places. On the whole it is not a grass of any particular value as a fodder.

PIG RAISING.

Following are selected replies from the correspondence of the Instructor in Pig Raising in the course of the month:—

Pig Raising and Dairying.

J.G. (Jambin, Rannes)—

There is no reason why pig raising should not be a payable proposition without having to depend upon dairying, but it requires more knowledge and attention to detail where milk is not included in the list of foods, for it is difficult to substitute any other food for milk unless resort is made to some purchased concentrated food like barley meal, pollard, or oat, wheat, or maize meal. In any case, one or two house cows would probably be kept, and in this case there should be some milk for the very young pigs. It is an advantage in the absence of milk to feed the sows more liberally at the age when the pigs are approaching weaning, and to allow the sow to suckle the pigs till they are up to ten weeks of age. The extra two or three weeks on the sow at this stage makes all the difference in the future growth of the young pigs.

It is necessary also to feed the young pigs more liberally at around six to ten weeks of age so that they do not suffer any check in growth at this stage. The foods to which you refer—pumpkins, sweet potatoes, green crops, and the like—together with grain maize, wheat, &c., all go to make up a good reliable list of foods.

You should, at this stage, also purchase one or two good text-books on pig raising and read the subject up extensively. There are several good books on the market. Pott's on the Pig, at about 12s. 6d., James Long on the Pig, at about 15s., Swine in America, by Coburn, at about 15s.

We would be pleased to select for you and to send on suitable books, on receipt of remittance, if you so desire.

Faulty Feeding.

W.D. (Woolooga)—

The trouble is due to faulty feeding. There is evidently far too much fluid in proportion to the solids being fed to both the sows and the young pigs. One occasionally notices farmers diluting skim milk with water to the extent of from 20 to 30 per cent. or more and still expecting good results. Young pigs particularly, require comparatively concentrated food with water available for drinking purposes at all times. Many young pigs suffer because they do not have any drinking water at all. It is suggested also, in the case of the pigs that are off colour, that the sweet potatoes should be boiled to a mash after being well washed to free them from soil. The skins may be left on the potatoes. To every ten parts of sweet potato fed to sow and young pigs add one part of pollard, barley meal, or maize meal. Also give each sow one tablespoonful or more of lime water in her feed every morning. Feed the pigs three times a day the amount of food they can eat up clean each time. Give green lucerne and succulent greenstuff. Try cleaning up the premises generally, liming the yards and pens, and white-washing the sties. Perhaps, as a preliminary in the case of badly-affected pigs, it would be helpful to give each young pig a dessertspoonful dose of castor oil in a small quantity of warm milk. Give the sow a bran mash to which 3 or 4 fluid oz. of castor oil has been added.

General Notes.

Broom Millet Board Election.

The Department of Agriculture and Stock announces that the following nominations have been received for election as members of the Broom Millet Board. The election will take place on the 16th May next:—Frederick H. V. Goodchild, Degilbo; William M. Hutchinson, Duleen; Hans Niemeyer, Hatton Vale; James Scanlan, Flagstone Creek; Erich M. Schneider, Binjour Plateau. Two members are to be appointed, and they will hold office for a term of one year, unless otherwise determined.

Arrowroot Board Election.

The counting of votes in connection with the annual election for the appointment of five growers' representatives on the Arrowroot Board took place at the Department of Agriculture and Stock, Brisbane, on Thursday afternoon, 14th April, with the following result:—

	Votes.
Alexander McG. Henderson (Redland Bay)	89
Alexander Clark (Pimpama)	82
Robert Stewart (Ormeau)	78
Johann F. W. Sultmann (Pimpama Island)	66
Benjamin G. Peachey (Ormeau)	65
William F. Oxenford (Oxenford)	64
John W. Latimer (Norwell)	61
Wilhelm A. Shipplock (Norwell)	61
Hans Grantz, junior (Norwell)	54

The first five persons will be appointed, and will hold office for a term of one year, unless otherwise determined.

Australian Canned Fruits Equal to World's Best.

At an exhibition of sample fruits arranged recently by the Department of Markets and Migration, the Minister (Mr. T. Paterson) said that Australian canned fruit was equal to the world's best. For purposes of comparison twenty tins of Californian fruit, purchased on the London market, were displayed side by side with corresponding samples of last year's Australian pack, and the result amply proved the Minister's contention. The Australian peaches were superior to the Californian in size, colour, and flavour, and the pears also were superior. It was emphasised, however, that the American pears had been subjected to much handling, and that much of the fruit was broken. The Australian apricots were equal to the Californian, and in some instances better.

"The display," said Mr. Paterson, "proved that the Australian canned fruit industry has profited by experience, and that to-day our product is unsurpassed. Proof of the quality of the Australian pack is shown in the attitude of the buyers in London. Our advices from the purchasers of the 1926 pack are to the effect that, when opened up, it was as good as the best Californian, but what is more to the point, London buyers are anxious to take our pack this year. Other buyers also, who previously would not take our fruit, are now keen to buy. We have progressed tremendously during the past three years, and now our product can hold its own with any other canned fruit in the world."

The Royal Society of Queensland.

The Annual Meeting of the Society was held in the Chemistry Lecture Theatre of the University at 8 p.m. on Monday, 4th April, 1927. The President, Dr. J. V. Duhig, M.B., was in the chair. The Annual Report and Financial Statement were adopted.

Officers elected for 1927 were—

President, Professor E. J. Goddard, B.A., D.Sc.; vice-presidents, Dr. J. V. Duhig, M.B. (*ex officio*), Professor T. Parnell, M.A.; hon. secretary, Mr. D. A. Herbert, M.Sc.; hon. treasurer, Mr. E. W. Bick; hon. auditor, Professor H. J. Priestley, M.A.; members of Council, Dr. W. H. Bryan, M.C., Professor R. W. Hawken, B.A., M.E., M.Inst. C.E., Dr. E. O. Marks, B.A., B.E., M.D., Professor H. C. Richards, D.Sc., and Mr. C. T. White, F.L.S. Professor Goddard was inducted to the position of president for 1927.

Mr. J. H. Smith, M.Sc., Dr. G. C. Taylor, M.B., Ch.M., and Misses L. Crawford, M. Fitzgerald, B.Sc., and G. Jones were proposed for ordinary membership. Mr. G. H. Barker was elected as an ordinary member.

The retiring President, Dr. J. V. Duhig, delivered his address, entitled "Nutrition." The foods of primitive and civilised man were compared and the effects on the human system outlined. The effect of different diets upon the teeth, the influence of light on nutrition, and the vitamin content of various foodstuffs were among the subjects discussed. Ideal diets for children and adults were suggested.

Staff Changes and Appointments.

Mr. R. M. Wallace, Inspector of Slaughter-houses, has been appointed Inspector of Stock, with headquarters at Kingaroy.

The following transfers of Inspectors of Stock have been approved:—W. Ford, from Cooyar to Boondooma; E. T. Lewin, from Kingaroy to Toowoomba; L. P. Doyle, from Kingaroy to Cooyar; R. Ferguson, from Winton to Beaudesert; R. J. T. Kidd, from Beaudesert to Mackay; S. J. Monaghan, from Mackay to Richmond; R. Pusey, from Richmond to Muttaburra; H. Coffey, from Muttaburra to Winton.

Messrs. F. Gillan and W. Richardson have been appointed millowners' representatives on the South Johnstone Local Sugar Cane Prices Board, vice Messrs. N. Fisher and A. L. McColl, resigned.

Mr. N. T. Anderson, of Biddeston, *viâ* Oakey, has been appointed Chairman of the Cheese Board in place of Mr. H. Keefer, who has resigned his position as Chairman of that Board.

The following gentlemen have been appointed Members of the Arrowroot Board as from the 15th April, 1927, to the 14th April, 1928:—A. McG. Henderson, Redland Bay; A. Clark, Pimpama; R. Stewart, Ormeau; J. F. W. Sultmann, Pimpama Island; B. G. Peachey, Ormeau; and L. R. Macgregor (Director of Marketing).

The following transfers of Inspectors under the Diseases in Plants Acts have been approved:—J. A. Stockdale, from Wallangarra to Stanthorpe; S. C. Todd, from Wallangarra to Nambour; C. G. Williams, from Nambour to Brisbane; H. St. J. Pratt, from Stanthorpe to Wallangarra; R. L. Prest, from Brisbane to Stanthorpe.

Mr. F. B. Rutledge, of Quilpie, has been appointed Government representative on the Adavale Dingo Board, *vice* Mr. H. C. Pegler, resigned. Mr. W. J. Clements has been elected member of the Clermont Dingo Board, *vice* Mr. R. C. Hutchinson, deceased.

Mr. H. Whitcomb has been appointed canegrowers' representative on the Racecourse Local Sugar Cane Prices Board, *vice* Mr. R. S. Stevens, resigned.

Mr. J. A. Stockdale, Inspector Diseases in Plants, Wallangarra, has been also appointed Inspector of Stock.

Mr. R. C. Lethbridge has been appointed Government representative on the Booringa Dingo Board, Mitchell, *vice* Mr. H. J. Hearn, resigned.

Mr. B. A. Webb, of Darr Creek, has been appointed an Acting Inspector of Stock, as has also the member of the Police Force stationed at Rathdowney, such appointments to take effect as from 1st April, 1927.

Mr. N. Annand has been appointed Millowners' Representative on the Gin Gin Local Sugar Cane Prices Board, *vice* Mr. J. Laurison, resigned.

Mr. J. C. Pryde has been appointed Temporary Inspector of Stock at Maryborough.

All Inspectors under the Diseases in Stock Act have been appointed officers under and for the purposes of the Animals and Birds Acts.

Constable P. T. W. Allen, of Ravenswood Junction, has been appointed Inspector of Slaughter-houses.

Mr. C. B. Buxton, Clerk of Petty Sessions, Mackay, has been appointed Chairman of the North Eton Local Sugar Cane Prices Board, *vice* Mr. M. Gallagher, Police Magistrate.

Mr. G. F. Dafforn has been appointed millowners' representative on the Tully Local Sugar Cane Prices Board, *vice* Mr. G. B. Blair.

Mr. E. R. Hollamby, Inspector of Slaughter-houses, has been attached to Rockhampton, and Mr. R. T. Cridland, at present at Rockhampton, will be attached to Mareeba.

Constable W. E. Martin, Officer in Charge Police, Cooyar, has been appointed also Inspector of Stock for such time as he remains at Cooyar.

Mr. J. M. Matheson, Inspector of Stock, Cloncurry, has been transferred to the South Burnett Cleansing Area, with headquarters at Kingaroy.

Mr. J. P. H. Clark, Inspector of Stock, East Haldon, has been transferred to Wandoan, and Mr. A. W. Noll, Inspector of Stock, Wandoan, will go to East Haldon.

Mr. E. J. Lorraine, Brisbane, has been appointed Inspector under and for the purposes of the Diseases in Plants Acts, as from the 4th March, 1927.

Messrs. W. E. Black, J. H. Dendle, W. F. Hough, A. K. Williams, and W. D. Wilson have been appointed Temporary Rangers under and for the purposes of the Animals and Birds Acts.

The District Inspector of Stock, Longreach, has been appointed Government representative on the Mitchell West Dingo Board.

Australia in America.

The Prime Minister's Office advises that from the 30th ultimo the address of the Commissioner for Australia in the United States of America will be Cunard Building, 25 Broadway, New York.

Citrus Levy Regulations.

The period during which the Citrus Levy Regulations under the Fruit Marketing Organisation Acts shall be in force has been extended from the 28th February, 1927, to the 29th February, 1928.

Broom Millet Board.

An Order in Council has been passed, authorising the Broom Millet Board to give security to the Commonwealth Bank necessary for the financial accommodation to be provided by that bank to the board.

Stock Gate at Spicer's Gap Closed.

An Order in Council has been made under the Diseases in Stock Act, providing that stock (with the exception of horses in actual work accompanied by a permit to travel) shall not cross to the Darling Downs through the gate on the main road at Spicer's Gap.

Stallion Registration.

Regulation 4 under the Stallions Registration Act, providing for the fee for registration and renewal of registration of a stallion has been amended. Previously the fee for registration of a stallion was 20s. and for renewal of registration 10s. The Regulation as amended now provides for a fee of 20s. both for registration and renewal of registration of a stallion.

Dairy Produce Act.

A further Regulation 3A has been approved under the Dairy Produce Act, and in consequence several minor alterations in the previous Regulations have also been approved. These Regulations provide for the certification of butter and cheese makers. At the present time testers and graders of dairy produce at factories are issued with certificates of competency under the Dairy Produce Act. The new Regulation provides for the issue of similar certificates of competency for those engaged in the making of butter or cheese.

Queensland Represented at the Cuban Sugar Conference.

Hon. W. Forgan Smith, Acting Premier and Minister for Agriculture, has informed the Press that Mr. Norman Bennett represented his department at the conference organised by the International Society of Sugar Cane Technologists, and held in Cuba in March last. The previous conference held by this society was in Honolulu, in 1924. The subjects discussed at the recent conference at Havana included insect pests of sugar-cane; diseases of the sugar-cane plant; sugar-cane varieties and related problems of seed selection and seedling propagation; protective quarantine measures; field practices such as cultivation, fertilisation, tillage, &c.; and the operation and chemical control of the cane sugar factory.

Mr. Bennett is one of the Department's Travelling Scholars, and is at present in America. He started on his tour of the sugar countries of the world early in 1924, and on his return to Queensland in 1928 will devote his services in the Department to technical matters in connection with the manufacture of sugar. Mr. Bennett has already visited Java, Glasgow, the United States of America, and the West Indies. He will be in Hawaii in November of this year. Other Travelling Scholars in connection with the sugar industry are Mr. A. F. Bell, who is specialising in plant pathology, and Mr. H. W. Kerr, who is specialising in soil matters.

Mackay Show.

The Pioneer Farmers and Graziers' Show Society will hold its Annual Show on 28th, 29th, and 30th June.

Fruit Marketing Regulations.

Regulations under the Fruit Marketing Organisation Act have been amended. The amendments are made mostly in Regulations dealing with the election of sectional group committees.

Farleigh-Homebush Sugar Mill.

The Farleigh-Homebush Sugar Mill Suppliers' Committee has, by Order in Council, been brought under the operation of "*The Primary Producers' Organisation and Marketing Act of* 1926."

Importation of Pigs Prohibited.

An Order in Council has been made prohibiting the introduction into Queensland of any infected or suspected swine or carcass or portion of carcass of infected or suspected swine from the States of New South Wales and Victoria, for a period of twelve months from the 21st April, 1927, the date of the Order.

Banana Weevil Borer.

By Regulation 127 under the Fruit Marketing Organisation Act, the Committee of Direction of Fruit Marketing has been authorised to offer a reward of £2,500 for an effective scheme of treatment for the control of the banana weevil borer. The Regulation provides for an investigation committee to inquire into schemes received, and also provides for conditions under which schemes may be offered.

Pure Seeds Districts.

By Order in Council, Pure Seeds Districts have been formed for the purposes of the Cotton Industry Acts. The following are the districts:—

District No. 1.—Upper Burnett Settlement, consisting of Counties of Yarroll and Rawbelle.

District No. 2.—Callide Valley, Counties of Raglan and Pelham.

District No. 3.—Boyne Valley, county of Clinton.

Custard Apple Levy.

The Committee of Direction of Fruit Marketing have, by Regulation under the Fruit Marketing Organisation Acts, been empowered to make a levy on all custard apples marketed for the year ending 31st December, 1927, such levy to be payable by the growers of the custard apples so marketed, and to be at the rate of one penny per half-bushel case of custard apples. All sums raised by the levy will be expended only in the interests of the custard apple section of the fruitgrowing industry, and the primary purpose for which the levy is being raised is to advertise custard apples in Sydney and Melbourne.

Sugar Levy.

The Acting Premier and Secretary for Agriculture (Hon. W. Forgan Smith) has gazetted his intention to levy an assessment, at the rate of one half-penny on every ton of sugar-cane raised at sugar-mills during the season 1927-28, for the purpose of providing funds for the administration of the Sugar Cane Prices Acts. At the same time he is making a levy, at the rate of one halfpenny on every ton of sugar received at mills during the same season, for the purpose of financing the Bureau of Sugar Experiment Stations.

These assessments are payable by the owner of the sugar-mill in the first instance, and are levied annually, the one for last year under the Regulation of Sugar Cane Prices Acts being one penny per ton against the halfpenny per ton to be levied this year.

The levy last year for the upkeep of the Bureau of Sugar Experiment Stations was one farthing per ton against the one halfpenny per ton this year. It will thus be seen that on the combined two levies there is a reduction of one farthing per ton.

The levy under the Sugar Experiment Stations Acts is for the purpose of maintaining the sugar and entomological stations established at Bundaberg, Mackay, Gordonvale, and South Johnstone, and for subsidising amounts raised for the destruction of sugar-cane grubs.

The assessment levy under the Regulation of Sugar Cane Prices Acts is absorbed in the administrative expenses of the Central Sugar Cane Prices Board, the salaries of the various cane testers at the different mills throughout the State, and in defraying the expenses of the Travelling Research Scholars who are now visiting the other sugar countries of the world with a view of their subsequently placing their knowledge at the service of the Queensland cane industry.

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Co-operation.

Two fool jackasses—now get this dope—were tied together with a piece of rope. Said one to the other, "You come my way, while I take a nibble at this new mown hay." "I won't," said the other, "you come with me, for I, too, have some hay, you see." So they got nowhere; just pawed up dirt, and, oh, by golly, how that rope did hurt! Then they faced about, those stubborn mules, and said "We are just like human fools. Let's pull together. I'll go your way, then come with me, and we'll both eat hay!" Well, they ate their hay and liked it, too, and swore to be comrades good and true. As the sun went down they were heard to say, "Ah, this is the end of a perfect day."

Australia's Debt to Farrer.

A special appeal is being made in New South Wales by the Farrer Memorial Trust for funds to enable the trustees to maintain the trust's selected scholar. Referring to the appeal the Minister for Agriculture in the mother State said that apart from the excellent work which had been done by the trustees of the Farrer Memorial Fund to perpetuate Farrer's memory by financing young scholars to undertake research work into various avenues of wheat improvement, and a movement started in Victoria a few years ago which met with indifferent success, practically nothing had been done to mark Australia's debt to Farrer. An effort, he added, was being made by the trustees, apart from the training of the research scholars, to have a national memorial raised over Farrer's grave, which, happily, was situated within the Federal Territory at Canberra; also to have his original holding, the birthplace of his wheat improvement work, to be retained as a national reserve. The trustees already had approached the Federal authorities in these directions through the Federal Capital Commission, and there were hopeful prospects that success would be met with.

Dairy Cows Should Have Clean Drinking Water.

Although it is most desirable from many points of view that cows should have a plentiful supply of good clean drinking water, sometimes the water is blamed for second-quality cream, when in reality it has nothing whatever to do with it. Although tainted drinking water can, and does, impart certain flavours to cream, it rarely happens that such flavours cause the cream to be graded second quality. Whatever flavour the water may impart is absorbed from the body of the cow before and during the secretion of the milk, and it does not become worse as the cream is kept, but sometimes gradually disappears. In any case, it can usually be partially or wholly removed by the ordinary treatment at the factory. This class of flavour is not as important as bacterial flavours, for instance, which gradually become worse and worse as the cream is kept, but absorbed flavours imparted by water do not.

Where cows wade in muddy pools or waterholes, it is the contamination they carry out on their legs, flanks, tails, and udders, which causes trouble later on. This is one of the commonest causes of ropy milk or cream. The bacteria responsible find their way into the bucket during milking, and from there into other utensils or separator parts, where they may exist for some considerable time, unless proper precautions are taken.

Early Soil Preparation for Fruit Trees.

If the land intended for new planting is in fit condition for ploughing and subsoiling, it is a good plan to have the work done as early as possible, as moisture is thereby conserved. The soil is also put in a condition in which it will absorb any rains that fall, and thus no hold-up will occur at planting time through the land being too dry.

Except where the subsoil is of such a nature that it is undesirable to encourage the roots to strike into it, the land should be ploughed and subsoiled to a depth of 15 or 18 inches. This is generally more easily and thoroughly done in two "lifts," one being a plough turning a furrow in the ordinary way, and the second being a subsoiler that loosens up the bottom before the next sod is turned on to it. In most soils it is not possible to keep this uniform, the ordinary subsoiler sinking almost to the beam in some places and rising in others, so that the total depth may vary from 12 to 18 inches.

If planting is being carried out during a dry season it is an advantage for the subsoiling to be completed some months beforehand, so that any rain that falls will be caught and stored. It is important that, after subsoiling, land be brought to a fine condition as deep as possible; for this reason a deep cross-ploughing is advocated. If for any reason the lower depths of the worked soil have not been brought to a fine tilth, a wider hole should be dug when planting, and care taken that it is only filled with fined soil. The roots of the young trees are then assured of a fine but firmed soil to extend into.

Trees for Shade and Shelter.

The stockowner should recognise the value of shade and shelter. A little rough hill on the property, covered with stunted gum trees, is worth more to the farmer as it stands for shelter purposes than the small amount of grass it would grow should he decide to have it rung. To settlers in naturally clear country, judicious planting is a necessity. Some of our native trees lend themselves for shelter purposes admirably, while some species from other parts of the world adapt themselves to the same purpose.

America Looks to Australia for Guidance.

Thus an editorial in the Queensland "Grazier's Review":—

We are so often being told that Australia is miles behind the rest of the principal civilised nations in the marketing of its produce, and in other commercial avenues, and so many shining examples are continually being held before our eyes —particularly America—that it is a pleasant relief to be reminded that there is at least one department in which we hold undisputed sway, and one matter on which even America is not ashamed to seek our guidance and profit by our example. That is, of course, the handling and marketing of our wool. America—by which is meant the United States—is noted as a seeker after efficiency, and as having an uncanny nose for the best in everything, and the courage to go after it regardless of false pride. Thus it is that Mr. J. W. Walker, a research worker in the U.S. Department of Agriculture, has been assigned to make a twelve months' study of wool production and marketing in Australia and New Zealand. Delegates from the leading co-operative wool marketing associations, representing 38,000 American wool producers, met officials from the Department of Agriculture at Washington recently to develop a Government programme of research service and educational work. At the conference Mr. Walker told them that wool coming from Australia and South Africa threatened to dominate the American market, as being better graded and better suited to mill requirements. Our methods of production and marketing have earned for us the confidence of buyers all over the world. Considering our tremendous output, the multitudinous sources of supply, and the conditions under which it is often prepared, our clip is a marvel of meticulous care. Mr. Walker has emphatically come to the right place, and we should have much of interest to show him.

Cleansing Dairy Utensils.

There are two common methods of killing bacteria—one is by the use of germicides or disinfectants, and the other is by the use of heat in the form of boiling water or steam. Disinfectants cannot be safely used for treating dairy utensils except in special cases, and the boiling water treatment is the general method adopted.

The question of an effective boiling water supply on the farm has been rendered more difficult of late years on highly improved properties by reason of the shortage of wood. This has not yet reached an acute stage generally, and where it has steps can be taken to overcome it. Older dairying countries have had the same problem to face and have adopted modern water heaters—electric heaters (where cheap power has been available) and other methods. We have hardly reached that stage, but consideration might be given on certain farms to the installation of bricked-in coppers (where not already done) as an economical means of heating water for cleansing dairy utensils. The ordinary chip bath heater is a convenient method of using up cobs, waste paper, &c., but care must be exercised to see that the water is heated effectively. To effectively treat the utensils, the water must be close to boiling point. Warm water is of very little value, and water which has been heated some distance from the dairy and is left to stand at the wash-up bench for five or ten minutes after being removed from the fire quickly cools off to well below boiling point.

The most effective method is to place the separator parts and the smaller dairy utensils, after properly washing, in the vessel used for heating water (be it a copper, kerosene-tin, or whatever is used), while still on the fire, making sure that the water comes to the boil. After five minutes, remove utensils and hang up, or stand, in a clean atmosphere. They will dry thoroughly in a few minutes without resource to rags, and will be in a perfect condition for the next milking. Set-in coppers are very useful for this purpose, and are not only economical as to the wood supply, but are effective in wet weather.

It is, of course, necessary to treat the utensils as outlined *twice daily, i.e., after each milking.* Where the milking has been carried out in such a way so as to reduce bacterial contamination to a minimum, and where the separator parts and other utensils have been correctly treated as suggested, other things being equal, the cream coming from the separator will be in a sound condition from a bacteriological point of view, and will not be heavily contaminated. This being so, there is every likelihood of it remaining in a "choice" condition until it is delivered to the factory. Additional precautions may be taken to assure of this being done.

PUBLICATIONS RECEIVED.

"Farm Engineering."

Byron B. Robb, M.S.A., Prof. Rural Engineering, Cornell University, and Fred. G. Behrends, B.S., Prof. Rural Engineering, Cornell University. John Wiley and Sons, Inc., New York. Our copy from Chapman and Hall, Limited, London. Volume I. Price, 12s. 6d. net.

In this volume there has been gathered knowledge of certain mechanical jobs which a farmer should know how to do. These include many smaller or shorter jobs, such as harness repairing, soldering, rope work, and belt lacing, as well as certain larger jobs requiring a greater degree of judgment and managerial skill, such as concrete work, leveling, and drainage, and the installation of water supply and sewerage disposal systems. Throughout this book the authors have attempted to teach the practice before stating the principles upon which it is based, rather than to teach abstract principles before any practice is given.

"Crop Production and Soil Management."

Joseph F. Cox, B.S.A., Prof. Farm Crops, Michigan Agric. College, and Michigan Experimental Station. Same publishers. Our copy from Chapman and Hall, Limited, London. Price, 13s. 6d. net.

This volume is intended as a handbook for students, whether they are enrolled in a vocational school or at work on the farm. Special emphasis is made by the author on the methods employed by the more successful farmers, and he points out that practices developed on the farm or contributed by scientific investigations, which are effective in reducing production costs, improving market quality of products, and placing the upkeep of soil fertility on a more permanent basis, are of great significance.

"Pasture Improvement in Australia."

Victor H. Green and others. Australian Fertilizers Pty Ltd., 19 Bligh street, Sydney.

This small, but very useful book is the first direct and comprehensive effort by a commercial house to supply information to stockowners on pasture improvement. When it is realised that a very big proportion of our wealth is derived from our pastures and natural grass lands, it becomes obvious that any work directed to increasing the quantity and improving the quality of our pastures is of national importance. It is altogether a valuable little book, well written and illustrated, and full of information to the stockowner that is not always so readily available. In it is embodied the experience of animal and pasture husbandry of practical men who have spent a lifetime on the land.

DEPARTMENT OF AGRICULTURE AND STOCK, QUEENSLAND,

PRICE LIST OF STUD BERKSHIRE PIGS FOR SALE
at
STATE FARM, WARREN, via ROCKHAMPTON, CENTRAL QUEENSLAND.

The undermentioned animals are available at Prices Quoted for the Current Month only :—

LIST No. 2 FOR MONTH OF MAY, 1927.

Farm No.	Description.	Sire.	Dam.	Date Farrowed.	Price.	Remarks.
					£ s. d.	
1269	Berk Sow	Warren Monarch	W. Sadie	2-11-26	4 4 0	
1274	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1275	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1276	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1277	Berk Sow	Warren Monarch	W. Bonny	14-11-26	4 4 0	
1205	Berk Sow	Warren Premier	W. Perfection	27-8-26	5 5 0	
1206	Berk Sow	Warren Premier	W. Perfection	27-8-26	5 5 0	
1194	Berk Sow	Warren Monarch	W. Elsie	10-8-26	6 6 0	
1163	Berk Sow	Wilmot Ron	W. Pansy	6-5-26	7 7 0	

The above quotations are for pigs crated on rails Warren Station.

When placing orders full forwarding instructions should be furnished, together with Remittance, with Exchange added.

Further particulars may be obtained upon application to the Manager, State Farm, Warren, *via* Rockhampton.

Farm and Garden 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.

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 spring time to prepare them for the trial of heat they must endure later 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 ones. 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 lot, 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, daffodils, &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.

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, and 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 trees 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 of 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.

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.

1927.	May.		June.		Moonrise. May.	Moonrise. June.
Date	Rises.	Sets.	Rises.	Sets.	Rises	Rises.
					a.m.	p.m.
1	6.19	5.19	6.38	5.2	5 31	9.50
2	6 20	5 18	6 38	5.2	6.39	10.55
3	6 21	5 17	6.38	5.1	7.46	11.57
4	6 22	5 16	6 39	5.1	8 53	...
						a.m.
5	6 22	5.16	6 39	5.1	9 55	1.0
6	6 23	5.15	6.39	5.1	10.54	2.1
7	6 23	5.15	6.40	5 1	11 47	3.2
					p.m.	
8	6.24	5.14	6.40	5.1	12 33	4.3
9	6.24	5.13	6 41	5.1	1 11	5 2
10	6 25	5.12	6 41	5 1	1 50	6 1
11	6 25	5.11	6.41	5.1	2 23	6.58
12	6 26	5.11	6.42	5.1	2 54	7.54
13	6 26	5.10	6.42	5.1	3.21	8 45
14	6 27	5.10	6 43	5.1	3.53	9.32
15	6 27	5.9	6.43	5.1	4 24	10.14
16	6 28	5.9	6.43	5.1	5.0	10.53
17	6 29	5 8	6.44	5.1	5.36	11.28
						p.m.
18	6 30	5.7	6.44	5.2	6.19	12.2
19	6 31	5.6	6 44	5.2	7 5	12.33
20	6.32	5 6	6 44	5.2	7 58	1.6
21	6.32	5.5	6.44	5.2	8.55	1.39
22	6 33	5 5	6.44	5.3	9 55	2.16
23	6.33	5 5	6 44	5.3	10.58	2.56
24	6.34	5 4	6.45	5.3	...	3.41
					a.m.	
25	6 34	5 4	6.45	5.3	12 19	4.30
26	6 35	5.3	6.45	5.4	1 5	5.29
27	6.35	5 3	6.45	5 4	2.9	6.31
28	6 36	5.3	6.45	5.4	3.14	7.38
29	6.36	5.2	6.45	5.5	4.19	8.45
30	6 37	5.2	6.45	5 5	5 25	9.50
31	6 38	5.2	...	...	6.32	...

Phases of the Moon, Occultations, &c.

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

1 May	● New Moon	10 39 p.m.
9 ,,	☾ First Quarter	1 27 a.m.
17 ,,	○ Full Moon	5 2 a.m.
24 ,,	☽ Last Quarter	3 33 p.m.
31 ,,	● New Moon	7 5 a.m.

The unusual occurrence of two new Moons in this month is somewhat remarkable.

The conjunction of Venus and the Moon on the 4th should be looked for in the western sky about the time of sunset. Venus will be three degrees, or half the length of the Southern Cross to the northward of the crescent-shaped Moon. As the twilight deepens they will appear to more advantage, being still a good height above the horizon, over which they will disappear soon after 7:30 p.m. Mars, still fairly high up in the sky will then be the most brilliant object in the west.

Mercury will be in superior conjunction with the Sun on the 20th, when it will be on the far side of its orbit and in a line only just below the northern edge of the Sun's disk. Six months later Mercury will be in front of the Sun and a transit across its face will occur.

Saturn will be in opposition to the Sun on the 26th, that is it will be on the opposite side of the sky, rising very nearly as the Sun sets, and at its highest point at midnight and setting almost at the time of sunrise. Thus it will be above the horizon all night and be a favourite object for telescopic observation. The ring-shaped system, though not quite at its best, will be wide and very well displayed.

There will be an occultation of Epsilon Leonis, the stars at the point of the sickle in the constellation of the Lion on the 9th, commencing about 8.45 p.m. and ending about 9.45 p.m. near the latitude of Brisbane.

Saturn will be occulted by the full moon about thirty-six minutes after midnight on the 17th in Southernmost Queensland, this will be an interesting sight with or without binoculars.

7 June	☾ First Quarter	5 48 p.m.
15 ,,	○ Full Moon	6 19 p.m.
22 ,,	☽ Last Quarter	8 29 p.m.
29 ,,	● New Moon	4 32 p.m.

The greatest astronomical event of this month will be the total Eclipse of the Sun on the 29th observable across the narrowest part of England, Scandinavia, etc,, but not in Australia. The previous total Eclipse of the Sun in England was in 1724, and the next will be in 1999.

A fortnight earlier an interesting total Eclipse of the Moon will occur—eighteen minutes before the moon rises at Warwick it will enter the Umbra or the darkest part of the earth's shadow. An hour and a half later it will be totally emersed and a total Eclipse will occur. Instead of the usually bright, full-orbed Moon it will most probably have a darkened, copper-coloured appearance.

The occultation of Iota Leonis on the 7th about 8.30 p.m. will be observable in Southern Queensland. It will be about 50 degrees above the horizon in the north-west, and in a favourable position for observation.

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

VOL. XXVII. 1 JUNE, 1927. PART 6.

Event and Comment.

The Quality of Queensland Butter—A Notable Success.

It is very pleasing to note the success obtained by Queensland butter and cheese manufacturers in the Australian Open Championship Classes at the competition held under the auspices of the Australasian Butter and Cheese Factory Managers and Secretaries' Association in Melbourne, said Mr. Forgan Smith, Acting Premier and Minister for Agriculture, when referring recently to the notable success obtained by the Wide Bay Co-operative Dairy Association in winning the Australian Open Championship for butter. Queensland has definitely placed itself in the forefront with other leading butter and cheese manufacturing countries. In recent years our butter has more than held its own in competition with the product of other States and countries, among the most notable successes being Mundubbera's first place at the Islington Show, England, in keen competition from all parts of the world; Oakey's second place in the world's competition at New Zealand, being but half a point behind the winner; and now in the Australasian Championship, in which Queensland factories secured first and second places in the butter section, and second and third places with cheese.

The winning butter was produced by the Wide Bay Co-operative Dairy Association's factory at Gympie, which was recently rebuilt at a cost of over £60,000, and is now claimed to be the largest butter factory in Australia. Departmental officers report that the product of the new factory has shown a distinct improvement. Maleny has also improved its factory equipment, with the result that its butter has been grading consistently well for some time.

The managers of these factories, Mr. B. C. Cumming (Gympie) and Mr. G. Newton (Maleny), are congratulated on their success. Both these gentlemen have always shown a keen desire to bring their product to the highest quality, and well deserve their win. The factories which won second and third places in the Cheese Championship are owned by the Downs Co-operative Dairy Association. This company has recently made special provision for the supervision of its cheese factories.

Owing to the unfavourable climatic conditions prevailing at the time the cheese was manufactured, the Queensland product was by no means at its best. Had it been made a month later, it is certain that cheese of a much higher quality would have been submitted for competition from this State.

Departmental Economic Committee.

The need for general inquiry into the basic factors of land settlement, agricultural production, and marketing systems was stressed recently by the Minister for Agriculture (Mr. W. Forgan Smith), when referring to the work of the Economic Committee now functioning in his Department. Mr. Smith said that the farmer was one of the first to suffer during any periods of economic depression, and in order to establish ways and means of reducing losses and wasted effort from which agriculture suffered, the Departmental Economic Committee had been appointed.

It was felt that what was required was intelligent direction and economic harmony in the agricultural industry. The committee, as a result of its investigations, would, it was expected, be in a position to give sound advisory service to the farmer on the economics of his industry in relation, particularly, to the varying production cost factors in different districts; the advisability or otherwise of adjusting production to demand in respect of certain of his crops; and primary factors affecting crop cultivation, areas to be cropped, cycles of over and under production, and cycles of high and low demand in relation to certain crops, changes in ease of production or in demand, seasons, weather, and accidental causes.

The committee was not giving attention to the economic position of the dairying industry, and had taken a wide survey of its problems. It was realised conditions throughout the State varied vastly, particularly in respect to soil, climate, and rainfall. This variation in seasonal and other circumstances had been recognised by the committee, and in its deliberations allowances had been made accordingly.

Up till now the committee had given consideration to land values, cost of improvements, necessary plant and equipment, cost of stock, labour costs, general working expenses, economic production of dairy cows, so as to determine the payable production limit, analysis of average production of cows, tested under the departmental herd-testing scheme, the minimum number of cows required to be kept in order to assure a living wage and a reasonable return on capital invested, fodder conservation, field and storage costs, financial assistance required to enable the dairyman to store against lean periods of production, methods of improvements of dairy stock, and stock food values.

Two members of the committee were now obtaining first-hand information from producers in selected dairying districts. This information would be of much assistance to the committee in arriving at decisions on which sound advice and guidance might be based.

A Libel on Queensland.

Mr. A. J. Jones, Minister for Mines, as Acting Premier in the absence of Mr. Forgan Smith in the South, had this to say in the course of a recent commentary on certain of the contents of a "Handbook on the Commonwealth of Australia," issued by the Oversea Settlement Department of the Dominions Office, London:—

"It seems to me that one has only to look to London to be told of anything that is bad about Australia—of floods and droughts, of intense heat and hardships, of reptile and other pests, of forest fires and wind storms."

Some of the assertions, Mr. Jones held, constituted a libel on Queensland, and he said he had communicated with the Agent-General on the matter.

It was claimed that the "Handbook" contained official information regarding openings for settlers, land settlement schemes, wages and hours of labour, cost of living, and assisted passages and fares, and had been revised to 1st July last. Respecting Queensland and sugar planting in this State, said Mr. Jones, the "Handbook" stated:—"There is a demand for the white labourer in the cane fields of Queensland and Northern New South Wales, but the work, especially in Northern Queensland, is unsuited to new arrivals from the United Kingdom. The climate in the North is tropical, hot, and moist in the rainy season, from January to March, and hot and dry at other times. In the South the climate is less trying, but even here it is doubtful whether a newcomer could stand the conditions until he has become acclimatised. . . . Any person intending to take up work in the canefields of Queensland would we well advised to start in the South, or in New South Wales.

They should arrive not later than May, which is the busy time, and would thus have a few months of comparatively cool weather before the hot season begins in November.''

The foregoing certainly misrepresented the climate of Queensland, said the Minister. Only recently an Englishman who had spent the previous twelve months in Queensland, visiting every part of the State, including the far North, and was about to return to the old country, wished him good-bye, adding that it was with the greatest regret that, business having called him away, he was leaving Queensland, and that he wished he could take with him to England ''some of Queensland's delightful climate.''

It was, indeed, a fact, continued Mr. Jones, that so healthful was the climate of Queensland that the death rate was the lowest of the Australian States, and the second lowest in the world.

He (Mr. Jones) was indignant at the statements in the ''Handbook'' in question —statements calculated to do Queensland a great deal of harm and which, certainly, would not induce immigration to the State. Consequently, and in view also of the fact that the contents of the ''Handbook'' were to be revised in July of this year, he had cabled to the Agent-General for Queensland in London (Mr. J. Huxham), asking him to endeavour to have the erroneous statements withdrawn, and to see, if possible, that any future publications dealing with Queensland conditions were first submitted to him for revision, thus obviating the inclusion of incorrect information.

Queensland's Agricultural Legislation Commended.

The Acting Premier (Mr. W. Forgan Smith) informed the Press recently that he had received a letter from Mr. C. Freeleagus, Consul-General for Greece, intimating that the Greek Government had requested him to forward a copy of Queensland's Primary Producers' Organisation and Marketing Act, which was passed last session. In his letter to the Acting Premier, Mr. Freeleagus said that he thought this information would be of interest to the Government, and added, ''that the request from his Government for the copy of Queensland's legislation was a pleasant surprise to him, in so far as it spoke well of this State's legislation.''

The Acting Premier also made available to Press representatives an excerpt from the March issue of ''Empire Production and Export,'' a journal published in London as the official organ of the British Empire Producers' Organisation, a body which is well known throughout the world. Commenting on the last report presented to Parliament by the Director of the Council of Agriculture, that journal regards it as ''a document of the highest importance,'' and goes on:—''As long ago as 1924 we commented on a previous report from the same source and on the same subject, and commended it to the notice of the (British) Minister of Agriculture as being suggestive of a system of co-operation, co-ordination, and control which, if applied here, might save British agriculture, and raise it from the rut of depression in which it has been for far too many years. The material contained in this new report has more than justified our faith in the system and our confidence in its effectiveness as a panacea for our own agricultural ills. Complete representation of the producers has been secured by a theoretical division and subdivision of the organisations connected with the production of specific commodities, and the appointment of delegates for each resultant section. By these means mutual co-operation of all branches of the agricultural industry is assured, and on this basis of confidence and co-ordination, much excellent work has been done in the direction of safeguarding interests, stimulating production, improving marketing methods, and prosecuting research. The only pity is that Queensland's organisation should be practically unique.''

Mr. Smith added that it was indeed gratifying to receive such appreciative reference to the efforts which the Queensland Government is making to assist the producers, and it was also indicative of the interest which is taken in Queensland agricultural legislation in other parts of the world.

Banana Grade Standards.

The Secretary for Agriculture (Mr. W. Forgan Smith) has announced that grade standards for bananas have been gazetted by the Victorian Department of Agriculture. It is understood Victoria intends to enforce these regulations, which provide that all Cavendish bananas shall be packed according to size, and the variation in length of fruit in any one case shall not exceed 1½ inches. No bananas measuring below 5½ inches in length by 4 inches in circumference shall be allowed to be marketed. When varieties other than Cavendish are marketed, the name of the variety shall be marked on the case. All measurements in length are to be taken on the outside of the curve, from the junction of the fruit at the stem-end to the top of the fruit.

Bureau of Sugar Experiment Stations.

CANE DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (10*th May*, 1927) *from Mr. E. J. F. Wood, Assistant to Pathologist:—*

BUNDABERG DISTRICT.

Two diseases are of wide occurrence in this area—Mosaic and Gum. More restricted in distribution are Leaf Stripe and Root Disease. Iliau was not observed this year, possibly as most of the planting has been late, and the young cane is not yet showing symptoms. It is also possible that the rapid growth of the cane during the recent rains has not allowed it to get a hold.

Gum has been observed at Fairymead, Tantitha, and is widespread in the Woongarra from Spring Hill to Windermere and down to Elliott Heads. In a few cases the farmers who have 100 per cent. infection, are asking "What can I do?" and are apathetic on the subject. Gum is a disease which, by its varied characteristics, and its sporadic outbreaks, has long puzzled the plant pathologist, but gradually the factors which govern it are becoming known. The long suspected presence of an insect vector has, as far as I know, never been actually proved, but is hardly doubted. This accounts for the sudden and unexpected appearance so characteristic of the disease, while the relation of the gum bacteria to weather and soil conditions, and possibly to hydrogen on concentration of the cane juice, would all tend to the elusive nature of gumming outbreaks. Resistant varieties still remain the chief method of control, though it seems that the resistance of a variety is liable to diminish. The growers of the Woorgarra are fortunate in having the variety Q. 813 to fall back on. In one area it is standing practically unharmed, while Badila and N.G. 16 nearby are 70 per cent. to 100 per cent. gummed. Moreover, it seems to do very well, and, if gum is to be controlled in the Bundaberg district, it will have to be called to mind the part which Malabar is playing in the control of gum in the Northern Rivers; and Malabar has a very low c.c.s., while that of Q. 813 is high.

Badila and N.G. 16 are badly affected, as is also M. 1900 Seedling and D. 1135. If these canes are to be grown, seed selection will have to be practised, and it is always advisable to bring the seed cane from a free or lightly gummed area. The majority of Badila and N.G. 16 is grown by companies, and these should find little difficulty in obtaining healthy seed.

E.K. 28 and H.Q. 285 are also susceptible to gum, and care should be taken to keep them free.

Mosaic was present on every farm visited, but usually to a small extent. Rigorous seed selection and subsequent eradication is having its effect in most areas. Black Tunis is a dangerous friend owing to its high susceptibility. Shahjahanpur 10 has actually been planted out on one farm at Bucca, and has been ratooned on several farms on Barolin road. The eradication of this cane is essential if Mosaic is to be fought. It is useless to attempt any control measures till this step is taken.

The river farms at Avoca, Oakwood, and Sharon, also at Wallaville, are badly infected, and afford a problem of control.

River Farms.—H.Q. 285, the staple variety, is rather susceptible, and is very badly affected on the river. As this is the only early maturing cane grown in this area the position is a difficult one, as seed selection where infection is greater than 60 per cent. is a difficult and costly matter. The other alternative is to bring plants from a lightly-infected area after due selection, and to form a buffer area of Q. 813, which is the leading late maturer in these river lands, between the old infected cane and the imported clean seed.

Frequent plantings (*i.e.*, few ratoon crops) would be a necessary factor of control in such cases, and it might be well to rotate varieties, replacing Q. 813 by H.Q. 285, and *vice versâ*. The cleaning up of these plantations should be commenced from the direction of the prevailing wind, and the clean seed cane planted to windward of the infected varieties, with, if possible, a buffer area of Q. 813. This should mean a rapid method of control. Systematic work by the farmers as a body is the only thing which will relieve the Mosaic situation on the river lands.

At Wallaville all varieties, including Q. 813, are badly infected with Mosaic, due solely to the planting of infected seed. Q. 813 is even here markedly less infected than other varieties, though it shows the damage more. This gives rise to the fallacy that Q. 813 is susceptible. It is resistant but intolerant. In this area clean seed must be brought from the hill farms and planted to windward. Then seed selection should control the situation. It will pay to import seed rather than to plant infected cuttings.

The loss due to Mosaic is often not apparent except to an observer who can visualise the true productivity of the soil, as compared with its actual productivity. The farmer, living on the soil, accustomed to estimate crops with Mosaic, does not see the damage, and it is hard for him to believe the extent of it; 5 tons per acre loss is not unusual in heavily-infected fields.

A peculiar case of high secondary infection was seen at Currajong on a hillside farm. Seed selection had been practised from a M. 1900 Seedling block, less than 1 per cent. infected. The cane had been planted on a newly cleared hillside facing an infected block of D. 1135 on the other side of the valley. Assuming that no selection had been practised we would still have a field approximately 2 per cent. infected, though the *number* of diseased stools and, therefore, the *centres* of infection would be greater. But selection was practised, and there is now at least 20 per cent. infection, which shows the symptoms of secondary infection, usually in the very early stages of growth. This infection is still going on, and it is significant that the cane leaf hopper (*Perkinsiella saccharisida* Kirk) is very prevalent. No aphids were observed. As the hillside is not stumped, control will be a difficult matter, and replanting the M. 1900 S. and D. 1135 blocks simultaneously as soon as is possible is the only method. It is observed here as elsewhere that while secondary infection occurs readily from one hillside to that facing it—*i.e.*, across a valley—it rarely spreads across a ridge, the conclusions being that the light insects are wind borne rather than that they fly of their own volition, and that it is difficult to descend on a slope facing to leeward. The particular farm mentioned is fortunate in that the infected area is in this way screened from the rest of the farm.

Leak Stripe was not observed at Hill End or Windermere where it has been reported previously. It is still infesting several fields at Bingera, and as it is caused by a fungus the spores of which are wind borne, it should be stamped out as soon as possible by rogueing—otherwise it is liable to become epidemic. It can be distinguished from Mosaic by—

(1) The more definite stripes on the leaves;

(2) The presence of a white downy appearance (fungus mycelium) on the lower leaf surface;

(3) The frequent elongation of the affected stick, and the ribboning of the leaves (this is in the later stage).

Root diseases are prevalent also, especially in the Woongarra in the shape of Peg Leg or Foot Rot, and of Leaf Sheath fungus. *Marasmius sacchari* was observed in fructification on cane on the Burnett Heads road and at Fairymead, and was causing death due to strangulation in both cases. It is considered, however, that the fungus is merely a secondary agent and that the primary cause is soil infertility. In the "Hawaiian Planters' Record," xxvii. 4, p. 259, Dr. H. L. Lyon quotes Dr. Kuyper:—

> "In the great majority of root rot cases an excess of water in the soil is the first cause to think of; in a great many cases, even on light soils a temporary excess of water could be shown as the detrimental element with a fair degree of certainty.
>
> "A factor of decided influence upon the occurrence of the disease is a change in the moisture content of the soil," &c.

W. T. McGeorge, "Hawaiian Planters' Record," vol. xxix. 2, p. 167, states—

> "In our own soils several possible primary chemical physical and bacteriological factors suggest themselves, and all have been found to be definitely associated with soil infertility."

Thus, better drainage, better tilth, and the application of the necessary fertilizer as shown by analysis of the soil, or better by actual trial, seem to be the control measures of this type of disease.

Mention may also be made of slight occurrences of nematodes and of cane-killing weed (Striga) along the road to the Elliott River, but these are of minor importance, as the farmers are already seriously attacking them.

CANE PESTS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (18th May, 1927) of observations for the period April-May, 1927, from Mr. G. Bates, Assistant to the Southern Entomologist of the Bureau:—

Rhyparida Morosa Jac.

This shiny black beetle has been particularly plentiful in canefields during the past few months, more especially in dirty paddocks and fields adjacent to the river banks, but no actual damage has been reported. It belongs to the family Chrysomelidæ, or plant-eating beetles, and sometimes invades canefields in thousands and feeds upon the foliage. It is in the larval stage, however, that serious damage may be caused. The grubs eat the eyes of the set and tunnel up the young shoot, thereby killing the plant. Although widely distributed throughout Queensland, it is only occasionally that serious damage is caused, but in limited localities this pest is capable of playing havoc with young plant cane.

Soil fumigation with either carbon bisulphide or paradichlorobenzene has been recommended against the grubs, and with a view of controlling the adult beetle a series of experiments were carried out to test the relative value of lead arsenate and calcium arsenate as killing agents.

Beetles were collected and caged with the growing plant. The leaves were moistened with water and the poison dusted on. Results show that calcium arsenate kills quicker and gives a relatively higher mortality than lead arsenate, besides being cheaper to apply, as calcium arsenate is about one-third the price of lead arsenate. The following table gives the percentage kill over certain periods:—

Mortality.

	1st Day. Per cent.	2nd Day. Per cent.	3rd Day. Per cent.	4th Day. Per cent.	5th Day Per cent.
Lead arsenate	6	45	50	85	93
Calcium arsenate	20	61	70	86	90

Grubs.

Grubs of a large Dynastid beetle have found plentifully in cane land close to the sea-coast, notably at Elliott Heads. During the early part of March, in a block of spring plant cane, portion was found to harbour from three to seven large grubs per stool. These grubs were then in the third stage and nearly full grown, yet the cane showed no outward signs of grub damage. This block was again inspected two months later (May), and there were still no signs of the cane having received a set-back. I am of opinion that this species, being largely a humus feeder and feeding also on the hard portion of the stool rather than the young roots, will not be responsible for any serious injury to cane. However, it is being bred at the laboratory, and its habits studied, in case it ever warrants control measures. An allied species, *Dasygnathus australis dejeani* Macl., is recorded as a cane pest in North Queensland.

Grasshoppers.—Several species of grasshoppers, including *Locusta australis* Brun., and *Locusta danica* Linn., are numerous just at present on cane headlands, but so far no damage has been recorded. When in swarms these can be controlled by means of poison baits, and the following has given good results:—

> Bran, 25 lb.; Paris green or arsenic, 1 lb.; lemons or oranges, six finely chopped fruits; molasses, 2 quarts; water, 2 gallons.

This mixture is sown broadcast in early morning at the rate of about 10 lb. per acre.

The Christmas Beetle *(Anoplognathus boisduvali* Boisd.)

These beetles were noticed as late as 20th April feeding on a species of Eucalptus. These trees were, however, close to the town, and some little distance away from any cane paddocks. The larvæ, which are of economic importance as a cane pest in North Queensland, are quite common in canefields in this district.

Cane Killing Weed *(Striga* sp.)

This weed made its appearance in two canefields in the Bundaberg district during the last month, but caused very little damage, prompt action being taken by the farmers concerned and the weed destroyed.

The Soldier Fly *(Metaponia rubriceps* Macq*)*.

As reported previously, this insect caused damage to cane in isolated patches at Tantitha this year. On visiting this portion of the district on 1st May it was found that the flies had emerged in large numbers and were to be found clustered thickly over grass and cane leaves. This matter will be dealt with more fully in a subsequent report.

Official Insect Collection.

As mentioned in a previous report a collection of insects associated with cane, together with their parasites and predators, is being collected for reference purposes, This work is steadily going on, and growers are invited to visit the laboratory and become familiar with the various insects with which they may have to contend.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports (27*th April*, 1927):—

The crop for the coming season should be fairly heavy. New varieties which have never previously had a good trial owing to adverse climatic conditions are now proving their value, or otherwise. Several new canes are showing decidedly better than the staple varieties. By staple varieties D. 1135 and 1900 Seedling are principally meant. The following details were noted in the districts visited:—

Booyal.

Cane varieties making a good showing here are Q. 1098, H. 227, N.G. 16, Q. 813, E.K. 1, M. 1900 Seedling, B. 146, H.Q. 285, E.K. 28. New canes growers are advised to try carefully are H. 227 and E.K. 28. The latter is fairly well known and the H. 227 can generally be distinguished by its leaves, which are very erect after the manner of D. 1135. The E.K. 1 is now doing much better than the writer originally thought it would, and is finding a good deal of favour with the growers.

Dallarnil.

Cane here is looking well. Long haulage has, in the past, been against the farmers, but if they get a turn of seasons like the present, the good crops will compensate them for this. Canegrowers here and elsewhere are advised to do as much green manuring as possible, also, if they can, to carry out manurial experiments. It pays to fertilize, provided the correct ingredients are used. Remarks regarding varieties at Booyal apply to this area.

Maryborough.

Cane here is looking well and should harvest a good crop. Varieties making a good showing are H. 227, Q. 813, H.Q. 285, and M. 1900 Seedling. Growers are recommended to be careful in regard to disease, and follow carefully the instructions given by the field officers of the Bureau. H. 227 is making a good showing, both in plant and ratoon. One grower at Melrose has a very good crop of this cane, although as yet on a small scale. E.K. 1 is also beginning to attract the attention of cane farmers here. Growers in this district, as elsewhere, should remember that fallowing is a cardinal principle of farming. It is an operation as old as agriculture. Mosaic law demanded that all farm land must be fallowed once every seven years. It seems we still have lessons to learn from Pharoah's dream and the Book of Moses.

Pialba

This beautiful district has seldom looked better than it does at present. The ground has had a thorough saturation, too much in fact, but nevertheless some fine cane is in evidence. Varieties looking well are H. 227, E.K. 28, Q. 813, N.G. 81, H.Q. 285, M. 1900 Seedling, and D. 1135, also E.K. 1. This is a group of thoroughly good varieties, with the exception, perhaps, of D. 1135, and growers in Southern Queensland should make a note of the fact.

Farmers in this area are very keen on variety experimentation and co-operation with field officers of the Department.

Bauple.

A very good season is promised. Practically all the growers have good crops, some having quite exceptional growths of cane. Excessive rain since Christmas has retarded planting operations. Work at the mill is proceeding smoothly and efficiently, the machinery being overhauled pending a start towards the end of winter.

Growth of cane varieties is worthy of note, however, particularly E.K. 28, Q. 813, H.Q. 77, and E.K. 1. Other varieties doing well are H.Q. 285, D. 1135, H. 227, and M. 1900 Seedling. The writer has noticed from time to time that in relation to variety nomenclature the growers are a little at sea regarding the meaning of the letters. It can be explained that "D" is for Demerara, "B" for Barbados, "H" for Hawaii, "N.G." for New Guinea, "M" for Mauritius, "H.Q." for Hambledon, Queensland, "Q" for Queensland or that group of canes raised by the Queensland Acclimatization Society. The letters "H.Q." were given to a group of seedlings raised by the C.S.R. Company at Hambledon.

Farmers are recommended to be careful of disease, using only plants that have been taken from healthy stools.

The Southern Field Officer, Mr. J. C. Murray reports (17*th May*, 1927):—

Nambour.

The cane in the Nambour district is backward, principally owing to the prolonged dry spell before Christmas and heavy flood rains during the months of January, February, and March. The Maroochy River, for the first time for many years, overflowed its banks and almost covered the cane. In a few cases the cane was actually washed away. Only the legends of the blacks record such a flood before. The effect of this flooding will be beneficial, however, as silt deposits so formed greatly add to the fertility of the soil.

Varieties.

Under this heading will be discussed staple and experimental varieties. By "staple" is meant those canes wherewith the farmers are making a living, and by "experimental" is meant those varieties that are being experimented with. In the Nambour district staple varieties are H.Q. 285, Q. 813, D. 1135, Badila or N.G. 15, and M. 1900 Seedling.

Principal Characteristics.—H.Q. 285: Quick growth, early maturing, good sugar content, low fibre content, fairly disease resistant, wilts from frost, but often recovers rapidly, no standover properties, good milling cane. Early spring planter. Practically all growers should have 15 to 20 per cent. of this cane.

Q. 813.—Mid-season maturer, high c.c.s., low point of resistance to grubs, good striker, resistant to disease infection (apparently), but very susceptible to injury by disease, good milling cane, free trasher. Should be always planted on a well-drained soil and never cut before September nor after December. Taken altogether, a very valuable variety. Introduced to this district about 1918 by the Bureau of Sugar Experiment Stations, and distributed and made known by the Bundaberg Sugar Experiment Station, the writer, and others.

D. 1135.—A cane brought from Demerara about 1895 by Young Bros., of Fairymead. Has been a very good cane, but years of indifferent plant selection have caused deterioration and susceptibility to disease. Healthy cane of this variety would be difficult to obtain in this district at present. D. 1135 has shown some "sports" of high quality in recent years, one known as D. 1135 Sport, a thicker and softer cane than the original, being fairly frequently seen in the Bundaberg area.

Badila.—This cane is a variety that really only grows to perfection in the tropics. It is one of Tryon's collection, having been brought originally from New Guinea by that gentleman. Its appearance and habits are well known. Owing to slow growth in the southern part of the State this cane is not generally recommended in these latitudes. For fully twelve months in the life of a two-year Badila crop the farmers are unable to work down the rows, and the soil in some instances may get in a bad physical condition. This does not apply to the North, however, where Badila can be harvested annually.

M. 1900 Seedling.—This is a well known Queensland staple variety. Grows well on high well-drained soils. Shows no great resistance to pests or diseases. Is a late maturer with a high c.c.s. content. A good milling cane, and any farmer who has volcanic soil of average fertility could profitably grow it. Shows a fair point of resistance to drought and frosts.

Experimental varieties are H. 227, Q. 1098, E.K. 28, E.K. 1, H.Q. 77, Q. 970.

Characteristics.—H. 227: This variety was brought from Hawaii some years ago and is now showing considerable promise when it has been given a fair trial. According to figures H. 227 is extensively grown in the Hawaiian Islands. Its erect growth enables the grower to plant more closely than usual, and the big stools hold the ground tenaciously. Farmers are requested to persist with this cane and should remember that it takes a number of years to fairly try a new variety.

Q. 1098.—This is a very good cane in general. It thrives well on alluvial soils. In colour like Q. 813; the leaves are not so plentiful, are a darker green, and more erect. Growers should keep this cane in mind and try it on their farms.

E.K. 1 and E.K. 28.—Both these varieties are excellent canes and by no means should they be discarded, except upon special advice. The c.c.s. content of each is high and both are weighty luxuriant growers, given a fair season. These two varieties are fairly well known to the farmer so that there is no need for a detailed description.

H.Q. 77.—This is a heavy cane of high sugar content, but not a prolific stooler. Grows well on almost any type of cane land and is more and more coming into favour. Further particulars of this or any other variety could be obtained by getting in touch with the writer, care of Bundaberg Sugar Experiment Station.

Q. 970.—This is another of the group of ''Q'' seedlings. A good ratooning cane. Q. 970, though not particularly resistant to disease, is nevertheless a cane every grower should try. Do not place on a headland and leave to the tender mercy of the weeds and insects, but give a good trial under typical conditions.

Soil and Drainage.

No soil, no matter how rich, is of the least value unless effectively drained. Growers in this district recognise that fact, and, collectively, have spent thousands of pounds on drainage. To improve the soil after drainage lime could be used. Growers who have used lime on soils such as these dense river deposits say they have had excellent results. The land in such cases is referred to as sour and can best be made fertile by lime.

Diseases.

There is nothing fresh to comment upon since last visiting this district. The Mosaic disease can be controlled by plant selection, and the gum epidemic of the year before last has this year lost its virulence. The growers are advised to be unceasingly careful in plant selection.

Mr. E. H. Osborn, Central District Field Assistant, reports (29*th April*, 1927):—

HOME HILL.

When last inspected in November, the country was under extreme drought conditions, the cane only being kept alive by the gradually diminishing underground water supply, whilst all other vegetation was dying out rapidly. Now, however, thanks to the rains of January and February, the whole country looks beautifully green, with the creeks and lagoons carrying plentiful supplies of water. Crop prospects are very fair, considering what a bad year 1926 had been for the Burdekin growers. The early planted cane ranged from good to medium, but the late planted crops were only medium, except in odd places.

The ratoons would only be classed as ordinary except in a few odd cases where fertilizers had been used.

Cultivation.

Much activity was evident everywhere. All makes of tractors were well represented, and as the weather was hot and muggy their work was much appreciated, apart from their usefulness for pumping purposes.

Varieties.

Badila (N.G. 15), B. 208, Clark's Seedling (H.Q. 426), M. 1900, Goru, Q. 813, H.Q. 285, and E.K. 28 are the principal canes grown, the first three being in most favour.

Badila is one of the very best, but in odd places suffers from Top Rot. B. 208 gives extremely high density returns, but will not stand a check in growth, and is also very liable to disease. H.Q. 426 upon medium to poor land is an excellent cane, but seems to be rather slipping back in yield. E.K. 28 is becoming very popular and some beautiful stands of same were seen, one block planted as late as September looking a picture. To show its popularity it was noticed growing in twelve farms amongst twenty-four visited in one week, and in nearly every case it looked ahead of the other canes.

Wherever the writer discussed the cane, emphasis was laid upon the fact that so far the best returns from the variety are expected to be obtained on medium to poor land. Q. 813 should also pay upon the poorer soils.

Diseases and Pests.

Top Rot in N.G. 15, B. 208, M. 1900, N.G. 24 B (Green Goru), and Q. 813 was scattered throughout the area, but in isolated patches.

White ants were noticed in odd stools near headlands or adjoining dead timber. In such cases poisoning with arsenic, caustic soda, and molasses mixture would benefit.

AYR.

Activities here were confined principally to the Pioneer area, the greatest portion of which was inspected in company with the Cane Inspector (Mr. C. Wynter).

Conditions on this side were about the same as upon the Home Hill side, but the January flood had certainly done more damage, for besides small patches of flooded cane, fences and fluming had been carried away in odd places. Here also the soil was in a caked condition after such flooding, rendering cultivation very difficult, but subsequent rains enabled ploughing operations to be carried on again. Before the rains a certain amount of first ploughing had been carried out, with the result that there are now some splendid crops of green stuff to plough under. Where the second ploughing has been done the soil is breaking up beautifully.

Present indications are that the planting for 1928 will be very large on the Burdekin. Crops are from good to medium. The early plant is rather below the generally high standard of the Burdekin, while the later planted crops suffered so much from dry conditions that they are certainly upon the light side, very poor stooling being noticeable, and quite a number of such crops will cut in the vicinity of only 10 or 12 tons per acre. The ratoons in general were also light, with the exception of a few crops that had been fertilized with ammonia or soda; they stood out on their own in every case.

Varieties.

These are practically similar to those upon the Home Hill side, with the possible exception that there is probably more Pompey (7 R. 428) upon the northern side of the river, and principally grown upon the Kalamia Estate, where a high tonnage with a medium density is claimed. Of the canes growing throughout the area E.K. 28 has increased greatly in favour, and nearly three-fourths of the growers seem to have from a small plot to a decent-sized paddock. One of the most characteristic blocks seen was at Mr. J. Murphy's Airdmillan farm. This is an 18-acre block upon medium forest land, planted in July and grown entirely without water, which should cut between 32 and 35 tons per acre, and is a marked contrast to some B. 208 planted in same paddock at same time.

Another splendid block was seen at Klondike (September plant), which was easily ahead of any other late planted cane.

Green Manuring.

Green manure is only used to a limited extent in the area for, unless favourable weather is experienced at sowing time, watering is necessary. About the largest user is the Kalamia Estate, which has steadily gone in for it during the past few years, with the result that its benefits are plainly seen in all cane to harvest this year, whether plant, first, or second ratoon.

The ratoons N.G. 15, 7 R. 428, and H.Q. 426 were also fertilized with nitrate of soda and have made into a fine crop. For this season some 123 acres have had peas or beans ploughed in, with a further 63 acres to be planted in 1928; so evidently the Kalamia management are satisfied with regard to its benefits.

Diseases.

Top Rot in N.G. 15 and M. 1900 was scattered about, but in genral not as bad as other years. One or two farms at McDesme and Klondike were very bad in odd patches, as was another farm at Airdmillan. Sooty Fungus was noticed in H.Q. 426 at both sides of the river. Leaf Stripe was noticed in nearly all the paddocks where B. 208 was growing, in odd stools in many paddocks, but in others the cane was very heavily diseased. In several places the disease was very bad, where the owners of such farms had been repeatedly advised of the danger of still continuing to plant such a cane, without, at all events, trying to get clean seed from elsewhere. From the number of paddocks carrying Leaf Stripe this year, the disease is rapidly spreading, and growers are again cautioned against trusting too much to such a cane. Mosaic was noticed in H.Q. 426 in an Airdale farm within 200 yards of where the writer first found it about two years ago, but only to a limited extent.

GIRU.

Only a very brief visit was possible here, the outstanding feature of the area being the wonderful improvement in the crops since my last visit in November. The prospects were then very cloudy, but at present it seems probable that, including the Ingham Line, some 60,000 tons of cane will be harvested.

As on the Burdekin, some of the best cane seen was two paddocks of May plant E.K. 28 carrying good stools and fair length of cane.

Some very good third and fourth ratoons N.G. 15 and H.Q. 426 were also noticed upon a river farm, which should make into a very nice crop.

The Central Field Officer, Mr. E. H. Osborn, reports (20*th May*, 1927):—

MACKAY.

North Eton.

Since my last visit early in the year a great change has come over this particular area, the rain having completely altered the doubtful outlook to quite a promising one. Present indications point to a crop of somewhere in the vicinity of 60,000 tons, including, of course, the Oakenden cane.

The tramline is well under way and should be in order for the crushing. Grass and weeds were naturally very much in evidence, the headlands especially being overgrown. Everywhere ploughing operations were being carried out, and some planting.

Through the courtesy of the Queensland Producers' Association, who very kindly provided the means, I was enabled to visit some twenty-two farms, principally in connection with disease detection, with the following results:—

District.	Farms visited.	Carrying Mosaic.
Barrie	8	2
North Eton	8	4
Brightley	6	2
Totals	22	8

Mosaic was found in the following varieties:—

E.K. 28 plant—light, in 1 farm.

D. 1135 plant—light, in 1 farm.

M. 1900 plant—light, in 2 farms.

Malagache plant—light, in 2 farms.

Innis plant—light, in 1 farm.

Badila ratoons—badly, in 1 farm.

Pompey (7 R. 428) plant—light, in 1 farm.

Pompey (7 R. 428) ratoons—badly, in 2 farms.

In the course of a subsequent meeting at Eton, stalks showing Mosaic were shown to interested growers, and means for eradication outlined. It was very gratifying to notice the interest taken by growers in matters pertaining to diseases.

Mount Martin.

A large proportion of this area is practically new, for I understand that it is only about four years ago that cane replaced cattle hereabouts. In the area heavy dark soils predominate, parts of which would be benefited by the use of lime as a means of sweetening the soil and making it more friable; lower lying portions now carrying dense masses of grass could be profitably put under cane after draining.

Canes showing up well here are M. 1900, Q. 813, H.Q. 426, E.K. 28, Badila (N.G. 15), and Malagache, some very good crops of each being noticed, and ratoons of Badila (N.G. 15) were looking particularly well.

Diseases and Pests.—Mosaic, seemingly the chief disease in these areas, was found in three farms—*i.e.*, in one farm in N.G. 38 ratoons, light; one farm in M. 1900 plant, light; one farm in H.Q. 426 (Clark's Seedling) plant, to a very much larger extent. Disease symptoms were well recognised, and much local interest taken in control measures advocated.

Grubs were observed to be very active in a corner of a paddock of N.G. 15, and may probably show up more in the near future. Borers, too, were noticed in odd stools of Q. 813 and H.Q. 426 adjoining headlands, but not to any appreciable extent.

Kungurrie.

Some exceptionally nice cane was noticed between here and Dow's Creek, more especially at the Kungurrie end of the railway. The soil varies to a great extent from rich dark volcanic soil on the foothills and hillsides to a dark stiff alluvial and a greyish forest soil. On the volcanic soil some splendid cane was noticed, some Badila and M. 1900 first ratoons showing very fine growth. Nearby very good N.G. 15 plant looked very well. On poorer classes of soils Q. 813 was seen to be ratooning very well, especially when one remembers what a bad year 1926 was.

Pompey (7 R. 428) was also cropping well and is credited with good density upon certain classes of soil, but is so patchy that growers are chary of planting more than a small area. Q. 970 looked well, both in plant and ratoons. It is said to mature about a month later than Q. 813, but seems to give better ratoons than Q. 813.

Particular attention to disease was given, but out of nineteen farms visited Mosaic was seen in M. 87 on only one, and to a very slight extent there; local growers were advised not to get seed from any other area unless absolutely convinced that it was clean.

Pests.—Grubs were noticed on some half dozen farms, principally at the Kungurrie end, in one case doing very heavy damage, nearly every variety of cane suffering. Borers were also seen to be doing minor damage in several places, generally adjoining headlands. While in the area the writer was surprised at the quality of the citrus fruits growing, beautiful orange and mandarin trees being much admired. The hill slopes with their rich and slightly stony soils should be good for banana growing; also from a scenic and climatic point of view Kungurrie is amongst one of the most favoured spots that the writer has visited in the Mackay area.

Mirani.

This centre looked very well, the crops presenting a healthy appearance and showing in most places a very even growth. Active farm operations were noted upon all sides. Tractors and horse-drawn ploughs were working full time everywhere.

Generally, the ground was in fair order, and a certain amount of planting had already been carried out, for most growers are trying to plant up before crushing operations take up all their time.

Of cane varieties Q. 813, M. 1900, and H.Q. 426 (Clark's Seedling) are the most popular, with the first-named easily the favourite.

Only a small quantity of E.K. 28 was noticed, but in each case it compared very well with other varieties as far as growth was concerned. One very fine crop of Pompey (7 R. 428) plant was showing splendid stools of heavy cane looking very healthy. Near Marian a block of B. 208 had stooled out well, but had not made extra good growth.

Diseases.—Some nine farms were inspected, of which only one was showing Mosaic. This farm, a particularly well worked one, was showing the disease very badly in plant H.Q. 426 in two separate paddocks. Mosaic markings were even noticed on some young H.Q. 426 plants, maybe two months old.

The owner was fully advised of the danger to his crop and also to neighbouring ones, and strongly advised not to plant any more land with this seed, for such cane now being used for plants shows up Mosaic to quite a large extent. He has no Q. 813 on his own farm, but was strongly advised to purchase some from nearby areas.

The Northern Field Assistant, Mr. A. P. Gibson, reports (22nd *April*, 1927):—

TULLY DISTRICT.

Tully had a phenomenal fall of rain the first two months of the year, 52.26 inches being recorded in three days; such a deluge occasioned widespread flooding, great alarm, and destruction. The mill floor was inundated to a depth of 11 inches, and the railway station yard by 7 feet. Had the town been built adjacent to the station where it was desired by many, loss of life and much destruction obviously would have resulted.

Rainfall—January, 34.58; February, 65.65; total, 100.23 inches.

Five thousand eight hundred acres were harvested last year for the Tully mill and yielded 131,715 tons; to this total must be added the amount crushed from South Johnstone area, viz., 16,291 tons, making a total of 148,006 tons. The greatest tonnage of cane crushed in any one week of forty-four hours was 7,289 tons.

The town and its surrounding cane fields continue to develop. More scrub has been felled and further areas planted to cane. For some months past clearing operations have been made difficult and costly owing to the prevailing wetness which has prevented the fallen timber drying, and promoted undesirable vine and undergrowth, the former quickly over-running the lying, tangled mass, and preventing a satisfactory burn. Fortunately, most of the timber is suitable for mill firewood, and when cut into desired lengths is removed from field to factory by portable trams and trucks. The money received for this fall assists materially in meeting the very heavy clearing costs.

The Crop.

Some dry weather has followed the wet, and this most welcome sunshine has already proved of untold benefit to the industry in general. The crop for the greater part consists of N.G. 15 (Badila); interplanted among this kind in parts are stools of H.Q. 426, which in growth is really outstanding, being fully 2 feet in advance of the surrounding cane. Generally, the entire crop possessed a fine healthy colour and was making wonderful progress. It had apparently suffered little by wind, and to a very much lesser degree by water than generally expected. The maximum amount of damage was noted on the somewhat alternating lands of the Lower Tully; here several great riverside basins held the water for many days, hence the increased destruction. Consideration in the near future should be devoted to the draining of such cavities. Fine patches of N.G. 15 (Badila) plant were observed throughout the area, possibly running in the vicinity of 50 tons per acre; such weighty crops it may be said are too far advanced at this time of the year, for during the wet and windy weather the root anchorage is found insufficient to keep the weighty crop standing. Recumbent canes generally shoot and produce aerial roots and become damaged by scalding brought about by the action of rain and sunshine.

Planting.

The time of planting, variety, condition of land, and season, of course, have a decided bearing on the progress or otherwise of a crop. It is, however, wise to plant in these parts immediately after the area is freed of its encumbrances. Insufficient attention is devoted to the mode of planting; too close planting in loggy or unploughable virgin land seems a mistake. The stubble is expected to produce for many years prior to renewing, therefore stool expansion room is desired, otherwise grass-like stems may result. Five feet between the drills, with seed interspaces ranging from 2 feet 6 inches to 3 feet should give satisfaction.

Cane harvested during November and December last year had grown astonishingly; 8,500 acres probably will be harvested this season. At present this area looks surprisingly well and is estimated to yield 180,000 tons.

Pests and Diseases.

Leaf hoppers are more numerous here than elsewhere. It is highly possible that fewer of its parasites are present. Leaf Scald was not largely noticed this inspection, although known to be very prevalent in parts. It is known that fields which appear healthy early in the year are likely to be severely affected later in the season. Top Rot was considered severe in some of the Lower Tully River Farms, one or two canes in many stools had died from the effects; chocolate to red leaf streaks were abundantly found. Much Leaf Sheath Fungus was noticed; this is one which occasions the binding of leaf sheath to stem.

The mill overhaul work is being carried on. Much of the sand ballast along the mill railroads had been removed by the flood water. The farmers intend building about 1½ mile of 2-feet line, commencing at a point adjacent to Mr. Allison's farm and extending to Birkalla. When this is completed it will bring forward the harvested cane on the small trucks in preference to the big.

INNISFAIL DISTRICT.

Temperatures for the month, generally, were very warm and muggy with an unusually low rainfall up to the 27th, when rainy conditions set in and the month's total was greatly raised.

Rainfall for March, 20.8 inches; total for year, 82.81 inches.

Rainfall at Experiment Station, 18.42 inches; total for the year, 81 inches.

A more hopeful view is now taken of the coming seasonal crop. Last month's storm retarded the crop growth fully three to four weeks. This month the prevailing weather conditions have been marvellously suitable, and in consequence the foliage and root damage occasioned has speedily made good and the great probability of the seasonal tonnage eclipsing that of last year now seems assured.

Flooded Cane.

Most tops have rolled off the more severely damaged flooded cane, stems have sprouted badly, and Army worms are now destroying the leaves. The Goondi crop obviously had suffered to a greater extent from wind and water than did its neighbouring mill areas, due to the fact that it possesses more land subject to flooding and a higher percentage of Pompey (7 R 428), a somewhat brittle and faster growing variety. About 5 acres of cane on a riverside farm at Daradgee were deeply and completely covered by flood debris and the root crop mostly ruined. Removing this encumbrance will entail much work. Badila growers are a bit concerned over the abnormal sprouting of stems, which doubtless must have an ill effect on the crop if continued. This condition is more pronounced where the stems are directly exposed to sunlight. It is highly possible that this has been occasioned by the temporary non-functioning of tops, for it is known that when a top is damaged, shooting immediately follows.

Leguminous Crops.

It is pleasing to note that the area planted to cover crops is on the increase. The torrential February rains had considerably damaged many very promising crops. The favourable weather conditions of this month, fortunately, had permitted its recovery. Rice bean or Jerusalem pea is fast becoming a favourite. It possesses many excellent qualifications; the spreading of this has been curtailed owing to the inadequate supply of seed.

Cultivation.

Interspace cultivation has hardly been possible this month owing to the tangled and advanced nature of the crop, therefore field operations have been mainly confined to the ploughing in of cover crops, the preparation of land prior to planting, and headland cleaning.

Grubs.

At Daradgee the ever-spreading brown patches among the green indicate those parts infected; these patches are more pronounced on the hillside farms near the standing scrub. Upward of fourteen grubs were found under upturned stools; these were of two distinct sizes, therefore suggesting the probability of two beetle flights. The destruction, however, is small compared to that of last season. The weevil-borer has not been very active this year so far. It is generally thought that the season has been favourable for the breeding of its parasite and less favourable for the pest. Tachinid flies have been abundantly found on the northern side of the

North Johnstone River, such a beneficial increase, it is considered, is due principally to the greater percentage of standover cane usually left in these parts. Leaf Scald noted, more or less, throughout the area, and a malady killing the lesser cane shoots in parts and known as the Banded Sclerotial Leaf disease.

MOURILYAN.

The crop destruction is considered much less now than first expected. About 98 per cent. of the crop is N.G. 15. This was looking well and growing vigorously. Liverpool Creek had reported a record flood, and in consequence the crop there had suffered. Grubs were found damaging young can in four fields at the beginning of February. Leaf Scald showing up strongly in H.Q. 426 and Goru family of canes. A block of Badila near Liverpool Creek was considered dangerously affected, and the following precautions were recommended:—

(1) Not to use cane from this field for seed;
(2) Sterilize well the used knives after cutting the area;
(3) When cut, immediately plough out and plant to beans, and make sure the old stubble is killed before replanting with cane.

Real leaf rust was located on the leaves of Goru.

A very small percentage of flooded cane showing dead heart had recovered. In such instances the heart arrow, not the growing point, had been injured. When the growth was resumed the decomposed heart was slowly forced out and a new but temporary deformed top resulted. On the present face of things it would appear that crushing operations may not commence as early as desired. The following are the individual district mill crushings of last year, and that approximately estimated for this:—

	1926.	1927.
Tully	148,006	.. 180,000
Goondi	170,006	.. 153,000
Mourilyan	135,473	.. 160,000
South Johnstone	165,927	.. 207,000

El Arish and Jaffa.

Forward patches of cane were observed. The progress of the crop harvested after Christmas was not to be compared with that completed before. Generally, the crop seemed further advanced than last year. Further small areas had been cleared and planted. Badly diseased paddocks have been ratooned when they should have been ploughed out. Better crops would result by renewing some of the too old stubbles. Standover cane was found recumbent, sunburnt, shooting, and slightly rat eaten.

Leaf Scald is still very prevalent in parts.

Big moth borer was responsible for dead hearts in ratoons, especially among cane in the dirty and wet places. On the 22nd, 23rd, and 24th March innumerable very fast-flying dark-brown moths were noted travelling northward the whole day long. The body of this moth was black encircled by six creamy bands.

The Northern Field Assistant, Mr. A. P. Gibson, reports (9th May, 1927):—

INNISFAIL.

Innisfail is a wonderfuly rich and picturesque cane-producing district, possessing great possibilities. It is the home of four of Queensland's greatest mills. South Johnstone Mill had its maiden run in 1916; it has been controlled by the Government since its inception and has milled 1,395,354 tons of cane since that year. The annual crushings are as follow:—

Year.	Cane Crushed. Tons.	
1916	56,205	
1917	81,584	
1918	47,106	(Reduction due to cyclone)
1919	86,554	
1920	126,017	
1921	120,686	
1922	107,897	
1923	173,862	
1924	232,257	(Sent to Goru .. .. 12,262 tons)
1925	197,744	(Sent to Tully .. .. 19,469 tons)
1926	165,442	(Sent to Tully .. .. 16,291 tons)
11 years Total ..	1,395,354	(Sent to other mills .. 48,022 tons)

Recently the management of the South Johnstone Mill was offered to its suppliers on certain conditions. The growers from the outset unanimously agreed to accept such conditions. A farmers' directorate and a staff to manage same has been appointed, and they were to take over on the first day of May.

An efficiently balanced mill can only economically grind a given cane tonnage per hour. This, of course, is more or less influenced by the variety and its fresh or stale condition. Therefore it is highly desirable to have harvested cane milled as soon as possible. Too much cane (the result of unrestricted planting combined with the injudicious practice of ploughing out and immediately replanting) has, at times, occasioned friction and probable losses to producer and manufacturer. It is computed that 10,347 acres of cane will be harvested this year, particulars of which are as follows:—

Standover	719	acres.
Plant cane	2,756	,,
First ratoon	1,888	,,
Second ratoon	1,610	,,
Other ratoons	3,374	,,
	10,347	acres.

(This does not include unpermitted cane.)

The seasonal average cane tonnage per acre may be put down at 20 tons; this being so, some 9,000 acres annually harvested should yield enough cane to keep this factory profitably engaged.

Weather.

Copious rains were experienced the first two weeks, after which the rainfall was somewhat scanty.

Rainfall, Innisfail.—January, 17.01 inches; February, 45.42; March, 20.08; April to 28th, 11.86; total, 94.37 inches.

The Crop.

The 1927 crop is estimated at 207,000 tons. This is composed mainly of N.G. 15 (Badila) and isolated patches of H.Q. 426, which was growing vigorously and like its neighbouring areas presented a fine appearance. Generally, it had been little harmed by wind or water, and so far to a lesser degree than usual by pests. Flooded cane patches had been left to take their chance.

The make-up and physical character of our cane soils differ very much, consequently it is obviously impossible without analysis or some accurate knowledge to form a definite opinion as to what manure to profitably apply. There is a general deficiency of vegetable matter, more especially in our volcanic red and coarser granite soils. This apparent deficiency upsets the soil balance, and, besides reducing its fruitfulness has the tendency of increasing destruction by grubs, for it seems the larvæ have found the cane roots more palatable than their native food. This waning matter may be restored by the ploughing in of cane trash or preferably one of the several popular leguminous crops raised. It is difficult to convince our growers of the great all-round benefit to be derived from this practice.

Manuring.

Molasses, although costly to apply, would, I think, be of untold benefit, especially on the volcanic red soils.

Mode of application—

(1) Plough medium depth drills with 5 feet interspaces.

(2) Place suitable tank on a dray having two taps and outlets, regulated to directly empty into drills on either side of the dray as it proceeds steadily along (for distant fields, rail and tank trucks might be found to apply the waste product cheaper).

(3) After a short time level by harrow, and cross plough, so as to thoroughly mix with the soil.

The following is rather interesting, and one of many convincing molasses experiments conducted on a 35-acre red soil patch on a Bundaberg plantation:—

Fifteen acres had a dressing of 5½ tons waste molasses per acre; cost of application 5s. per ton, approximately 27s. 6d. per acre. A prolific crop of maize was raised and ploughed in. Crop produced 57 tons cane per acre, c.c.s. 12.01 per cent., value then 27s. 11d. equals £79 11s. 3d. per acre.

Ten acres—No molasses; previously grub infested; two indifferent maize crops ploughed in. Cane produced 39.6 tons per acre, c.c.s. 13.26 per cent., value then 32s. 4d. equals £64 0s. 4d. per acre.

Both areas planted same time; both areas received 3½ cwt. per acre of "777" fertilizer.

The 15 acres were harvested about two weeks prior to the 10 acres. The c.c.s. it will be seen was higher where molasses was not applied. Nevertheless results show marked increase in cane tonnage from molasses—17.4 tons, nearly 47 per cent., value £15 10s. 11d. per acre.

Sulphate of ammonia: 160 lb. of this had been applied to some of the more backward cane fields this month. Some acres of maize were sandwiched among the cane, the seed of which had germinated favourably, but overmuch rain had badly stunted its growth. Mosaic disease was plentiful in this crop. Maize perishes earlier than does cane, and being similar we are told that the corn aphis (considered to be a virus carrier of this complaint) moves to adjacent fields, hence one of the reasons given for its spreading.

Leguminous crops were being ploughed in. The rice bean was heavy in flower and should yield seed enough to plant a big area for 1928. Innumerable, active, medium-sized banded flies having a high pitched note when on the wing were noted among its vegetation, probably parasitic to some of its pests.

At Japoon a rather light scrub was being felled, logged, burned, holed by mattock, and planted for £20 per acre.

Most mill locomotives are busy hauling in the seasonal fuel requirements; this is becoming more costly and difficult to procure. Although the 1926 season was a big one, a large stock of unburnt wood remained. Better and more economical work in the factories has very considerably reduced the amount of fuel required to manufacture 1 ton of sugar, thus cheapening the cost of production. Growers and would-be growers at Silkwood and Liverpool Creek are discussing the need of another mill. The time, however, is not opportune; when it is, better business perhaps would result by enlarging the South Johnstone factory, thus treating the extra tonnage under the one roof.

The wonderfully interesting "sensitive plant," with its gaudy purple-headed flower, is spreading rapidly in the enclosed area, but controlled by the stock on the roads.

BABINDA.

Wet weather was encountered here, consequently my duties were greatly hampered. The increased price paid for cane has strengthened the position of the farmers, and at present many tractors are being bought. The 1926 crop was a great all-round success, finishing with 5,130 tons better than estimated. 195,130 tons of cane were crushed from 9,325 acres; 2,084 tons of this total were unpermitted. The general mill average was exceptionally good, being 14.2 c.c.s. 300 acres of cane were not sufficiently advanced to cut at the season's end, consequently was left to carry over.

The 1927 crop had not been seriously damaged by wind, water, or pests, therefore the present prospect is again distinctly encouraging. Some 9,500 acres to cut is forecasted to yield 190,000 tons. The whole area at the beginning of the month had been well soaked, consequently cultural activities were suspended for a time. The valued filter-press cake was being trucked to the various farms and deposited by the road side; it is unfortunate that paddocks are unprepared to immediately receive the manure, thus saving extra handling costs and losses by leaching.

Cultivation.

It is not too much to emphasise the more thorough preparation of land prior to planting, and the need of an improved drainage system; this is of great benefit to subsequent crops. Alluvial and likewise local district volcanic soils possess isolated small unfruitful patches among the surrounding good. One of the several things mentioned below may occasion this:—

(1) An impervious subsoil at a shallow depth or a deficiency of plant food or foods.

(2) A severe, local, slow, underground fire where a stump has been baked out, thus destroying humus and probably nitrifying bacteria.

(3) Toxic theory, where the roots of a previously growing plant have ejected a something in the soil detrimental to subsequent growing crops. Analyses made of the bad and surrounding good soils should aid us in determining what is required.

Pests and Diseases.

Grubs, weevil, and bud moth borers—the former two mentioned present really a serious problem, and at all times call for most urgent action. Grubs have been more or less active since February; the time is fast approaching when they will go down in the soil to hibernate, consequently their destruction is waning. The severest losses have occurred in the vicinity of Daradgee, Japoon, Eight-mile, Harvey Creek, Bellenden Ker, and Q.N. Bank Estate, adjacent to the Russell River. The larva could not be found in several of the grub-damaged patches that were examined. Termites (white ants) were found devouring the grub-damaged stubble at Daradgee.

Weevil borer not very active so far; it is evident they are becoming so. Bud moth borers were seriously damaging the eyes of cane.

Diseases.—Leaf Scald widespread; Banded Sclerotial Disease on leaf and sheath. The fungus responsible for the former is less operative; this is generally more acute in wet periods. The latter sheath fungus mentioned binds the sheath to stem and commonly is responsible for what is known as spindle or needle top. Bleached erratic markings surrounded by red on young leaves, probably due to a fungus interfering with the chlorophyll. The writer noted a similar complaint on the leaf blades of the Russell River couch grass. Fast flying brown moths mentioned in my Jaffa notes were plentifully found at South Johnstone on the lantana flowers.

Farmers at Bartle Frere declared that lightning had killed small patches of cane; such destruction was grub-like.

Babinda has been operating for the past twelve years and has crushed 1,690,267 tons of cane.

Weather and Crops.

Rainfall: Babinda.—January, 21.39 inches; February, 53.69; March, 18.88; to 12th April, 23.05; total, 117.01 inches.

1927 prospects at Innisfail and Babinda continue to look bright. Most fields especially the plant is progressing favourably. Some ratoons are shabby and growth disappointing.

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On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

THE SAN JOSÉ SCALE

(*Aspidiotus perniciosus* Comstock).

By HUBERT JARVIS, Entomological Branch.

The San José Scale was first noticed at San José, California, in 1873, and on its discovery in the surrounding districts it became known as the San José Scale although its original home is probably China. It is believed that it was first introduced into Australia on nursery stock in 1894. Since that date its spread has been rapid, and it is now present wherever deciduous fruit trees are grown throughout the Commonwealth of Australia.

Host Plants.

The San José Scale has been found on nearly all deciduous fruit trees such as apple, pear, plum, peach, and cherry, and, in addition, it is known to attack a very large number of other cultivated trees and shrubs, over 100 different species being recorded as host plants of this destructive scale. In the Stanthorpe district the English hawthorn is one well-known host plant of the San José Scale, and doubtless there are others, such as the willow, poplar, elm, and osage orange, which are all growing in the district, and on all of which this scale has been found in other countries.

Appearance of Injury.

In the early stages of infestation the San José Scale is extremely difficult to detect on the old wood of most deciduous fruit trees, but on the fruit, young wood, and leaves (Figs. 8. 9. and 10) the scales are conspicuous as brown specks, surrounded by a pink discoloration, which forms a ring around the scale. This is particularly noticeable on the fruit (Fig. 8). As infestation increases the bark of the tree assumes a roughened appearance, the patches of scale appearing darker in colour than the healthy wood. When badly infested by this destructive insect the whole tree appears as if covered with a brownish-grey scurf; this scurf, when viewed through a hand lens, will be seen to be composed of countless numbers of minute scales which, when rubbed with the finger, will exude a yellow oily fluid.

On badly infested trees, usually a branch here and there will die first, and finally the whole tree perishes; it is possible for the scale if left unchecked to kill a tree in three seasons.

On peach and plum trees the scale may be looked for on any portion of the trunk or branches; on the apple, pear, and cherry, however, it is more often met with on the younger wood and fruit, and sometimes on the leaves.

Life History.

A large number of the adult scale insects perish during the winter, as do also many of those half and quarter grown, but an ample supply of immature scales survive to start an infestation in the spring, when, as soon as the sap begins to rise, the insects become active and grow rapidly.

The female scales (Fig. 6) which are more numerous than the males are circular in outline, convex in shape, and have a nipple-like boss or prominence at the apex of the scale. They are greyish-brown in colour, and in general shape not unlike a minute tent. The female scale, when full grown, is about one-twelfth of an inch in diameter (about as big as a pin's head). The male scale (Fig. 7) is more elongated than the female, its width being usually about half the diameter of the female scale, and its length twice as great as its own width.

The scale insect proper develops underneath the scale. The female is a curious, legless, segmented, yellow insect (Fig. 5), somewhat circular in form; she never leaves the protection of the scale. When mature, she gives birth to living young which crawl from under the scale and swarm over the branches of the host tree. Each scale insect is furnished with a hair-like sucker or beak, which it inserts into the tissue of the host plant, thereby sucking up the sap and speedily weakening the tree.

The sexually mature male is a tiny two-winged insect (Fig. 2) just visible to the naked eye. The first hatching of males usually takes place in the early spring.

The newly-born scale insects are just visible to the naked eye as tiny yellow specks, and they may often be observed crawling actively over the branches of the host tree. They move about freely for a few hours; they then settle and become stationery and legless, inserting their hair-like sucker into the tissue and quickly secreting the waxy scale which soon completely covers them.

In about a month after birth the mature male insects emerge and mate with the females, which in about another two weeks give birth to young. The life cycle of the female scale is, approximately, from five to six weeks, and several generations are possible during one season. The rate of increase is very great, each female being able to produce about 400 young. The rapidity with which this pernicious insect can increase will thus be easily realised, and also the need for prompt control measures on its discovery.

Distribution.

San José Scale may be carried from one orchard to another in various ways. Birds alighting on an infested tree, when the young scales are active, undoubtedly carry the insects on their feet from one orchard or district to another. The same possibility applies to tree-frequenting insects such as flies, green grasshoppers, beetles, &c. It is also possible for the young scales to be carried by strong winds or on the clothing of any person brushing against a scale-infested tree.

Another source of distribution is the importation of nursery stock, scions, grafting material, &c. The danger of this should be fully realised, and all such material should be fumigated prior to its being sent out, and immediately on its reception.

Natural Enemies.

As natural enemies of the San José Scale, two species of ladybird beetles are of importance, and wage unceasing war against the scale. The species referred to are *Orcus australasiæ* and *Rhizobius* sp. The first beetle mentioned is about one-eighth of an inch in length and nearly as broad, steel blue in colour, and marked with six small orange spots on the wing covers.

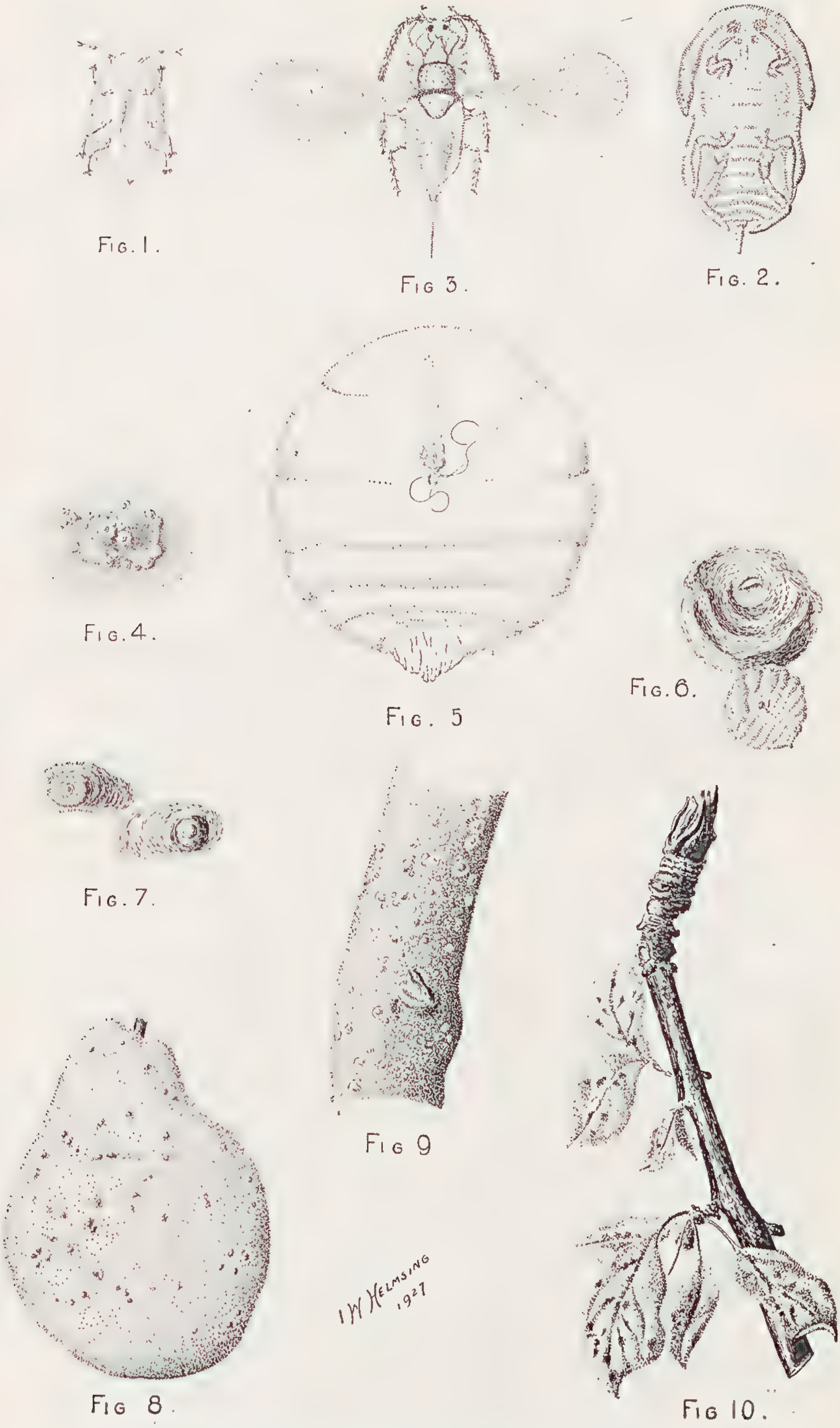


PLATE 123.—THE SAN JOSÉ SCALE (*Aspidiotus perniciosus* Comstock).
(*For Description of Plate, see page 517.*)

The *Rhizobius* beetle is not much more than one thirty-second of an inch in length, rounded in shape, and of a greyish colour, marked with two reddish spots, one on each wing cover. Both the larvæ and adults of these two beetles greedily devour the San José Scale, and when numerous must act as a considerable check to its increase.

The larvæ of a small Tineid moth also prey on the San José Scale in the Stanthorpe district, and in certain seasons it becomes a predator of importance. The caterpillar when full grown is about three-eighths of an inch in length; it is slender in form and very active, and lives entirely on the scale which it covers in with a fine web under which the caterpillar works. The moth, *Batrachedra* sp., measures about three-eighths of an inch in length across the expanded wings. It is of a uniform greyish-yellow colour, with its hind wings beautifully fringed at the edges.

A minute parasitic wasp is also known to attack the San José Scale in Queensland, and this parasite was bred in numbers from the scale in the Stanthorpe district. This wasp has been identified as *Coccophagus clariscutellum* Girault.

Yet another check to the increase of San José Scale is the parasitic fungus *Sphærostilbe coccophila.* This fungus is recorded as destroying both San José and other scales of the same genus in different parts of the world.

Some of our small birds, although acting as carriers of the scale, also play some part in its control, an examination of the stomach contents of certain species having invariably revealed scale insect tests. These birds have often been observed, both by the writer and also by fruit-growers, on scale-infested trees feeding on the scale. The species more particularly alluded to are the brown tit warbler, *Acanthiza pusilla,* and the short-billed tree tit, *Smircornis brevirostris.*

Control Measures.

When a tree is heavily encrusted with San José Scale and is in a seriously weakened condition, it is far better to dig it out and burn it than to apply any spray, but when a tree is only partially infested San José Scale can be effectively controlled. The best sprays to use against this scale are either miscible oils or lime sulphur; both are effective if properly prepared and used.

Oil sprays are easy to mix and apply, and are cheaper than lime sulphur. They are, moreover, claimed to be more effective than the lime sulpur spray. Many growers, however, prefer the lime sulphur wash, and in this matter each orchardist must decide for himself. Lime sulphur has undoubtedly fungicidal properties, which are wanting in the miscible oils.

If it is decided to use oil, a well known and reliable brand should be obtained. It should be used at a strength of one part of oil to thirty or forty parts of water. It is important to make sure that a perfect emulsion is made first. This can be accomplished by taking one gallon of oil and one gallon of water, and pumping the mixture from one vessel to another three or four times; a perfect emulsion will thus be secured, and it can then be broken down to any strength required.

One spraying should be applied during the dormant season (mid-winter) at a strength of one in thirty, and as the young scales become active on the approach of spring, another application of the spray should be made just when the buds begin to swell. This latter spraying should be at a strength of one in forty; at this period the young scales are particularly vulnerable.

Summer sprayings for the control of San José Scale are not worth while, as at best they are only a partial check to its increase. The two sprayings mentioned should be sufficient to effectively control this scale.

An oil emulsion should not be used during the growing season on deciduous fruits, as injury to the foliage may result. Soft water should always be used if possible, as hard water will sometimes set free particles of oil. The addition to the spray of a weak solution of Bordeaux will overcome hard water trouble.

If lime sulphur is preferred to a miscible oil spray, either the commercial or home-made lime sulphur are equally effective.

Concluding Remarks.

Although so serious a pest, the San José Scale can be controlled in any orchard where it is present by well directed effort. It must be realised that the area occupied by this destructive insect is still increasing, and a determined co-operative effort should be made towards its control.

Neglected scale-infested trees or orchards should be cleaned up, as one such orchard in any district is simply a nursery for the scale, and is not only a menace to uninfested orchards, but is also a serious adverse factor hindering success in the work that may be accomplished by progressive growers in attempting to control this pernicious insect pest in the orchards in which it is already established.

DESCRIPTION OF PLATE.

PLATE No. 123.

Fig. 1.—Young larva x 57.

Fig. 2.—Pupa of male x 57.

Fig. 3.—Adult male x 32.

Fig. 4.—Colony of scales in various stages of development x 4.

Fig. 5.—Adult female x 32.

Fig. 6.—Adult female scale turned over to reveal the insect itself x 12.

Fig. 7.—Male Scales x 12.

Fig. 8.—Pear fruit, showing infestation.

Fig. 9.—Apple twig, showing infestation.

Fig. 10.—Plum twig, showing infestation.

"SHOULD BE IN EVERY FARMER'S HOME."

"A Millmerran farmer writes (14*th May*, 1927):—*"The 'Agricultural Journal' I have taken for years and it should be in every farmer's home, for it contains valuable information. I have often to turn up back numbers for some information I want to know."*

THE CLASSING OF QUEENSLAND COTTON CROPS, 1919-1926.

By L. L. GUDGE, Chief Government Cotton Classer.

SEASONS 1919–1922.

During the above-mentioned seasons, the seed cotton received (for ginning) was given very little if any attention as regards segregating the different qualities. The price of 5½d. per lb. for seed cotton which the Government guaranteed applied only to cotton of good quality and cotton free from disease. This term "good quality seed cotton" meant cotton that was not of ratoon growth and which was clean; it did not apply to immature, stained, dirty, or otherwise damaged cotton. Seed cotton which was not defined as "good quality" might be rejected or subjected to a lesser advance. Ratoon cotton was to get an advance of 3d. per lb. and was not to be mixed with annual.

The comparatively large crop harvested in 1922 showed the limitations of this system of receiving and ginning the seed cotton. Many of the bales were plated, mixed packed, or generally uneven in grade and quality. The buyers overseas were also dissatisfied with the lack of uniformity of the cotton contained in the bales. It was apparent that some system of grading would have to be established. The grower himself was getting a false impression of the value of cotton and of the necessity for clean picking. Moreover, it was realised that if Australia hoped to establish a reputation for cotton on the world's markets it could only be accomplished and maintained by a proper and uniform system of grading. During this period the cotton which was being grown was produced from seed of mixed origin. The bulk of it was "Upland" in type and descended from several varieties that had been introduced from time to time, and which also had become crossed in the field with Egyptian and other long staple varieties, with the result that the staple was very uneven. In view of this fact and taking into consideration the lack of cotton classers capable of this type of work, it was decided to concentrate on the grading only and to leave the stapling alone until such times as cotton from a pure variety of seed was being produced and men were trained in the method of stapling cotton. The production of seed cotton during these years was as follows:—

Year.	Seed cotton lb.
1919-1920	57,065
1920-1921	940,125
1921-1922	3,876,677

SEASON 1922–1923.

In the early part of 1923 the question of grading received serious consideration, more especially as the crop that was about to be harvested was much larger than had ever been produced in a single year before, and also that unsatisfactory comments had been made by the overseas brokers on the irregularity of the cotton which was directly attributable to the lack of a system of grading.

A conference was held between officers of the cotton section of the Department of Agriculture and Stock and the officials of the British-Australian Cotton Association, which resulted in a system of grading of the seed cotton being adopted for the forthcoming crop. The grades were simplified as much as possible with the idea of having a good distinction between the grades, and to limit the number as far as possible. The grades were to be lettered alphabetically as shown by the following table, which also shows the lint grades that each grade of seed cotton should produce when ginned:—

Seed Cotton Grade.	Corresponding Lint Grade.	Guaranteed Price.
		d.
A	Middling Fair; Strict Good Middling	5½
B	Good Middling; Strict Middling	5½
C	Middling	5½
D	Strict Low Middling	5
E	Lower Grades	4
F	Lower Grades	3

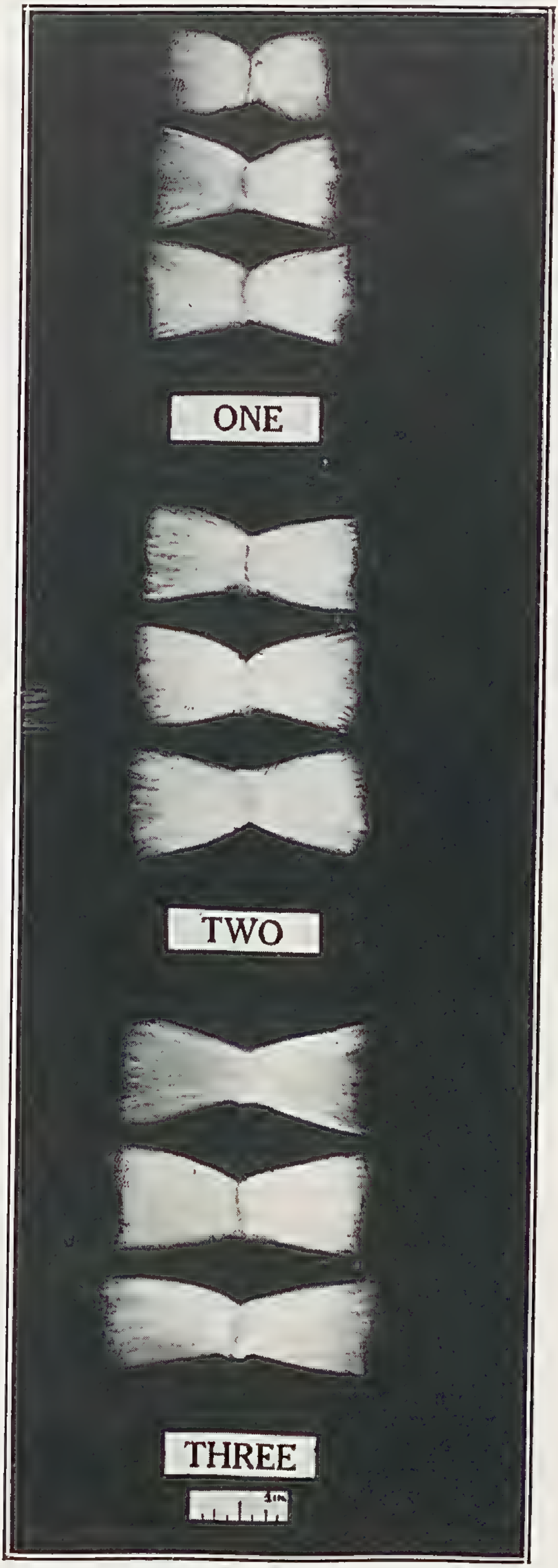


Plate 124.—Illustrating Staple Classes of Seed Cotton.

The grades were approved by the Minister, and each ginnery was supplied with a representative set of grade samples in order that the men who were to do this grading would have a standard to guide them. Temporary men were employed on this work, and the diversity of the styles of cotton harvested during this fairly large crop, showed how necessary it was to have a system of grading in order to segregate the different qualities before ginning.

Ratoon cotton was received and ginned separately at the Rockhampton and Whinstanes ginneries. This cotton was ginned without previously being graded.

The Durango type of seed cotton which had been grown on various farms throughout the cotton area was sent to Whinstanes ginnery, where it was treated entirely separately from the other seed cotton and the seed was kept for future planting. This cotton was classed for both grade and staple, and the different qualities were matched up in order to make uniform bale lots. The quality of this cotton was excellent, and the length of staple of the bulk of the cotton averaged $1\frac{3}{16}$. The grade was largely Strict Good Middling to Middling Fair. Samples of this cotton were sent over to the United Kingdom and were very favourably commented upon by the brokers. The production of this class of cotton amounted to thirty-six bales of lint.

The grade percentages and total quantities of lint production at each ginnery were as follows:—

Grade.	Rockhampton.	Wowan.	Whinstanes.
	Per Cent.	Per Cent.	Per Cent.
A	22·7	5·3	35·9
B	37·0	19·4	50·43
C	21·7	74·2	9·4
D	8·8	1·0	1·7
E	1·4	·1	·22
F	..	..	·08
Ratoon	8·4	..	1·4
Durango	..	..	·77
Sundries	..	..	·10
Total Weight Annual	1,106,915 lb.	..	1,937,104 lb.
Ratoon	101,840 lb.	..	27,545 lb.
Durango	..	..	14,683 lb.
*Thursday Island	..	..	..
Total	1,218,755 lb.	548,630 lb.	1,969,882 lb.

* Thursday Island cotton, 750 pounds, ginned at Melbourne.

SEASON 1923–1924.

The importance of grading was appreciated after the results of the previous year's work, and steps were taken to secure the services of a cotton classer from England, who arrived in September, 1923. The seed cotton standards formed in the previous year were revised and important additions were introduced. A staff of men were appointed and taught the principles of grading seed cotton, and by the beginning of the season they were proficient and capable of grading seed cotton according to the revised standards. The most important revisions on last season's standards were the tightening up of the top grades of A, B, and C, whereby these three grades of seed cotton were limited to cover three grades of lint cotton instead of the five grades covered in the last season. This meant that A grade seed cotton should produce lint cotton of the grade of Middling Fair, B grade—Strict Good Middling, and C grade—Good Middling. The lower grades of seed cotton were not so restricted in their quality and were of a sufficient range to cover two grades of lint cotton. This meant that in order to cover the whole range of lint grades an extra grade of seed cotton would have to be established to include the lowest lint grades. This new grade was called G. The main reasons for the tightening up of the top three grades was to endeavour to produce as many bales of top grade lint cotton as possible. The premiums obtainable for high grade cotton on the overseas market were very good, owing to the scarcity of this class of cotton in the American crop.

It will be readily understood that it is necessary, in order to produce the highest lint grade of Middling Fair, that the seed cotton has to be of the very cleanest and brightest nature, and must be ginned separately from any seed cotton of a lower quality. As an example: if there are three wool packs of seed cotton of sufficient weight to make a bale of lint, two of which contain seed cotton of a grade which will gin out Strict Good Middling and the other contains seed cotton of a grade which would gin out Middling Fair, a blending of the cotton in the three packs would probably produce a lint cotton which would be classed as a Strict Good Middling. The premium realised would be in accordance with values ruling for cotton of that grade, and the extra premium or value obtainable for the grade of Middling Fair represented by the seed cotton in the one wool pack would be forfeited. The best way to assure this premium is by segregating and ginning that class of seed cotton entirely on its own and not blending it in with cotton of a lower grade. The same system of grading applied equally to the B and C grades.

In addition to these revisions three grades were formed for immature cottons. The examination of many consignments of seed cotton from the previous year's crop revealed the presence of varying amounts of immature locks of cotton, which

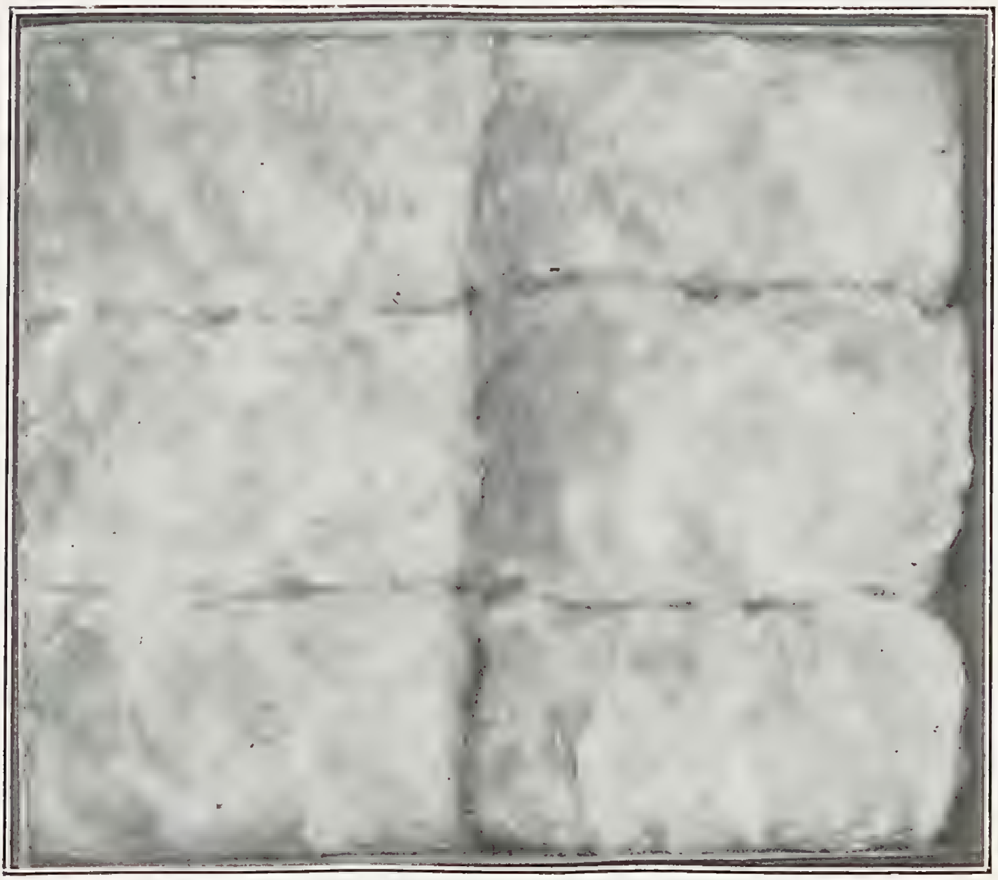


PLATE 125.—STANDARD GRADE OF GOOD MIDDLING.

were in the majority of cases stained a light brown colour, and in all cases this type of cotton was very wasty and tender. The lint produced was also spotted and wasty. For these reasons it was deemed advisable to segregate consignments of this nature and gin them separately, not mixing them with mature cottons, as had been done in previous years. Three grades were formed to accommodate these cottons and were marked 1X, 2X, and 3X.

The 1X grade of seed cotton contained an amount of immature locks, causing the lint to be lightly spotted or wasty to a degree that would lower its value from that of a sound cotton; the amount of trash contained to be no greater than that contained in a C grade. The grade of lint produced would be approximately Good Middling Spotted.

The 2X grade was comprised of seed cotton containing immature locks, causing the lint cotton to be badly spotted or very wasty, together with the amount of trash that was admissable in the C or D grades. The lint cotton produced by seed cotton of this type would vary from a Strict Middling Spotted to a Middling Spotted grade.

The 3X comprised seed cottons containing a very large percentage of immature locks, causing the resultant lint to be of a tinged or stained class of cotton of the grade of Middling or below, and alternatively if such cotton also contained a large amount of trash, the cotton would be of an off-coloured Strict Good Ordinary grade or thereabouts.

The ban on ratoon cotton was lifted during this season and the grower was allowed to forward this class of cotton providing he abided by certain conditions. This seed cotton was not graded, and an advance of 3d. per lb. was paid to the grower. The bulk of this cotton was of a very short staple length and generally harsh in character and very uneven.

The seed cotton of the Durango variety was received at the Gladstone ginnery, where special arrangements had been made to keep the seed pure. All Durango seed cotton in addition to being graded was also classed for length of staple, and was segregated into four different classes of staple length, which were as follows:—

Class 1 cotton of $1\frac{1}{16}$ inch staple; Class 2 cotton of $1\frac{1}{8}$ inch staple;

Class 3 cotton of $1\frac{3}{16}$ inch staple; Class 4 cotton of $1\frac{1}{4}$ inch staple.

The cotton on arrival at the ginnery was classed and branded with the grade and staple length such as A3 or B2, &c., and then each lot was ginned separately so that the quality of the cotton in the bales of lint would be uniform. The number of bales produced in this class of cotton were 257 against 36 bales in the previous season.

Grade percentages and total quantities of lint ginned at the various ginneries for season 1923-24:—

Grade.	Whinstanes.	Rock-hampton.	Gayndah.	Dalby.	Gladstone.	Gladstone (Durango).
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per cent.
A	41·6	6·92	14·7	22·5	27·0	11·2
B	31·58	19·90	37·7	..	29·0	20·0
C	8·67	28·10	23·6	..	22·2	33·0
D	2·62	32·8	..	77·5	6·6	13·2
E	·92	3·06	..	..	2·2	4·9
F	·13	·14	..	..	..	·4
G	·05	..	..	..	..	..
1X	11·5	5·4	18·7	..	9·70	8·2
2X	2·23	3·00	5·3	..	3·0	9·1
3X	·16	·40	..	..	·3	..
Ratoon ..	·54	·28	..	..	..	..
Total Lint lb. Production	2,497,432	1,760,146	229,369	1,797	129,653	121,860

SEASON 1924–1925

The system of grading that was introduced in 1923-1924 was adhered to without any revisions. The Durango type of seed cotton was treated at Gladstone ginnery, and was classed for both grade and staple as practised during the previous season. The storage for seed cotton at this ginnery was very heavily taxed and there was considerable congestion, caused to a large extent by the treating of ordinary annual seed cotton, ratoon seed cotton, and the Durango at the one ginnery; each different growth had to be kept separate, and in turn had to be separated for grade, and the Durango seed cotton for both grade and staple.

It was expected that the bulk of the seed cotton produced in the coming season would be of the Durango variety, and this would mean that the seed cotton received at all the ginneries would have to be classed for grade and staple length; therefore, the opportunity was taken to give tuition to all the graders in the method of stapling the seed cotton. This was carried out at Gladstone ginnery during the receiving of the Durango seed cotton.

Ratoon cotton was accepted at all ginneries and was graded on the same principles as the other seed cotton, but was valued at a lesser price. This cotton was of course ginned separately.

The following tables give the percentages of grades produced, also staple lengths of the Durango cotton:—

Grade.	WHINSTANES.		ROCKHAMPTON.		GLADSTONE.	
	Annual.	Ratoon.	Annual.	Ratoon.	Annual.	Ratoon.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
A	8·06	6·3	3·0	1·6	2·5	..
B	17·4	16·1	12·5	11·8	12·6	3·3
C	15·3	13·6	19·1	16·1	15·3	13·0
D	9·5	12·6	23·1	23·7	14·06	17·7
E	6·18	4·9	14·72	14·1	6·5	26·0
F	1·20	2·8	4·32	5·8	1·35	5·0
G	·13	·4	·46	1·7	·69	·9
1X	32·1	35·6	11·5	15·1	37·00	22·7
2X	9·0	7·7	9·8	9·1	10·00	11·4
3X	·93	..	1·5	1·0	..	..
Sundries ..	·20	..	..	..	..	..
Total weight lint cotton in lb. ..	2,245,922	206,746	1,945,421	253,608	148,604	41,653

DURANGO.

Staple Lengths.	GRADES.									Durango Ratoon Cotton, C Grade.
	A. %	B. %	C. %	D. %	E. %	F. %	1X %	2X	3X	
								All Staples.		
1	·09	·33	·73	1·40	·79	·38	1·30	..	..	..
2	6·00	16·89	17·20	6·40	·23	·09	13·10	5·17	·36	..
3	7·10	9·50	4·30	·80	·36	..	6·30	..	..	..
4	..	..	·2	..	..	..	·35	..	..	..

Total weight lint cotton, 869,807 lb. 2,255 lb.

SEASON 1925–1926.

During the 1924-25 season, when dealing with the increased production of Durango cotton at the Gladstone ginnery and the dual work of grading and stapling was done, it was apparent that the separate stacking of the different grades and staples of seed cotton before ginning was a costly matter, and also required a great deal of space. The storage room was greatly taxed and at times was very congested. Also, the more grades and staples there were the larger the numbers of "changeovers" in ginning were required, and coupled with these facts was the knowledge that, in the coming season, the majority of the cotton produced would be of the Durango variety, so that in the future the cotton would have to be classed for both grade and staple length at all the ginneries.

Taking these factors into consideration, it was decided to widen the classes of staple length and grade, thereby making it possible to diminish the number of classes. All the graders had now had some experience in the method of stapling seed cotton. This work is more intricate than grading and requires a greater amount of experience, so the enlarging of the range covered by each class would aid the grader, in that he would not have to differentiate by such close margins. It also allows for a variation of quality that occasionally occurs in the pack of seed cotton sent in by the farmer.

The seed cotton standards were now composed of seven grades, as follows:—Four grades of mature cottons (A, B, C, and D), and three grades of immature cottons (1X, 2X, 3X), and three classes of staple length.

The following table shows the range of lint grades and length of staple covered by each class:—

Staple Length.			Grade.
Class 1. Up to and including 1 in.	Class 2. Full 1 in. and including $1\frac{1}{8}$ in.	Class 3. Good $1\frac{1}{8}$ in. and above.	
A1 ..	A2 ..	A3 ..	Top side Good Middling to Middling Fair
B1 ..	B2 ..	B3 ..	Middling to Good Middling
C1 ..	C2 ..	C3 ..	Strict Low Middling to Low Middling
D1 ..	D2 ..	D3 ..	Strict Good Ordinary to Good Ordinary
X1 ..	X2 ..	X3 ..	Good Middling Spot and above
XX1 ..	XX2 ..	XX3 ..	Middling to Strict Middling Spot
XXX1 ..	XXX2 ..	XXX3 ..	Stained cotton or off colour low grade

A description of the characteristics of these grades can be found in the article on the "Description of Present Seed Cotton Grades."

These grade and staple length classes were duly approved of, and instruction work in accordance with the revised standards was carried out during the off season. This system of grading and stapling has proved satisfactory. The range covered by each seed cotton grade is approximately $2\frac{1}{2}$ lint grades. This is a wide variation, and it is necessary that the seed cotton is thoroughly blended before being ginned. If this is not done, there will most probably be a lack of uniformity in the quality of the individual bales, but by thorough blending this fault can be controlled to a great degree.

Under this system of classing the seed cotton it is impossible to guarantee that a run of bales from one grade of seed cotton will all be of equal lint grade or all of equal staple length, and in order to ascertain the correct class of each bale it is necessary to draw samples of lint cotton and have them classed.

The weights of lint cotton produced at the various ginneries and the percentages of grades and staples are as follows:—

Staple Class.	Grade.						
	A.	B.	C.	D.	1X	2X	3X
			WHINSTANES.				
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	5·14	·07	·22	·15	1·34	·24	·03
2	32·0	2·10	·84	·14	15·0	2·2	·08
3	35·7	·35	..	..	4·4	..	..

Total weight, 1,409,202 lb.; special growths, 19,251 lb.; includes 11,722 lb. carry-over from previous season.

Staple Class.	A.	B.	C.	D.	1X	2X	3X
			ROCKHAMPTON.				
1	8·4	2·7	·46	·2	2·64	·08	..
2	28·2	5·4	·59	·04	11·0	·30	..
3	25·0	5·6	·49	..	8·0	·90	..

Total weight, 1,047,599 lb.

Staple Class.	A.	B.	C.	D.	1X	2X	3X
			GLADSTONE.				
1	1·36	1·04	·26	..	·34	·10	..
2	22·25	4·68	·25	..	4·33	·44	..
3	60·04	2·54	..	..	2·37	..	..

Total weight, 396,398 lb.; includes 1,394 lb. carry-over from previous season.

COTTON CLASSING.

By L. L. GUDGE, Chief Government Classer.

The system by which cotton is sorted out according to quality is known as "classing," and this term embraces two separate functions; one is determining the grade, and the other the length of the staple. The term grade is used in denoting the colour, lustre, and the nature of preparation of the ginning, and also the amount of leaf trash, sand, or other foreign substances contained. The length of staple denotes the length of the cotton fibre, taking into consideration the character, which term embraces the strength, body, uniformity, and smoothness of the fibre. These qualities have an important bearing on the lint. By the classification of cotton it is possible to determine its comparative value, to facilitate the sorting of individual bales into even running lots of the same grade and staple, and to expedite trading by affording the purchaser means of buying cotton on description without the examination of actual or type samples. The utilisation of cotton in spinning depends largely on its class and in the manufacture of yarns or fabrics, for which all but a negligible portion of the world's cotton is used, cotton of certain definite qualities is ordinarily selected for certain kinds and qualities of goods. Spinners also require cotton that has been selected into uniform lots of both grade and staple.

The spinning value of cotton can be expressed to a certain extent in terms of grade and staple length. The longer staples and higher grades are, as a rule, necessary in the production of finer and stronger yarns and fabrics. The higher qualities are more valuable for these reasons. A high-grade cotton contains less waste than a low grade and does not require to go through a severe cleaning process. This cleaning process damages the yarn according to the amount of cleaning required, and if the lower grades are not cleaned the yarn is affected adversely according to the amount of trash. Moreover, the higher grades are of a brighter and better colour and give greater satisfaction in both the bleaching and dyeing process. Generally speaking, the longer staples cottons are required in manufacturing yarns of greater strength and higher "counts" or fine size. The term "count" is used in expressing the number of hanks of yarn that 1 lb. of lint cotton will produce in spinning. One hank is 840 yards in length, so it will be seen that a long staple cotton of fine size which will spin 70 to 80 counts per lb. is of a greater value than a short staple cotton that will spin only 20 to 30 counts.

Cause of Varying Grades and Staples.

The grade of cotton is governed to a large extent by the weather conditions in the period intervening between the opening of the bolls and the time of picking. Cotton which is picked with care while the leaves of the plant are still green and has matured under bright sunlight conditions should be comparatively free from leaf, and should also be of good bloom and lustre and bright colour. On the other hand, bolls which are left open in the field for a long period tend to lose their lustre and become dull in colour or even bluish. Wind storms will damage the open bolls by blowing them on to the ground and picking up soil, &c., or by bringing the bolls into contact with the dry brittle leaf. Low grades are produced, however, under favourable weather conditions by deferred or careless picking, or the exposure of cotton to excessive moisture before being ginned. When several pickings are made in the same field the grades will vary, as weather conditions may have altered between the times of the different pickings, and it usually happens that a considerable number of grades can be found in the crop of any one field.

The length of the cotton fibre is dependent on the quality and type of the seed planted, the character of the soil, the care and cultivation given to the growing crop, and the climatical conditions under which it matures.

As all these numerous grades and staples are found according to the different conditions, it will be realised that cotton classing is very essential in the operations which attend the movement of cotton from the farm to the mill.

THE UNIVERSAL STANDARDS.

The classer of America-grown cotton is guided in his work by special standards which are known as the Universal Standards. It is only during the last three years that there has been one definite set of standards. Previous to the introduction and acceptance of these Universal Standards by the various Cotton Exchanges of the world, there were in operation several different sets of standards, differing in style and grade terms. The desirability of a uniform set of standards was appreciated by the majority of persons in the cotton trade, and the United States Department of Agriculture promulgated sets of Universal cotton standards in all grades, colours, and types of American Upland and American Pima cotton. These standards are officially recognised by the leading Cotton Exchanges and Spinners' Associations throughout the world. They are the accepted basis for all purchases and sales, arbitrations and valuations, and all matters that pertain to the grade of a cotton. There are seven different sets of standards dealing with American Upland cotton, which is the type of cotton grown in Queensland. The most important set is that for white cotton. The bulk of the cotton grown is equal to one or other of the grades in this set, and it is the one that affects us most; the other sets of standards which we are interested in are those for the spotted cotton and yellow tinged. The following table shows the grades and standards of the various colours:—

GRADES AND COLOURS OF THE UNIVERSAL STANDARDS FOR AMERICAN UPLAND COTTON.

Standards for Grades of Upland White Cottons.	Blue Stained.	Grey.	Spotted.	Yellow Tinged.	Light Stain.	Yellow Stained.
1 or Middling Fair	..	..	..	..	..	..
2 or Strict Good Middling ..	..	..	..	**2 S.G.M.**	..	..
3 or Good Middling ..	**3 G.M.**	*3 G.M.*	*3 G.M.*	**3 G.M.**	*3 G.M.*	**3 G.M.**
4 or Strict Middling ..	**4 S.M.**	*4 S.M.*	*4 S.M.*	**4 S.M.**	*4 S.M.*	**4 S.M.**
5 or Middling	..	*5 M.*	*5 M.*	**5 M.**	*5 M.*	**5 M.**
6 or Strict Low Middling ..	..	..	*6 S.L.M.*	**6 S.L.M.**	..	..
7 or Low Middling	..	..	*7 L.M.*	**7 L.M.**	..	..
8 or Strict Good Ordinary ..	..	..	..	..	..	..
9 or Good Ordinary ..	..	..	..	..	..	..

NOTE.—Symbols in heavy type denote grades and colours for which practical forms of the official cotton standards are prepared. For the grades indicated by symbols in italics no practical forms are furnished. Grey cotton is between the White and the Blue Stained in colour, Spotted between the White and the Yellow Tinged, and Light Stained between Yellow Tinged and Yellow Stained.

The grades shown above the horizontal lines are deliverable on future contracts made in accordance with section 5 of the United States Cotton Futures Act. Those below the line are untenderable on such contracts.

In addition to official grade standards there are standards representing the staple length of Upland cotton. The standards are prepared by the United States Department of Agriculture. These standards are not universal. Several efforts have been made to get European Exchanges to accept them as such, but the movement has always been contested, due mostly to the difficulties that arise in taking into consideration the character of the staple and the effect it has on arriving at the length, so that up to the present time these standards are not effective and are not taken into consideration in valuations or settling disputes and arbitrations.

The personal opinion and practical experience of the classer is the deciding factor in arriving at the length of staple. The standards for staple length are made up in a practical form and cover the whole range of staple lengths that can be expected of the various types of American Upland cotton; they are expressed in inches and fraction of an inch as follows:—

$\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, 1, $1\frac{1}{32}$, $1\frac{1}{16}$, $1\frac{3}{32}$, $1\frac{1}{8}$, $1\frac{5}{32}$, $1\frac{3}{16}$, $1\frac{7}{32}$, $1\frac{1}{4}$, $1\frac{9}{32}$, $1\frac{5}{16}$, $1\frac{11}{32}$, $1\frac{3}{8}$ and $1\frac{1}{2}$.

THE GRADING OF QUEENSLAND SEED COTTON.

The American Method.

The method of classing described refers to the cotton after it has been ginned, when it is known as lint cotton. The Universal Standards are comprised of lint cotton. In America the cotton is not graded as seed cotton before ginning, as farmers bring consignments to the ginnery in sufficient quantities to make complete bale lots—roughly, 1,500 lb. of seed cotton. The uniform quality of the cotton in the individual bale is assured, as the seed cotton which the farmer brings in is generally from the same field and is composed of one or two pickings. The seed cotton is taken by suction right from the farmer's wagon through the ginning machines, and if there is a difference of quality existing in his load of cotton it is so thoroughly blended that the desired uniformity is accomplished.

Method in Queensland.

Here in Queensland, where production is on a smaller scale, warranting only a limited number of ginneries, and seed cotton is received in uneven quantities from in order to ensure this uniformity of quality in bales of lint cotton it was necessary widely varying areas, it is necessary to have to stack cotton before ginning; and to devise a system of grading the seed cotton. This system of grading has had the desired effect of producing uniformity of quality in the bales of lint; whereas prior to any system of grading there was dissatisfaction expressed by the overseas buyers of our cotton as to this lack of uniformity. Such bales of cotton are known by the trade and are called "mixed packed." The following is taken from regulation 6, section 5, under the United States Cotton Standards Act:—"If a sample drawn from one portion of a bale is lower in grade or shorter in length than one drawn from another portion of such bale except as otherwise provided in these regulations, the classification of the bale shall be that of the sample showing the lower grade or shorter length."

It will be seen therefore from the above regulation that the value obtainable for the high grade or long staple cotton is forfeited owing to it being mixed in with cotton of a lower grade or shorter staple.

The system of grading the seed cotton here in Queensland is as follows:—

The mature seed cottons are graded into four different grades, according to the amount of trash or other foreign substances contained. These grades are known as A, B, C, and D. They are standardised in order to produce certain lint grades, and in all they cover the range of grades contained in the Universal Standards for white or creamy cottons. In addition, there are three grades of immature or spotted cottons—namely, 1X, 2X, 3X. These grades are also standardised and cover the range of lint cottons contained in the "spotted" standards.

While this system ensures the uniformity of the grade of the cotton contained in the finished bale of lint or ginned cotton, it will not bring about the desired uniformity of the length of staple contained in the bale. The grade of a cotton is not in any way dependent on the length of staple, or *vice versâ;* and as the length of staple varies considerably according to the conditions under which the cotton is grown, the type of seed planted, character of the soil, and also the cultivation of the crop, it will be recognised that a system of classing had to be adopted in order to ensure uniformity of the length of staple in the pack. For this purpose all seed cotton is classed for length of staple. There are three classes of staple length, and the length of fibre which is admissible into each class is as follows:—

Staple Class.	Range of Staple.
1	Up to and including cotton of 1 inch.
2	From a full 1 inch up to and including cotton of 1⅛ inch.
3	From a good 1⅛ inch up to and including cotton of 1¼ inch or longer cotton.

DESCRIPTION OF PRESENT SEED COTTON GRADES.

At the present time the Queensland seed cotton is graded into four mature and three immature grades, and each of these grades can come into any of the three classes of staple length according to their quality.

The mature grades of seed cotton are described as follows:—

(A) grade comprises seed cotton of very good colour and bright, is fully matured, and can contain a small portion of leaf. Care should be taken to keep seed cotton of this character free from immature locks. The grades of lint cotton which can be produced from this grade are Middling Fair, Strict Good Middling, and Topside of Good Middling.

(B) grade comprises seed cotton of fair to good colour, practically free from immature locks, and containing a fair amount of leaf. The range of lint cottons covered are Good Middling, Strict Middling, and Middling.

(C) grade comprises seed cotton of dull colour, containing a large amount of leaf trash, &c., and small percentage of immature locks. The range of lint cottons covered are Strict Low Middling and Low Middling.

(D) grade comprises seed cotton which is very dull, and containing an excessive amount of trash of varied description and a fair percentage of immature locks. The range of lint grades covered are Strict Good Ordinary and Good Ordinary.

The immature grades are as follows:—

First: Immature, grade X, comprises seed cotton containing trash down to the amount contained in a low side A grade; is of good lustre, with the addition of immature locks to the amount of, roughly, 15 per cent. The range of lint grades covered are a Good Middling Spotted.

Second: Immature, grade XX, comprises seed cotton containing equal trash and lustre as that of B grade with the addition of immature locks to the amount of, roughly, 25 to 30 per cent. The range of lint grades covered are Middling Spotted and Strict Middling Spotted.

Third: Immature, grade XXX, comprises seed cotton of a very inferior character, containing a very high percentage of immature locks, about 60 to 75 per cent., and also containing a large amount of trash. The lint grades covered are off coloured low grades, or Strict Low Middling to Low Middling Yellow Tinged.

METHOD OF CLASSING AND RECEIVING AT THE GINNERY.

On the arrival of seed cotton at the ginnery, each farmer's consignment is sorted out according to the advices received as to number of sacks or bales forwarded. Each container is then opened by the grader who takes out sufficient cotton to judge it for grade according to colour and amount of trash that it contains, &c. After the grade is decided, locks of seed cotton are tested for the length of staple, and when the length is arrived at, both the grade and length of staple are chalked on to the container—such as A3 or B2, as the case may be.

Each farmer's consignments are then weighed separately under the supervision of a Government check weigher, according to the grades of the various containers. The cotton is then wheeled into the storage shed and stacked in separate heaps according to the grade and staple. When ginning each different stack is dealt with separately. The containers are split open and the seed cotton is emptied out and blended before being carried to the ginning machines through a suction pipe.

NOTES FOR GROWERS.

It is essential that the pack of seed cotton arriving at the ginnery contains a uniform quality—that is, from the top to bottom of the container the quality of cotton should be the same.

A Common Fault.

A very common fault with a large number of the wool packs of seed cotton that arrived at the ginneries in previous seasons was that different layers in the same pack showed that cotton picked by different pickers, or picked at different times, was dumped straight into the wool pack on the farm without any attempt being made at blending. Containers packed in this manner are apt to suffer in the grading, as it is very likely that the grading will be based on the lower quality contained; moreover, the bale of lint will be irregular in quality. In order to ensure evenness of grades throughout the container, the following method of packing seed cotton is advisable. After the pickers' bags have been weighed, the seed cotton should be emptied on the barn floor or any other suitable place and the day's or week's picking, as the case may be, thoroughly blended, and then packed into sacks or wool packs ready for despatch to the ginnery. The farmer in doing this is assisting the work of the grading and the industry, and at the same time obtaining a grade more in accord with the value.

Immature and stained cotton should never be packed with mature clean high-grade cotton. Care has especially to be given to this during the first pickings, as it is at this time that immature bolls are likely to be in evidence.

Method for Improving Grade.

Very leafy or dirty cotton but otherwise mature, such as is likely to appear towards the end of the picking season, should also be packed separately.

Seed cotton which contains leaf or other foreign substances can be greatly improved in grade by many simple means on the farm. A good plan is to pass it over wire netting stretched out to form a table, and by shaking it thoroughly quite a percentage of leaf and dirt will fall through the wire mesh. There are other simple methods which the farmer will find very advantageous in raising the grade of his seed cotton and so getting a better price at the ginnery, and the industry will benefit by obtaining the higher premiums realised on the top grades of cotton.

Send Dry Cotton.

It is always better to allow cotton that has become wet or even damp to dry on the bush, but if for any reason this damp or wet cotton has to be picked, on no account should it be packed or despatched to the ginnery without being thoroughly dried. First, for the reason that this style of damp packed cotton opens up at the ginnery very much inferior and the resultant grade will be lower, and secondly, for the much more important reason that such cotton cannot be ginned efficiently. The effect of the revolving saws of the ginning machinery on damp or wet cotton causes the lint to be cut and the cotton is lowered in value. Different growths of cotton should by all means be kept separate, and on no account should standover, ratoon, or annual cotton be mixed together. There is no need to mark on the container what the growth is, and growers who mix annual and ratoon cotton in the same container are not assisting in producing the desired uniformity of quality.

Australian Spinning and Weaving Mills.

It is anticipated that in future the bulk of the cotton grown here will be utilised in Australia by spinning and weaving manufacturers. This secondary branch of the industry in Australia is destined to grow into a large and important factor and will be of immense value to the cotton growers of Australia. The growth of the manufacturing industry will be governed to some extent by the quality of the cloth produced and the cost of production. The manufacturers pay high premiums for the higher grades and longer staple qualities of cotton. These premiums are of considerable value—for instance, the grade of Middling Fair cotton is quoted at a premium of approximately 1½d. per lb. of lint cotton more than the grade of Middling. The different staple lengths also vary considerably in value, and cotton that is equal to a class 3 in staple length is worth 1½d. per lb. more than a cotton that is only of class 1 staple length. A cotton that combines these two features of Middling Fair grade and class 3 staple length is therefore worth and can be sold for 3d. per lb. more than cotton of Middling grade and class 1 staple length. This means a difference of £6 5s. for each bale of lint weighing 500 lb. Naturally, buyers who are called upon to pay these premiums for quality cotton expect the bales of lint to contain cotton of a uniform quality, in accordance with the premiums paid, otherwise dissatisfaction is caused and claims are made, and once it became known that a certain growth of cotton could not be relied upon to be of uniform pack, it would be found very difficult to obtain good premiums for the higher qualities. The more uniform the quality of the lint is throughout the bale so is it more economical to the spinner, and the quality of the yarn and fabric produced is higher. Therefore a higher return is assured to the manufacturer and a better cloth to the consumer.

An Essential Point.

These factors all bear out the necessity for the careful classing of the seed cotton. Under the existing conditions of handling the seed cotton here in Queensland, it is impossible to ensure the uniform quality of the contents of each bale unless the seed cotton is classed first. It is absolutely essential that the system of classing which has been devised should be rigidly maintained, and by these efforts build up a reputation for uniformity of pack and quality, which will mean a keener demand for our cotton, more competition amongst buyers, and a higher return to the producer.

THE JOURNAL WIDELY APPRECIATED.

The following appreciative reference to the Journal by a Nambour subscriber is typical of many received from different parts of the State in the course of the month:—

"In renewing my subscription I must thank you for all past issues and also express my appreciation of the Journal. I think it is just splendid and of great value to the farmer."

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, 1927 AND 1926, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1927.	April, 1926.
North Coast.	In.		In.	In.
Atherton	4·31	26	5·98	2·17
Cairns	12·09	45	12·19	9·10
Cardwell	9·49	53	4·13	3·40
Cooktown	9·22	51	10·50	6·50
Herberton	4·14	40	2·81	1·34
Ingham	8·46	35	5·55	1·82
Innisfail	21·22	46	13·56	13·76
Mossman	9·96	14	7·23	3·96
Townsville	3·67	56	0·43	0·03
Central Coast.				
Ayr	2·72	40	0·10	0
Bowen	2·83	56	0	0
Charters Towers ...	1·68	45	0·62	0
Mackay	6·56	56	2·07	0·90
Proserpine	6·23	24	1·11	1·10
St. Lawrence ...	2·75	56	0·68	0·26
South Coast.				
Biggenden	1·80	27	2·90	1·59
Bundaberg	2·82	44	3·83	0·76
Brisbane	3·54	76	2·07	2·36
Childers	2·51	32	3·57	2·32
Crohamhurst ..	5·78	35	5·27	6·17
Esk	2·58	40	3·01	3·65
Gayndah	1·29	56	3·32	0·30
Gympie	3·12	57	4·16	2·65
Caboolture	3·91	40	3·64	4·26
Kilkivan	2·00	48	2·32	0·52
Maryborough ...	3·43	55	4·21	4·68
South Coast—continued:	In.		In.	In.
Nambour	5·39	31	4·43	5·57
Nanango	1·76	45	2·59	1·56
Rockhampton ...	2·24	40	2·03	0·80
Woodford ...	4·09	40	4·63	3·47
Darling Downs.				
Dalby	1·20	57	2·20	1·38
Emu Vale ...	1·15	31	0·79	1·14
Jimbour	1·19	39	1·87	0·91
Miles	1·28	42	1·37	0·53
Stanthorpe ...	1·62	54	1·32	0·56
Toowoomba ...	2·36	55	3·29	1·39
Warwick	1·58	62	1·21	0·34
Maranoa.				
Roma	1·21	53	0·85	0·17
State Farms, &c.				
Bungeworgorai ...	0·78	12	0·51	0·21
Gatton College ...	1·53	27	1·64	1·28
Gindie	1·14	27	0	0
Hermitage ...	1·18	20	1·13	0·59
Kairi	4·93	12	4·01	3·30
Sugar Experiment Station, Mackay	5·16	29	2·11	1·12
Warren	1·31	12	1·80	0·75

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 1926, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

BREEDS OF PIGS.

THE LARGE BLACK.

E. J. SHELTON, Instructor in Pig Raising.

Of the several breeds of pigs introduced into Australia during recent years from countries overseas and referred to in this series of articles on "Breeds of Pigs," either as new or comparatively new to Australia and to the Australians, we find the Large Black breed occupying a very prominent position though as yet it is quite a new breed to Queensland.

Other breeds in this category and of similar value in building up the industry here include the Gloucester Old Spot, or as it is more frequently referred to by breeders as the G.O.S., emanating from Gloucestershire and its environs in the British Isles, and the Large Yorkshire or Large White, one of a trio of British white breeds of which we already had one representative here in the Middle Yorkshire (or Middle White) firmly established and well and favourably known both here in the north as well as in the Southern States.

The other British breeds used here in Australia include the Berkshire (often erroneously referred to now as the "Improved" Berkshire), probably the most popular of all the breeds, and the Tamworth, a runner up in popular fame and a breed destined to occupy a much more important place in our agricultural affairs now that the breed value for crossbreeding purposes with the Berkshire and other breeds is so widely acknowledged and appreciated.

Of American breeds we have but two, the Poland-China and the Duroc-Jersey, both breeds in which many farmers are interested and both breeds of whom much more is expected now than in former years. There are, by the way, many more pure breeds of pigs in the British Isles and on the continent and in America, but of these we have no representatives here. Their historical record and their special features or advantages will be fully described and illustrated later.

The Large Black.

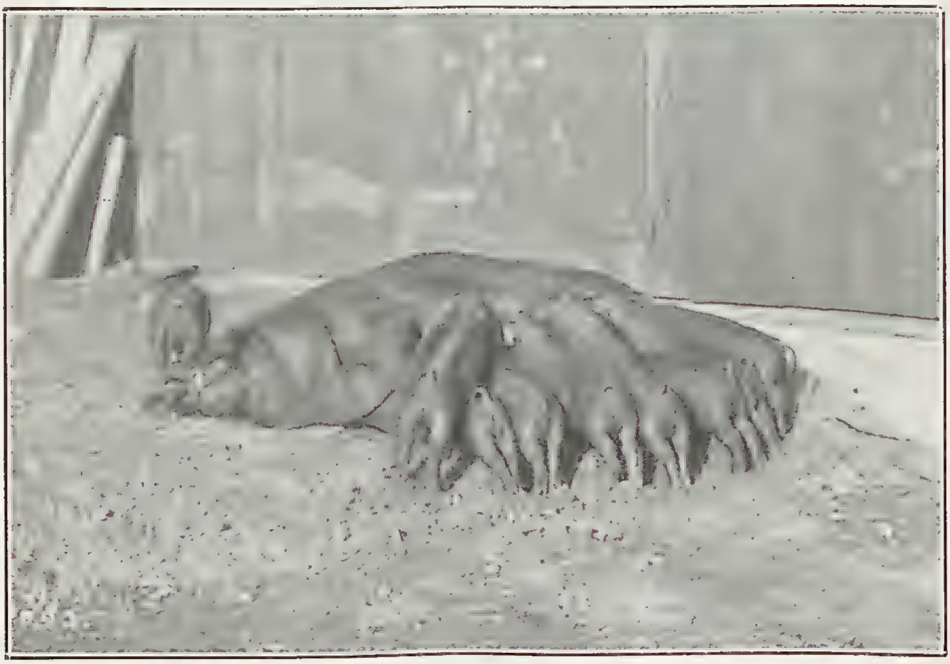
Undoubtedly the Large Black pig is one of the oldest breeds of pigs in the British Isles if not in the whole world, and although it has only been possessed of a breed society and herd book since the year 1899, its rise to fame has been rapid in the extreme owing to its very fine qualities as a dual-purpose animal. Just where the original foundation stock of the breed had their abode, or who the first improvers of the breed were, or who first took them up is a matter for the historian; certain it is the Large Black dates far back into early English history before it was the custom to keep accurate records of the various breeds or types of pigs.

Seemingly the great stronghold of the Large Blacks in those days was in Devon and Cornwall in the west of England, and in Essex and Suffolk in the eastern counties. It was not till the year 1899 that fanciers of this old world black breed got together and decided on incorporating the Large Black Pig Society and on fixing a definite standard of excellence and scale of points, and finally on publishing a herd book. The publicity given to the breed as a result of this initial organisation laid the foundation of the breed's distribution and success, a success which has made the Large Black breed a popular and profitable one wherever it has been introduced and given a fair and reasonable try out. Nowadays the breed is well set and of uniform type, a type appealing to many and attracting more and more attention as the years roll by.

Writing to the Large Black Pig Journal a year or two ago a prominent breeder and fancier of the type, in dealing with its early history, traces its breeding away back to the Old English Hog of the sixteenth and seventeenth centuries, and then on to the year 1807, which year he considered could for everyday purposes be taken as the year of origin of the modern Large Black breed.

In Australia the breed was, until a year or two ago, always referred to as the "British Large Black" or the "British Black," and is still referred to by a few of the old hands as the Devonshire breed or as the Devon. It is referred to also in the Australian Stud Pig Herd Book as the British Large Black. Parkinson, a prominent author of the early days, referred to them in a booklet published in 1810 in the following terms:—

> "The Large Blacks are distinguished by their gigantic size; they are the largest of the kind I have ever seen and of as perfect a make as is possible in pigs; their heads are large with heavy long ears hanging down on each side of the face so that they can scarcely see their way."



Photograph by courtesy of Captain H. N. Callcott.]

PLATE 126 (Fig. 1).—LARGE BLACK SOW, "MCHEATHER BEAUTY," WITH LITTER OF NINE WELL-DEVELOPED GROWTHY YOUNGSTERS.

The Large Black Sow is an ideal mother, with maternal instincts strongly developed and with a capacity for heavy milk production.

PLATE 127 (Fig. 2).—LARGE BLACK SOW, "MCHEATHER BEAUTY," PHOTOGRAPHED PRIOR TO FARROWING.

Note the exceptionally well developed body, the deep capacious chest, the development of udders and teats, and the well set-up hindquarters, all evidences of capacity and prolificacy. An ideal farmer's sow.

Writing about twelve months ago the secretary of the Large Black Pig Society at 12 Hanover Square, London W1. (Mr. B. J. Roche), in referring to the popularity of the breed, says:—

"You will, of course, be aware that we in England are experiencing something in the nature of a revival in the pig industry as compared with the last two or three years. Prices for store stock are very much better than they were, and breeders are finding it difficult to meet orders. Although prices for pedigree stock are not high, the best are selling well. There is no end of a demand from all quarters of the British Isles for Large Black sows, both for pure breeding and for crossing with Large White boars; this cross would appear to be much in favour in England, and it certainly has the benediction of the bacon curers. The progeny of this cross have the necessary length and depth for bacon with the virtue of early maturity. One is constantly meeting breeders and feeders who pay fine tribute to the maternal qualities of the Large Black sow."

Writing of the distribution of the breed Mr. Roche states that there would appear to be no reason why Large Blacks should not prove as useful in Australia as they have done in other parts of the world, notably in South Africa. It is a fact that Large Blacks strongly predominate in Africa and, according to the registrations contained in the herd books of the Pig Breeders' Society of the Union, the breed was twice as strong numerically in 1925 as any of the other pure breeds to be found in that part of the world.

Mr. Roche further states his opinion that British pig breeders see no reason whatever why the Large Black and crosses in which it is concerned should not do as well in Australia, and in Queensland in particular, as in the Old Country; there they consider the breed second to none in the matter of early maturity, for they regularly market baconers of the finest grade possible at five and a-half months. The success of the various crosses with the Large Black is, in their opinion, due in no small measure to the very fine maternal qualities of the sow; she is capable of producing big litters and of doing (or suckling) them well. Even bacon curers who are not entirely in love with Black pigs have admitted the value of the Large Black sow as a mother; they place so much importance on this point that they put it down as one of their reasons for including the Large Black in their list of "selected" breeds. Mr. Roche thinks the reason why Large Blacks have not boomed in Australia in recent years is that breeders here appear to be unaware of the progress which has been made in breed improvement in the British Isles. A few years ago—and this was unfortunately the experience here in Australia when the first importations were made many years ago—Large Blacks were bred and fed to erroneous size and quite naturally they were coarse. The process of refinement has, however, been going on since the establishment of the herd book in 1899, and nowadays we have in the Large Black a pig second to none for breeding and for early maturity.

Originally, of course, the Large Black was a somewhat cumbersome animal of great length, but nothing so symmetrical as it is to-day. Now, the breed produces a large amount of lean meat, its great length yielding a wealth of prime well-streaked bacon. At one time the breed was noted for size, not quality; to-day they possess not only size but quality, their early-maturing carcases yielding a prime marketable pig, 160 to 190 lb. dead weight, light in shoulder, jowl, and offal, and showing a large proportion of flesh and a well-developed hindquarter and ham. It is also claimed for this breed that the sows having such length of body are able to carry large well-developed litters with comparative ease; the depth of body gives ample room for the development of the vital organs, the heart and lungs particularly, while the long deep sides and well-built up fore and hind quarters make for all that a bacon curer requires. A pig with plenty of length from pin-bones to tail invariably carries good hams, and where the tail is well set up and the loin broad there is ample room for the development of the ham—the most valuable portion of the carcase.

Other Qualities.

In the Large Black breed the head should be of medium length, wide between the eyes and ears, this indicative of a strong sturdy constitution and a wide and deep frame; the jowl must be of medium size, not too light or pinched, while the chest must be wide, deep, and capacious; a narrow cramped chest would not allow for the development of heart and lungs to the best advantage, and thus constitution would suffer; the shoulders should be fine, not too heavy in the shield in the case of males. A heavy coarse shoulder is undesirable from the bacon curer's point of view, as it is a cheap cut and one for which there is a lighter demand than for middles or hams.

Photo.:—Sport and General, London.]

PLATE 128 (Fig. 3).—A MODEL TYPE OF THE LARGE BLACK BREED.

This Sow, "McHeather Susan, II." 1923, won First Prize at the Royal Agricultural Society's Show in England in keen competition.

PLATE 129 (Fig. 4).—LARGE BLACK GILTS (YOUNG SOWS), AT THE STUD OF W. E. BARKER, ESQ., BENDIGO, VICTORIA.

Sturdy well-developed breeders of the very best type. Ideal sows for cross-breeding purposes for the production of medium bacon pigs.

PLATE 130 (Fig. 5).—LARGE BLACK SOW, "BENDIGO HELEN," No. 15, PROPERTY OF CAPTAIN H. N. CALLCOTT, OF THE WATTLE HERD GIRGARRE, VICTORIA.

This sow is a noted prize winner at Sydney and Melbourne Shows. Her progeny have made a name for themselves also in the show ring. Note the development of ham and middle piece, and the well set-up tail of this sow.

A special feature of the Large Black is its long thin ears inclined well over the face with a nose of medium length. This carriage of the ears over the eyes induces a quietness of habit and docility quite characteristic of the breed. The legs and feet should be strong, short, and straight, with no sign of inbent knees or "cow" hocks.

Breeders of the Large Black claim that the breed is particularly resistant to disease and abnormal conditions, the young pigs at birth being vigorous and sturdy, well able to look after themselves and to battle for their living.

In colour the Large Black is distinctly black, no white, reddish, or greyish markings whatever being allowed. The breed is very hardy and is ideally adapted for the warmer climes of the North; they do not suffer from sunburn or sunscald, hence their adaptability for conditions on farms still in the early stages of development. The boars are particularly prepotent, stamping their type and quality on the progeny no matter what breed of sow the young pigs may have had as a mother. The sows are deep bodied, matronly, docile, and prolific, being heavy consistent milkers well able to rear a dozen good pigs or more per litter; the sows have particularly well developed udders and numerous well-shaped teats. The boars also show excellent development of embryo teats. This is a feature worthy of note; it is one often overlooked by pig breeders and judges. Stud cattle breeders always look for well developed and evenly placed teats both in female and male cattle, though, of course, the male teats do not fill up and develop as in the case of the female.

It is these powers of prolificacy and heavy milking capacity that give to the Large Black sow a value that can scarcely be claimed for any of the medium types shorter and more compact in body. It is at any rate a very great advantage to have breeding sows that are prolific and that produce large quantities of rich nourishing milk, for all too many sows nowadays lack these very necessary and important qualifications. It is a waste of time keeping a sow capable only of rearing litters of four and five, while sows of the larger breeds are available capable of producing twice as many suckers and feeding them well.

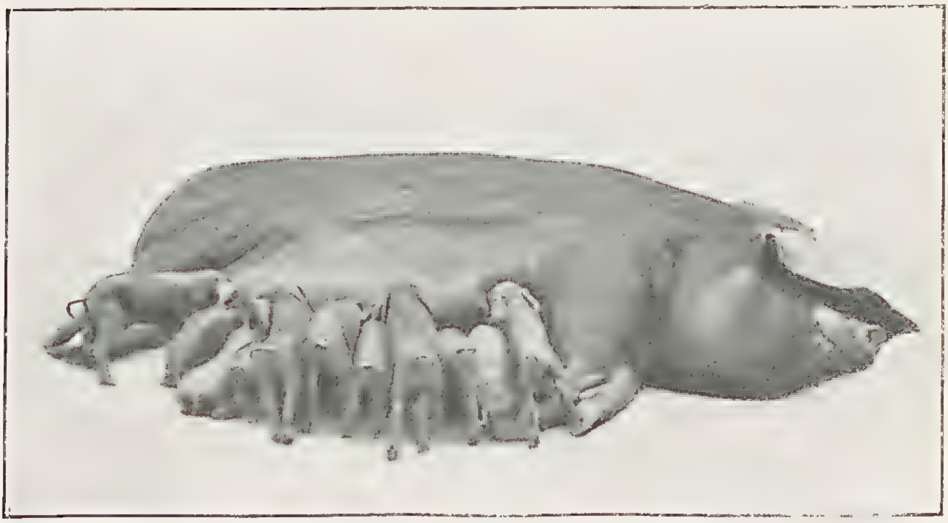
Instances of the Prolificacy of the Large Black Breed.

In a well-known British herd of Large Blacks four sows produced 53 pigs between them, one had 18 pigs, another 13, and two had 11 apiece. A Large Black boar was mated with ten sows and the result at farrowing time was 98 pigs; one sow in her first litter had 13 pigs. Eighty young pigs from eight sows is the experience of another breeder, while still another instance is recorded in which one Large Black sow had 38 pigs in four litters, of which she reared 34. Another in the same herd had 37 pigs in four litters and reared 34. As another authentic example a Large Black sow, four and a-half years old, farrowed a litter of 20 pigs; she had never farrowed less than 12 pigs, and her average litter was 16. At fifteen months old four other sows of this breed out of a famous prize-winning sow farrowed, one had 13 pigs, two had 11 each, and one had 10, all healthy, strong youngsters; altogether 45 pigs from four first litters. Yet another sow in four litters had 39 pigs, rearing 37 of them. It is further claimed that the Large Black sow not only produces large thrifty litters but is able and ready to rear them well.

The abovementioned records are taken from a pamphlet descriptive of the breed as issued by the Large Black Pig Society. Local instances of prolificacy are referred to in the following extract from a letter received from one of the leading breeders of this type in Victoria, Captain H. N. H. Callcott, of the "Wattle herd," Girgarre, Victoria. Captain Callcott writes:—

"With regard to the Large Black breed. I have bred these pigs for a considerable number of years and can vouch for the following qualities:—Firstly, they are very quiet, being exceptionally docile, and the sows make excellent mothers. Secondly, they are quick maturing. These pigs with proper feeding can attain a weight of 140 lb. dressed in five months. Pigs fattened by me in England attained a weight of 227 lb. (dead weight) at seven months and seventeen days of age, and a fat sow went 427 lb. (dead weight) at twelve months of age.

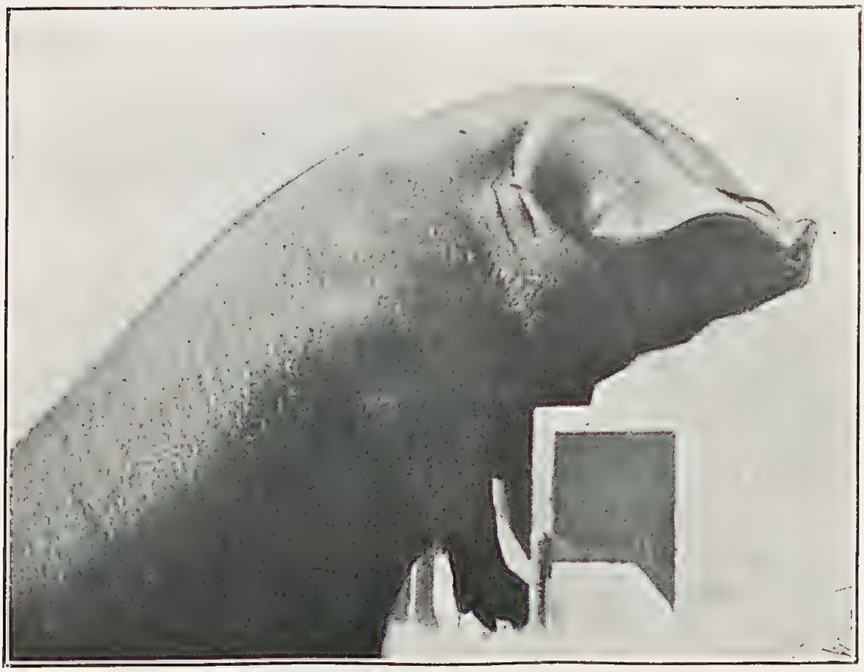
"The Large Black is an excellent bacon pig which has all the qualities required by the curer—*i.e.*, light head, light shoulders, great length and depth, well sprung ribs, and good hams. The pigs are good graziers. They can stand any extremes of climate and thrive under adverse conditions. Our litters are kept on their mothers till they are three months old, and the average weight of the piglets at this age is 55 lb. sows and 60 lb. boars. The boars are large litter getters. Three sows farrowed recently here at Girgarre producing 13, 13, 10, which average 12. One sow had a litter of 22, but this, of course, is exceptional, the average in a herd working out at 12 piglets. As you probably know I fattened two hogs of



Copyright Photo. by Walter Burke, Sydney.]

PLATE 131 (Fig. 6).—LARGE BLACK SOW, "BRENT GRACE," No. 4540 (IMPORTED). A TYPICAL MATRON.

She farrowed 47 pigs in three litters, and was the property of Mr. Herbert Garratt whose stud at Randwick, now dispersed, was for many years a centre of activity in the distribution of pigs in this breed.



Copyright Photo. by Walter Burke, Sydney.]

PLATE 132 (FIG. 7).—WAITING FOR THE BREAKFAST BELL. A TYPICAL LARGE BLACK SOW.

Note character of head and shape and size of ears, and the way they fall over the face and eyes. Characteristic features of the Large Black are docility, prolificacy, contentment, and quick growth.

this breed for the Melbourne Royal Show. These pigs were farrowed on 25th February, 1926, were weaned on 25th May, when they averaged 42 lb. each; they were then brought in and fed. On 12th July, 1926, they were weighed and averaged 142 lb. each live weight, and on 18th August, 1926, were weighed again and then averaged 221 lb. live weight, and were not able to be sent to the show on account of overweight. They therefore averaged 221 lb. live weight at five months and three weeks old. Taking into account that the bacon pigs in Queensland are desired to be of a lighter weight, the weights required could be comfortably acquired in five months.''

Captain Callcott states that it may interest readers to know that the Large Black Pig Society is the largest single pig society in the world, the number of registered Large Black pigs in England being greater than any other breed.

Queensland breeders of Large Blacks are at present very limited in number as this breed has not yet been introduced except by the two breeders, Mr. Geo. F. Davison, of North Arm, who has one boar and sow and a number of young pigs, and Mr. F. Muston, of Taabinga road, *viâ* Kingaroy, who has a Large Black sow. In each of these cases the breeding stock were secured from Captain Callcott's herd, Mr. Davison's pigs being the property of his son George, a member of one of the pig clubs to whom Captain Callcott had donated a Large Black boar.

Local experience therefore of the modern Large Black is practically nil. Mr. Davison's sow farrowed a first litter of nine a few days after arrival from Victoria and reared the lot, a tribute to her quality considering she had a long rail journey and sea trip during the period she was carrying her litter.

We do not, of course, recommend the use of the Large Black breed pure except for stud or for cross-breeding purposes, as our markets call for comparatively light and prime bacon pigs not exceeding 175 lb. live weight or thereabouts at approximately five and a-half to six months of age. Crosses of the Large Black with the Berkshire, Poland-China, and Middle Yorkshire are recommended, though whether these crosses with us here in Queensland will prove more adaptable or even as suitable as, say, the Berkshire-Tamworth cross, remains to be seen.

Breeders interested are urged to write for a list of names of breeders and for further information to the Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane, Q.

The Standard of Excellence for Large Blacks.

The Council of the Australian Stud Pig Breeders' Society have adopted the following ''Standard of Excellence'' for British Large Black pigs, the breed referred to in this article:—

Head—Medium length, and wide between the ears.
Ears—Long, thin, and inclined well over face.
Jowl—Medium size.
Neck—Fairly long and muscular.
Chest—Wide and deep.
Shoulder—Oblique and narrow plate.
Back—Long and level (rising a little to the centre of the back not objected to).
Sides—Very deep.
Ribs—Well sprung.
Loin—Broad.
Quarters—Long, wide, and not drooping.
Hams—Large and well filled to hocks.
Tail—Set on high, not coarse.
Legs—Short and straight.
Belly and Flank—Thick and well filled.
Skin—Fine and soft.
Coat—Moderate quantity of straight, silky hair.

Objections.

Head—Narrow forehead or dished nose.
Ears—Thick, coarse, or pricked.
Coat—Coarse and curly, bristly mane.
Colour—Any other than black.

STOCK JUDGING.—HINTS TO YOUNG COMPETITORS.

The following hints for competitors in the "Young Judges' Competitions" at agricultural shows have been compiled by Mr. E. J. Shelton, H.D.A., Instructor in Pig Raising, and are likely to be of use, not only to those for whom they are specially designed, but to all breeders when selecting their stud stock:—

1. Be confident. Judges of any class of stock or product must know their business; they must have a clear conception of the standard of excellence aimed at, and a knowledge of the comparative value of each point on which the animal or product is judged.

Remember: The world makes way for the man that knows—the man that knows he knows.

2. Knowledge of your business inspires confidence. Young judges should not be afraid to ask questions on matters about which they are not quite certain.

3. Study the animal or the object you are to judge, and compare its respective points alongside those referred to in the standard of excellence.

4. Practise judging and watch other judges at work as opportunity offers.

5. Study the list of disqualifications or objections to which reference is made in all standards of excellence. Judging is largely a matter of discovering faults or imperfections, and of comparing the seriousness of these faults with the increased value allowed for perfection. Some imperfections develop into disqualifications, some have hereditary tendencies, and tend to reduce the commercial value of the animal or product, some are of a less serious nature, and are not likely to influence the animal's value for show or stud purposes, but it is the animal whose scale of points approaches perfection that realises the highest value, and for which there will be keenest competition if offered for sale.

6. Be careful in filling in your judging cards, judges' book, &c., and be accurate with your figures.

7. Young judges should be prompt in attendance at judging contests, and if unsuccessful in gaining the coveted awards, be a good loser and come up smiling again next time.

8. Carefully note the following:—In judging and selecting pigs, the following points should be specially noted:—

(*a*) Constitution, as noted by general healthy appearance of animal, the quality of its skin and hair, the width between the eyes and ears, the width and depth of chest and body, the strength of the legs and feet, and by the animal's vigor.

(*b*) Pedigree.—For stud purposes, it is essential that the animal's pedigree should indicate careful breeding, that the parent stock were of reliable, vigorous, and unrelated strains, and that, in the case of a sire, he be unrelated to the dams to whom he is to be mated.

(*c*) Type and quality.—Type is important, as indicating the result of careful selection of the parent stock; quality counts for much in the commercial world; quality stock always realise top prices; they pay handsome dividends.

(*d*) Temperament.—Contentment and docility indicate the temperament of the animal. Note the appearance of the eye; a white streak in the eye is regarded as a sign of bad temper.

9. Value your animal. A judge is quite within his rights in asking the approximate value of an animal or its products. Practical experience and knowledge of commerce of the animal are invaluable.

Further details may be had on perusal of the pamphlet "Young Judges' Competitions," available gratis on application to the Department of Agriculture and Stock, Brisbane, Queensland.

THE FARMER WHO DESERVES TO BE POOR!

Thus a Yarwun subscriber (15th May, 1927):—"Any farmer who cannot be bothered to get and read the 'Queensland Agricultural Journal' deserves to be poor all his life."

THE AIM OF HERD TESTING.

The opinion is held by many dairy farmers that testing as at present carried out does not give a true record of a cow's capacity to produce butter-fat, because under normal conditions very few cows produce as much as they could produce if they received all the food they needed. The truth of this must be generally conceded. But no dairy farmer is very hopeful that his cows will get all the food they can consume every day right throughout the year. The advocate of herd testing does not attach any importance to this phase of the question; the chief aim of herd testing is not to record abnormal results.

The advantages of the herd-testing work are briefly as follows:—

1. It individualises each cow, and is the only method of estimating the producing ability of each member of the herd.
2. It tests systems of feeding for milk production.
3. It tests the herd sire through the production of his daughters.
4. It creates higher values for proved cows and their progeny.
5. It shows positively that some system of milk recording and testing is essential to progress.
6. It will direct attention to loss through faulty separating. During last year a dairyman with a large herd discovered a loss of 15s. a day by the herd tester chancing to test the skim milk.
7. Herd-testing Association meetings can be utilised as a means of bringing district dairymen together, when local and general problems can be discussed.

EGG-LAYING COMPETITION.

WORLD'S RECORDS BROKEN IN TOOWOOMBA TEST.

The final results for the single bird were won by Mr. R. Burns, of Warwick, 132 Black Orpington, who finished with 354 eggs in 365 days.

This record exceeds the previous record of 347 2¼ oz. eggs which was laid in the Government test held at Gatton in 1923 and won by the same owner, Mr. R. Burns. No. 132 won the winter test for the heavy section by laying 90 eggs in 92 days, her highest sequence during the test being 165, which she commenced on the 4th of July and finished on the 15th of December. Her weight on entering the test being 5 lb., and on completing the record she turned the scales at 7 lb., and still holding good in feather. At the official weighing of eggs (30th July) her eggs averaged 2.10 oz., and at the termination of her record the eggs weighed 2.25 oz.

PLATE 133.—S. V. B. SHARKEY'S TEAM OF WHITE LEGHORNS.

Team of Three Birds.

The White Leghorn Team No. 28, 29, and 30, won by Mr. S. B. V. Sharkey, of Toowoomba, also created a very fine score, if not a world record also by laying 923 eggs in 360 days; this score exceeds the New Zealand record by 2 eggs and 5 days less for each bird. No. 30 won the winter test for light section with 88, and No. 28 second with 85 eggs. The individual score for each of the birds together with their respective weight of eggs are:—No. 28: 315 2.40 oz. eggs. No. 30: 308 2.06 oz. eggs. No. 29: 300 2.25 oz. eggs.

This team won three silver cups and several of the cash prizes. It is regretted that the committee was unable to test this team out to the full 365 days owing to the entrance of the new birds for the forthcoming test, as they would have added a few more eggs to their very fine record.

SINGLE TEST EGG-LAYING COMPETITION.

Conducted at Toowoomba.

From 1st April, 1926, to 31st March, 1927. Variety, Black Orpington; 1st type; pen number, 132; weight of bird, 5lb; weight of eggs, 2·10oz. on 30th July, 1926; owner, R. Burns.

Day of Month.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	0	1	1	1	1	1	1	1	1
4	1	1	0	1	1	1	1	1	1	1	1	0
5	1	1	1	1	1	1	1	1	1	1	1	0
6	0	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	0	1	1
9	1	1	1	1	1	1	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1	1	0	1
13	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	1	1
16	0	1	1	1	1	1	1	1	0	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1	1	1	1	1	1
22	1	1	1	1	1	1	1	1	1	1	1	1
23	1	1	1	1	1	1	1	1	1	1	1	1
24	0	1	1	1	1	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1	1	1	1	1	1
26	1	1	1	1	1	1	1	1	1	1	1	1
27	1	1	1	1	1	1	1	1	1	1	1	1
28	1	1	1	1	1	1	1	1	1	1	1	1
29	1	1	1	1	1	1	1	1	1	1	..	1
30	1	1	1	1	1	1	1	1	1	1	..	1
31	..	1	..	1	1	..	1	..	1	1	..	1
Total for Month ..	27	31	29	30	31	30	31	30	30	29	27	29
Total to Date	27	58	87	117	148	178	209	239	269	298	325	354
Average per Month ..	27	29	29	29·2	29·6	29·6	29·8	29·8	29·9	29·8	29·5	29·5

Remarks.—Highest sequence during test from 4th July to 15th December equalled 165 eggs. Winner Winter Test (May, June, and July), 90 eggs; also highest score for single bird over all breeds in Test. The weight of the final egg being 2·25oz. Weight of bird at finish, 7lb. I certify that the above figures are correct—J. C. Kables, Supervisor.

H. CUTCLIFFE, Hon. Secretary,

Darling Downs Poultry Breeders' Association, Toowoomba.

INCUBATION.

By P. RUMBALL, Poultry Instructor.

SEASON TO INCUBATE.

This is perhaps the first phase that should be considered. Although incubation may be successfully practised throughout the year, the results obtained from the birds hatched is not always satisfactory. About the best months for hatching are July, August, and Setpember. Heavy breeds hatched in June and light breeds in the early part of October will in some people's hands prove satisfactory. Chickens of any variety hatched in February or early March also thrive, but unfortunately they commence producing during the period of plenty and generally moult at about the same time as birds which have done twelve months heavy lay.

The frequent fault of poultry raisers is to hatch in the latter part of October and sometimes November. Stock hatched then rarely thrive, and also take longer to mature than early hatched birds, with the result that their production period commences with the fall in prices of eggs.

Selecting Eggs for Hatching.

Care in the selection of eggs which are to produce the future layers should be exercised. They need to be selected for (*a*) size, (*b*) shape, (*c*) texture of shell, and (*d*) colour.

Although like does not produce like with any degree of certainty, constant selection along these lines tends to fix the qualities aimed at. Size is undoubtedly an inherited quality and one of the features which has an important bearing on successful poultry raising. Breeding birds should be selected early in life for size of egg, as it is only by this means that a strain of fowls can be built up which will lay a good marketable egg early in their pullet year. Do not be content with just using 2-oz. eggs. Aim at eggs which will average about 26 oz. to the dozen. Although shape does not materially affect the value of eggs, a uniform article is desired for marketing. Shape, however, has a certain influence on successful incubation. With incubators, as a general rule, the higher the tray or eggs the greater the heat, therefore if some plump eggs are set at the same time as rather long thin ones the hatching would be irregular owing to the greater heat received by the roundish eggs, they being higher on the tray. Texture of shell varies considerably with the feeding and general conditions of the stock, but it is also possible for this feature to be hereditary. Apart from this, uniform shell structure makes for improved hatches. Colour is not an important feature in Queensland in regard to sales, but from light breeds white-shelled eggs should be produced, tinted eggs being an indication of impurity of breed.

Keeping Eggs for Hatching.

Eggs for hatching purposes should not be kept for a longer period than ten days. If they were set when five days old better results could be expected than when ten days old. It is however, necessary to keep them sometimes longer than five days and sometimes even longer than ten, therefore they need to be kept under the best of conditions. A uniform cool temperature is desirable, slightly under 60 degrees if possible. The room where they are stored should be dry and not moist. Although fresh air is desirable, direct currents with their drying effect are detrimental to good results. They may be stored on racks or in straw board filters. Where any numbers are to be kept they could be held in egg cases similar to those used for market purposes. The turning of them daily is essential when they are to be retained for any time. This is a simple matter if stored in cases, it being merely necessary to turn the case one side one day and the other the next.

Period of Incubation.—Hen eggs 21 days, English ducks 28, Muscovy ducks 34 to 35, geese 28 to 30, and turkey 30.

METHODS OF INCUBATION.

Incubation may be practised either by natural or artificial means. The necessity of having birds hatched at the most remunerative period and the constant improvement in our commercial breeds of poultry makes it increasingly difficult for the poultry raiser who desired to keep a 100 or so good laying hens to use the broody hen.

Natural Incubation.

The Sitting Hen.—Generally, when the hen is used for incubation she finds her own nest. The best plan is to allow her to continue using it, merely protecting her from rough weather. Her eggs, however, should be removed and replaced with eggs which come from the best of your stock. As she is expected to remain on the nest for a period of three weeks and will not make full use of dust baths, she should have a good dusting with some insect powder to destroy any lice. She should also have another dusting a few days before the chickens are due.

Red mite are possibly one of the most common and irritating parasites which trouble poultry. They multiply very rapidly when unchecked, and a sharp lookout should be kept for their presence, for if allowed to infest a broody hen the irritation will often cause her to leave her nest. Scaly leg is also a condition which is undesirable in the broody hen. The number of eggs to be used will naturally vary according to the size of the hen. The hen turns the eggs under her at frequent intervals, and when there are too many for her to cover properly those that get on to the outside of the nest will become chilled, resulting in the destruction of the embryo. The hen should be fed exclusively on a grain ration and have plenty of grit and water available. The best results will then be obtained by leaving her as much as possible to herself after giving attention to the foregoing particulars.

Artificial Incubation.

There are many reliable makes of incubators on the market which are sold with instructions for working. These instructions should be followed by the operator as they are prepared after tests made by the manufacturer. There are, however, features which apply in a general way to most makes.

Location of an Incubator.

The incubator should be set up in a room in which there is as little variation in temperatures as possible. If a special room is to be built it should have two roofs with a space of 5 inches or 6 inches between them. The outer overhanging several feet on all sides. This is better than a good ceiling as it allows of a constant current of air and at the same time keeps the direct rays of the sun off the walls. Ventilation should be provided by windows in the walls and vents in the inner roof. These can be operated according to the number of machines working in the room and the outside temperatures. Direct drafts, however, should be avoided. Where it is not desired to go to the expense of building a special incubator room, an enclosure can be made under the majority of the dwelling houses in Queensland. If it is situated under the centre of the house it is well protected from the sun, and the temperatures are therefore fairly uniform.

Heating of Incubator.

The majority of incubators are heated by kerosene lamps. The lamp should always be thoroughly cleaned, the burner boiled in soda water, and new wicks used for every hatch. In starting do so gradually. If a large flame is used for a start with the idea of heating the machine quickly it frequently leads to the smoking of the lamp. A good grade oil should always be used, and in adjusting the flame turn a little higher than required and then reduce to the desired height. This ensures that there will be no running up of the wick.

The lamp should be cleaned and filled early in the afternoon. By doing this all char of the wick is removed, giving greater heat during the cold night and at the same time it gives the operator the opportunity of making sure that the lamps are correctly adjusted before retiring for the night. Do not trim the wick with scissors, use a match to rub off the charred crust, and thoroughly clean the hands before handling eggs, otherwise the eggs may become smeared with oil with the resulting injury to the growing embryo.

Beginning the Hatch.

Heat up the machine a couple of days before it is desired to set eggs, and after the machine is thoroughly warmed up commence to adjust the regulator until the temperature remains steadily at 102 degrees Fahr. with the bulb of the thermometer on a level with the top of the eggs. When the operator is sure that the regulator is correct the eggs can be set. This is better done in the morning so that the eggs will become warm and the machine again regulated before retiring. When the eggs are placed in the machine the temperature will drop, but the regulator should not be interfered with. All subsequent regulation should be done by the adjustment of the flame. Do not place too much work on any system of regulations; it has its limit of capacity to adjust temperature.

Thermometers.

All thermometers should be tested at convenient intervals. This can be done by any person having a clinical thermometer by placing the clinical and incubator thermometers in a basin of warm water gradually increasing the temperature until the clinical thermometer registers 102 degrees and observe the temperature of the incubator thermometer. If the latter registers a degree or so either way, allowance should be made by the operator for this discrepancy. Incorrect thermometers have been responsible for many poor hatches, and even though a new machine is just purchased do not take it for granted that the thermometers supplied are correct.

Temperature.

Temperatures are controlled by capsules or thermostat. Occasionally these get out of order by the former leaking and losing some of the liquid content or by the latter becoming bent. These should be examined particularly when regular temperatures cannot be maintained to ascertain if they are in correct working order. The temperature should stand at 102 to 102½ during the hatch when the bulb of the thermometer is hung as previously stated. During the latter period of the hatch (the last two days) the temperature may run up to as high as a 104 degrees. This need not worry the operator as it is caused by the additional animal heat from the live embryo.

Turning.

Begin turning the eggs at about forty-eight hours after setting, and continue to do so twice per day until the nineteenth day unless the eggs are starting to pip. When the eggs are placed in an incubator tray, they should be placed on an angle of about 45 degrees large end up. To turn these it is necessary to handle every individual egg, but after testing and the infertile eggs are removed, they can easily be gently rolled around with the hand. A complete turn is not necessary, it being sufficient only to alter the position of the egg to prevent the germ sticking to the inner lining of the shell.

Cooling.

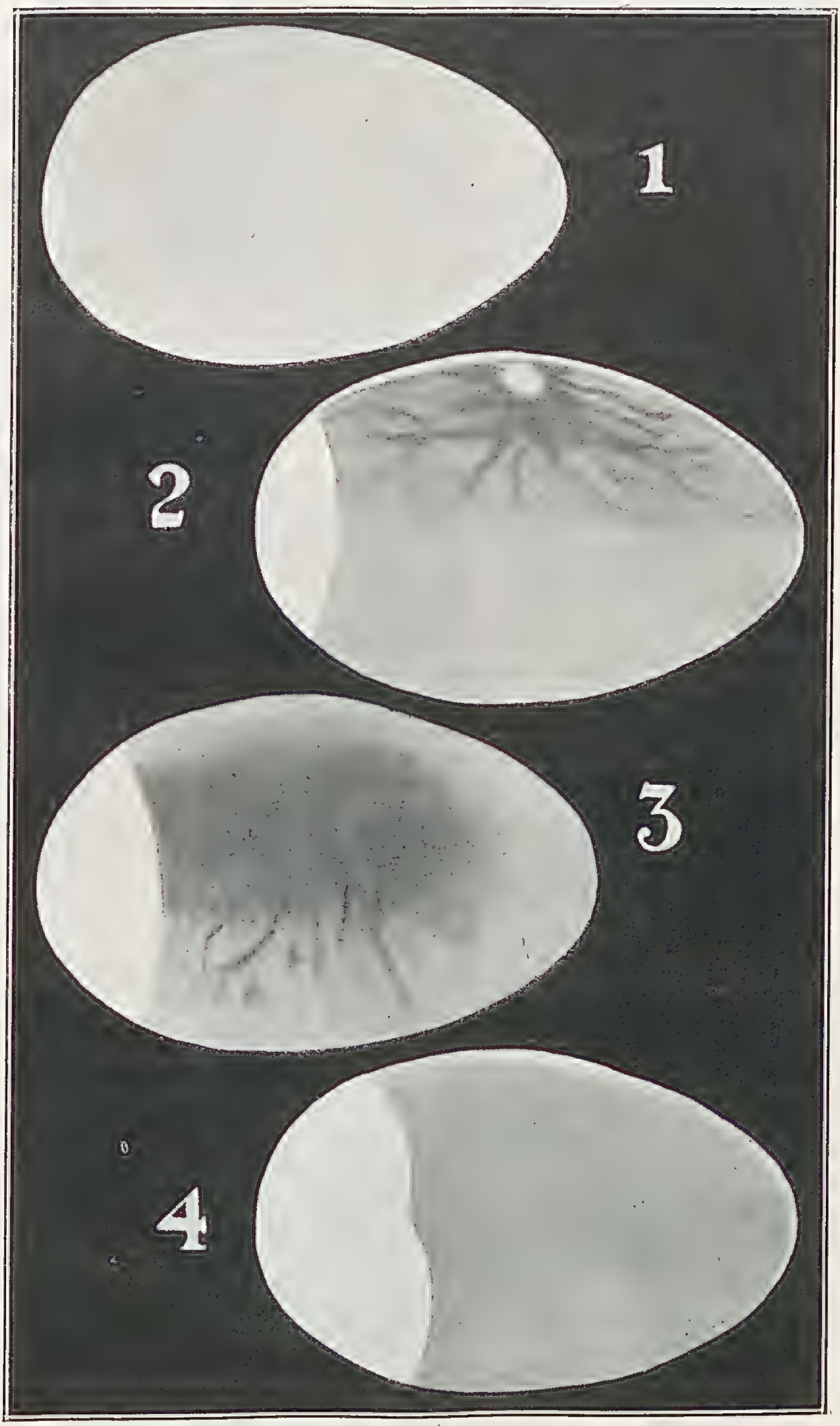
The cooling of the eggs is merely another method of giving the eggs a thorough airing with the consequent strengthening of the embryo. The necessity of airing varies with the make of the machine owing to the variation in the supply of ventilation. It is, however, important to remember that for the first seven days very little airing is required. The time taken in turning the eggs from the third to seventh day is usually enough airing. After this period the eggs can be kept out of the machine until all burning heat has left them. The period necessary will vary according to the length of time the eggs have been in the incubator, but after returning the eggs to the machine the temperature should have reached the desired height within an hour. In airing, place the tray of eggs on a table. Do not allow a portion of the tray to overhang, otherwise some may become chilled owing to the greater circulation of air. Airing should be practised up until the nineteenth day, but if eggs are then chipping they should not be aired.

Testing.

This should be done on the seventh day. It can be done at an earlier stage but the time necessary to do this work may result in chilling, and also the germ is not so easily distinguished particularly in dark-shelled eggs as on the seventh day. All infertile eggs and dead germs can now be removed. To test, a piece of cardboard having a hole in it similar in shape to that of an egg but a trifle smaller should be held between a lamp and the egg to be tested. An infertile egg will be perfectly clear, a fertile egg will have a dark movable spot about the size of the head of a match with numerous blood vessels radiating from it, while a dead germ will show as a blood ring or streak and generally stationary.

Ventilation and Moisture.

These are both interlocked. If a machine has a rapid circulation of air through it, it will require more moisture than a machine in which the circulation of air is slow. The reason why moisture is supplied is to prevent a too rapid evaporation of the moisture content of the egg. Undue evaporation of the egg content is detrimental to good hatches and to correct development of the embryo. Enlargement of the air cell naturally takes place due to evaporation of the moisture content and the escape of carbon dioxide through the shell. This enlargement can easily be judged when testing, and if too great restrict the air circulation or increase the moisture content of the air. Many machines are supplied with moisture trays. These trays



From "Artificial Incubation and Brooding."]

PLATE 134.—TESTING EGGS FOR FERTILITY.

(*For Description of Plate, see page* 546).

should be filled from the first of the hatch and refilled at frequent intervals. Where moisture trays are not supplied the air which passes into the machine is charged with a certain amount of moisture. To charge the air with moisture for this variety of machine the floor should be well wetted daily. Good ventilation is equally essential for the growth of the chicken within the egg as it is for the development of the chick when hatched. Without oxygen the changing of the egg content into a lusty chicken is impossible. If a fertile egg is examined on the seventh day a network of blood vessels can be seen near the shell and near the air cell. The blood stream not only converts the food into the embyro but it carries off the waste product (carbon dioxide), and without a good circulation of air this poisonous gas is not removed sufficiently fast, and consequently has a weakening effect on the developing embryo. It will be understood that the more advanced the embyro is the greater is the need of oxygen and the greater will be the amount of carbon dioxide given off; therefore, what will be the correct ventilation for eggs, say, a week old will not suffice when the eggs are in the third week of development. The increasing of the ventilation at this period will also assist in the regulation of the temperature of the incubator. Again, when the chicks hatch the ventilation should be increased, and if the chicks still pant the door of the machine could be slightly open and fixed in that position.

The Hatch.

After the last turning, on the nineteenth day, close the incubator and do not disturb it until the hatch is over. When the chicks have dried off give all the ventilation possible, darken the doors to prevent them picking at droppings or the toes on one another. It is as well to let them remain under this condition for about twenty-four hours, when they should be removed to the brooder. In doing so take every precaution to prevent them being chilled, as chills at this stage would prove disastrous.

Disinfection.

Immediately the chickens have been removed from the machine it should be thoroughly cleansed and disinfected. A good disinfectant is formalin. Any other good coal tar disinfectant may be used. The machine should then be closed up for a while to induce the fumes to penetrate every crack and corner, then allowed to dry and aired thoroughly before being used again.

DESCRIPTION OF PLATE.

1. New-laid egg, small air-cell and transparent.
2. Fertile egg, seven days' incubation.
3. Fertile egg, fourteen days' incubation.
4. Fertile egg, nineteen days' incubation.

It will be noticed that the air-cell increases during the period of incubation Operators should take this plate as a guide to normal development.

PLATE 135.—THE DUKE OF YORK'S BRISBANE ESCORT. A TROOP OF QUEENSLAND MOUNTED POLICE.

The magnificent chargers were bred at the Queensland Police Remount Station, Rewan.

QUEENSLAND AGRICULTURAL COLLEGE.

STUDENTS' ACTIVITIES.

The subjoined notes on life and work at the Queensland Agricultural High School and College, supplied by the students themselves, have, it is thought, an especial interest for all concerned with agricultural education and progress.—ED.

Much water has flowed along the bed of the Lockyer since the establishment of the College and, with the exception of a short period in 1913-14, no attempt has been made to record the activities and life of the institution.

Through the generosity of the Editor of this Journal, space has now been made available for us to record the doings of the College.

The commencement of the year saw the establishment of the Faculty of Agriculture, and the College was honoured by the appointment of the Principal as first Professor. We congratulate Mr. Murray on his appointment and feel sure that the destinies of the Faculty are in good hands and that Queensland will benefit by having a steady stream of trained men in her midst who will be fitted to solve some of the many problems that face the agriculturist.

The Easter Tractor School.

During the Easter vacation a school of instruction was held for the benefit of farmers interested in tractors. Queensland was the first State to recognise the importance of tractor or power farming, and the attendance at the school proved that there is a demand for vocational education. The tractors in use were:—Fordson caterpillar, Fordson wheel tractor with a rototiller attached, Hart Parr, McCormic Deering, Fitch, Twin City, Case, John Deer, and British Wallis.

In the course of the day lectures were delivered by the Principal and staff, and the evenings were filled in with lectures and educational pictures projected by the College cinematograph.

Question time (7 to 7.30) was always an interesting time, and many were the posers put by the farmers. Much information was gained through the answers to these questions, and we venture to think that this was the most profitable time spent during the course. In the afternoons the students were divided into groups and taken to the paddocks to learn to drive and handle the several types of tractors. A dance was held in the course of the school and proved very popular. At the conclusion of the school an enjoyable picnic was held at Glenore Grove, at which various sporting events were decided. We feel sure that the farmers who attended the tractor school had an enjoyable as well as an instructive time.

Before leaving they presented the College with a substantial cheque for the purchase of some memento of the fourth tractor school. This generosity showed in a tangible form that the farmers appreciate the work that is being done by the College.

Office Bearers, 1927.

Senior Prefect: R. J. McAllister.

Prefects: T. G. Graham, J. C. Spencer, W. P. Hamon, R. H. Grigg, R. K. Palmer, W. G. Steele, H. C. Stephens.

Cricket Captain: W. Nixon-Smith.

Cricket Committee: W. Nixon-Smith, A. M. Himstedt, A. Nixon-Smith.

Tennis Captain: W. G. Steele.

Tennis Committee: W. G. Steele, R. K. Palmer, A. Wallace.

Shooting Committee: R. J. McAllister, J. C. Spencer, W. P. Hamon, W. Nixon-Smith, H. Smith, O. Pommer.

Editor, Old Boys' Column: C. S. Christian.

Football Captain: W. Nixon-Smith.

Football Committee: W. Nixon-Smith, A. Nixon-Smith, R. J. McAllister.

Magazine Editor: T. G. Graham.

Magazine Secretary: W. P. Hamon.

Magazine Committee: R. J. McAllister, J. C. Spencer, T. G. Graham, W. G. Steele, W. P. Hamon, R. H. Grigg, R. K. Palmer, H. C. Stephens.

Dance Committee: R. J. McAllister, J. C. Spencer, T. G. Graham, R. K. Palmer, W. G. Steele, R. H. Grigg, W. P. Hamon, H. C. Stephens.

Colours Awarded, 1926.

Football: R. McAllister, W. Nixon-Smith, A. Nixon-Smith, C. Schroder, J. Spencer, T. Graham, I. Williams, N. Copeman, O. Pommer, P. Hamon, V. Brimblecombe, J. Ferguson, F. Benham, L. Pottinger.

Cricket: C. Christian, C. Schroder, J. Ferguson, G. Sigley, T. Graham, P. Hamon, A. Pepper.

Tennis: A. McKenzie, W. Aplin, R. Palmer, C. Christian.

Athletics: C. Schroder, D. O. Atherton, T. Graham, R. McAllister.

Winner of Senior Cup: C. Schroder.

Winner of Junior Cup: A. Himstedt.

Shooting: A. F. Moodie, J. Harvey, L. Pickles, P. Hamon, J. Spencer, I. Williams.

Cup Winner: A. F. Moodie.

The Duke's Visit to Gatton.

On the morning of the 6th April the staff and students journeyed to Gatton to take part in the reception to Their Royal Highnesses the Duke and Duchess of York The students were drawn up in their respective years with the staff in front and the veterinary section under Sergeant McAllister on the left. Time limited the formalities. Their Royal Highnesses inspected the school children and the mothers of fallen soldiers. Our Principal was presented to the Duke, who complimented him on the parade.

The Toowoomba Camp.

This year the veterinary corps again journeyed to Toowoomba for their annual training in camp. After a fortnight's training, the nine new recruits were equal to the old hands, and on the morning of the 8th March the corps turned out in good form under Major McKenzie, Sergeant McAllister, and Lance-Sergeant Hamon.

The corps camped in Newtown Park with the 11th Light Horse Regiment and carried out veterinary work and general camp drill.

Four of the corps passed examinations for corporal, and the general work of all was highly commended by the Colonel.

Judging at the Toowoomba Show.

Several members of the fifth year visited Toowoomba during the Show and participated in the young judges' competition. The results were—

Berkshire boar: R. J. McAllister 2nd, J. Spencer, R. Price P. Hamon 3rd, and T. Graham 4th.

Dairy cattle: R. J. McAllister 2nd.

Social and Other Activities.

The social side of life is not neglected at the College and all tastes are well served. Football is the most popular sport at present. In the 1926 season the team met with decided success, being defeated only on one occasion. There is the disadvantage of not being able to affiliate with the Secondary Schools Association, but nevertheless non-competitive games are played with the several schools, besides other outside teams.

"A VALUABLE JOURNAL."

Writing (19th May, 1927) to renew his subscription a Pomona farmer says:—"I might say that there is a lot of useful information to be gained from reading this valuable publication (the 'Agricultural Journal')."

FARM TRACTORS AND TRANSMISSION.

By E. T. BROWN.*

It is not altogether an easy thing to start up a large tractor at any time, but the job is rendered much 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, because otherwise the engine may backfire with serious results to the operator. In this connection references may be made to a new safety device that has recently been introduced. It is so constructed 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. As 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.

The Tools—Where are They?

During my recent tour of the country I have, on more than one occasion, lent a hand in overhauling a farm tractor. This is work that appeals to me, but I must confess that I like to do the work in a proper fashion. More than once I have been assured by the tractor owner that he possessed a complete kit of tools, but when they were required the most inportant tools were generally hidden away in some unknown place. On the chance that some of you are in the same position, may I give you the same advice as I gave verbally to those people I met? It is quite simple, but it certainly makes for better and more comfortable work. It is this: Keep your tractor shed, or the special shop which you have for the purpose, tidy. It is only when you are in a hurry that you are likely to require any special tool or spare part, and this is just the occasion when you cannot afford the time to look for anything. Have racks on the walls on which to hang your tools, and have a number of pigeon holes for storing all of the many small parts, such as nuts, bolts, washers, screws, &c., which you are bound to keep on hand. Then, when anything is required, you will be able to lay your hand on it at once. It is only a small matter, but you will speedily realise how convenient it is to have your workshop tidy and orderly.

The Needle Valve.

One of those small parts of the engine that can decrease the efficiency of the outfit very considerably is the needle valve of the carburetter. The needle valve is constantly working when the engine is running, and in course of time its seating becomes worn and, perhaps, pitted. When this happens there is always a danger that the carburetter will flood, that is, a too large supply of fuel will enter the float chamber. This may be so bad that the fuel flows out, in which case it is wasted. If the flooding occurs suddenly it may be, of course, that a tiny atom of grit or dust has found its way into the valve, in which case a few turns of the needle between the thumb and finger will generally remove it. If the valve requires grinding-in it can be done very easily, although it is a rather tedious job. A little valve paste or crocus powder and oil should be smeared on the seating and the needle, and the latter turned in its seating until the defect is remedied. A good seating is essential if the carburetter is to work properly.

Oil Level in the Gear Box.

In a great many makes of tractors the transmission is by means of a series of toothed wheels contained in a gear box and running in oil. To secure easy and silent running it is essential that the level of the oil in the gear box should be

* In the "Farmer and Settler."

maintained more or less constant, and to this end the box should be inspected from time to time. It is not necessary to make the inspection very frequently, but it should be done about once every three months. The only time when it is advisable to do so more often is if it be noticed that the oil is leaking at all. The best results are obtained when the oil reaches to the centre of the highest shaft in the gear box, as then it will be certain that all of the gear wheels will be properly lubricated. Special gear oil should be used exclusively, because no other oil is suitable for the purpose. Even this, however, may get rather on the thin side during a spell of very hot weather, in which case it will require to be thickened. The best way to do this is to add a little grease—the quantity being that amount which will bring the oil to its original consistency. If too much be added the oil will become so thick that the gear wheels will cut paths for themselves and these will fail to fill in; hence the wheels will suffer.

OILING THE OUTFIT.

It is surprising what a large number of tractor owners and operators cannot quite understand why it is so essential to pay such strict attention to the whole subject of lubrication, whether of the engine itself or the various working parts. And yet the reason is a very simple one, indeed. It amounts to this: Whenever two surfaces rub together friction is set up. The heat generated by friction causes the surfaces to wear away rapidly, but, moreover, the heat would prevent the movement of the surfaces in a very short while.

The whole object of lubricating the working parts, as they are called, is to cover the surfaces in contact with a thin film of oil so that friction will be reduced, the heat dispelled, and wear reduced to a minimum. Once fail to maintain this film of oil on each and every part, whether it be the big ends of the connecting rods, the crankshaft bearings, the gear wheels, or the wheels, and you will very quickly realise your mistake, because your repair bill will mount by leaps and bounds. The damage that is done by want of oil is always expensive to make good, and you may very easily run yourself in for a big account by neglecting the simple yet necessary precaution of keeping all parts properly oiled or greased. It does take a certain amount of time to fill up all the grease cups and the oilers, especially as so many of these are in inaccessible places, but it is work that has to be done if the outfit is to prove efficient and to have a long life.

Systems of Engine Lubrication.

The lubrication of the engine is the easiest part of the whole business.

Fortunately for the tractor operator the various systems for lubricating the engine in use to-day are automatic in action. As long as the oil reservoir is kept filled, the pipes free from foreign matter, the strainer clean, the oil in the sump renewed as occasion demands, and the feed mechanism in proper working order, all will go well. This sounds a lot, but it is really nothing, since very little does and can go wrong in these various directions. Sufficient oil is supplied to the engine for its requirements, whether it be working at full speed or at a lower rate. As a general rule a quantity of oil is contained in the lower half of the crank chamber and by a small mechanically-operated pump it is forced to the big end and other bearings. As the oil drips from the big end the movement of the crankshaft throws the oil on to the wall of the cylinder and thence it permeates throughout. It returns eventually to the oil sump in the base to be used again. Some engines are lubricated by what is known as the splash system. In this case the oil is fed automatically to the sump by the action of a pump. A dipper is attached to the lower part of the big end and as the crankshaft revolves a small quantity of oil is scooped up and flung over the bearings and on to the walls of the cylinder. This is a simple method, and as long as the pump is working properly there is practically nothing that can get out of order. With many makes the oil on its way to the base is made to pass through a glass tube on the dash, or elsewhere in sight of the driver, so that it can be noted instantly if anything goes wrong with the pump.

The Oil to Use.

There are many drivers who pay really strict attention to the proper lubrication of their outfits, but even then fail to obtain the best results.

This is due almost entirely to the fact that they are not so careful in selecting the right oil for their special machine as they are in using it.

Whatever oil is employed must be suitable for the machine that is being used.

There are many excellent lubricating oils on the market to-day, but each one is prepared for a definite type of tractor. An oil may be excellent in every way, but this does not say that it is the best oil for your outfit. The importance of this subject is so little appreciated that it is one of the commonest things for tractor owners to order so many gallons of oil without ever specifying what kind is required. They accept any lubricating oil that is given to them, irrespective as to its suitability or not. Use the oil that is recommended by the maker of your tractor, but, failing this, get into touch with a firm that specialises in tractor oil, tell them definitely the type and make of your machine, the system of lubrication, the normal crankshaft speed, and the horse-power. Such a firm will then advise you and you can rely upon obtaining an oil that will give absolute satisfaction in every way.

The cost of a high-grade oil is a little more in the first place than that of a low-grade lubricant, but, seeing that much more of the latter is required and that it cannot withstand the heat so well, it is very much cheaper in the long run to secure the best procurable. The efficiency of the engine will be increased and the wear and tear of the working parts considerably reduced by using a suitable high-grade oil.

Brake Adjustment.

Most tractors are fitted with internal-expanding or external-contracting type of brake. Each is easy to adjust, and should be set in such a way that there is no friction when the brake is not being used, yet it should grip well when it is applied. From time to time it may be necessary to reline the shoes, but this is quite a simple job, and any good amateur can manage it. The best lining to employ is that made of asbestos and brass wire woven together, and this can be obtained from any motor store or garage. Holes should be drilled in the fabric to correspond with the holes in the shoes and copper rivets should be employed. The holes must be countersunk so that rivet heads will sink well into the fabric. Inattention to the brakes may result in a serious accident, and thus they should always be kept correctly adjusted.

SALT FROM SEA WATER.

NEW QUEENSLAND INDUSTRY AT BOWEN.

Common salt is the most important product obtained by the evaporation of sea water, some being prepared in almost every country in the world. White salt is usually a cheap product. It is essential for human life, and therefore its manufacture is always of importance. The establishment of salt works at Bowen has a special interest for graziers and other large users of salt in Queensland. As a new secondary industry that will help to improve the local market for primary products, it is not without interest to the farmer either. The essentials for the manufacture of salt from sea-water by solar evaporation are suitable clay flats close to the sea and high evaporation.

Bowen has both of these. There evaporation is the highest on the eastern coast of Australia, and the clay pans being worked by Bowen Salt Limited, the operating enterprise, are adjoining the town boundary, close to the railway and electric power station, from which the required power is obtained.

The process of manufacturing salt from sea-water is as follows:—Sea-water is pumped by an electrically-driven pump at the rate of 300,000 gallons per hour into the first of five large evaporating areas, from which it is gravitated slowly from one to the other, the flow being controlled by suitable sluice gates. On reaching the last area the saturated brine is lifted by another electrically-driven pump into the crystallising areas, of which there are fifteen. In these areas the brine stands until all the commercially pure salt is deposited, when the mother liquor is drained off, the salt lifted into sacks, and hauled by a kerosene tractor to the stacking plans. The salt is washed and elevated into a large stacking shed, then crushed to a requisite size, bagged, and placed on trucks at the works siding for transit.

The company was inaugurated and works laid in 1926, and was successful in producing 500 tons of high-grade salt during the last weeks of the 1926 season; this was something like a record in solar salt production in Australia.

The equipment of this salt pan and its subdivisional areas, together with the necessary plant, machinery, stacking shed, and railway siding, may now be said to be complete and everything in readiness for the first full season's operations, which have already commenced. It is expected that at least 10,000 tons will be produced. This will be disposed of, either as coarse salt required by numerous industries, particularly meat works and butcheries, or as salt lick for sheep and cattle.

The site selected for the works and refinery is alongside the main railway line from Brisbane to Townsville, half a mile from the Bowen railway station.

Bowen possesses one of the finest natural harbours on the coast of Australia, and it requires no dredging. Some of the largest vessels trading to and from these shores, registering up to 12,000 tons, now berth without any difficulty alongside the coal wharf. For loading purposes for export an electric transporter crane is available with a capacity of 20 tons per lift. This crane is the largest in the Southern Hemisphere.

The Bowen coalfields are only 51 miles from the works. The rich deposits of coal are practically inexhaustible and the quality beyond question, and these should have an important bearing on industrial development in Northern Queensland.

PLATE 136.—EVAPORATING AREA, BOWEN SALT WORKS, NORTH QUEENSLAND. LARGE STORAGE SHED IN RIGHT BACKGROUND.

PLATE 137.—A NEW QUEENSLAND INDUSTRY. SALT WON BY SOLAR EVAPORATION, BOWEN SALT WORKS.

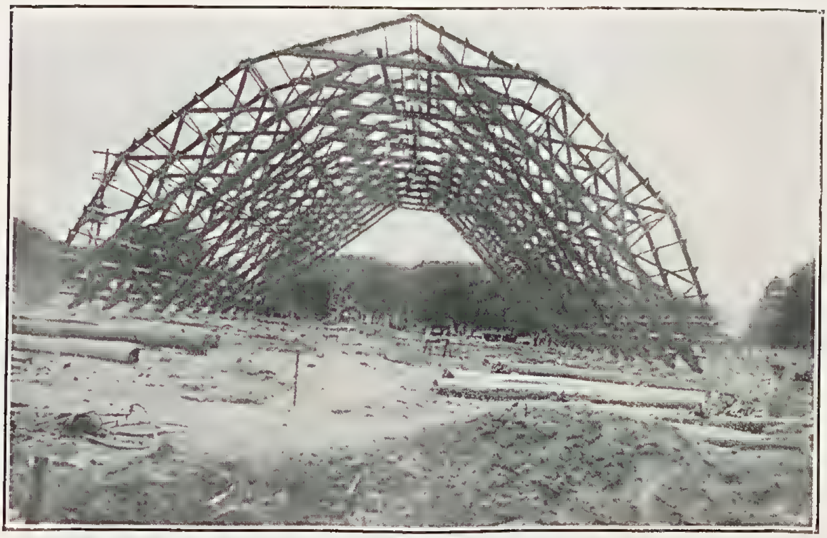


PLATE 138.—THE LARGE STORAGE SHED AT BOWEN SALT WORKS.
Showing details of construction, which is of wood on concrete base; capacity, 7,000 tons.

PLATE 139.—PUMPING STATION, BOWEN SALT LIMITED, BOWEN, NORTH QUEENSLAND.

Answers to Correspondents.

Clay Soil Treatment.

M. McE. (Gayndah)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises an application of about ¼ lb. of air-slaked quicklime broadcasted and slightly hoed under should make the clay more crumbly. Afterwards apply plenty of leaf mould or stable manure to increase humus contents and make the soil looser.

BOTANY.

The Government Botanist, Mr. C. T. White, F.L.S., addressed the following replies to correspondents in the course of the month. They are selected from a heavy mail because of their general interest.

Western Plants Identified.

M. McE. (Gayndah)—

J.E.T. (Longreach)—Determinations of additional specimens:—

12. *Boerhaavia diffusa.* Tar Vine or Sticky Weed.
13. *Salsola Kali.* A Roly Poly.
14. *Euphorbia eremophila.* Bottle-tree caustic.
15.
16. *Acacia homalophylla?* Boree.
17. *Euphorbia Coghlani.* Caustic bush.
18. *Corchorus olitorius.*
19. *Andrachne Decaimei.* Family Euphorbiaceæ.
20. *Rhynchrosia minima.* Family Leguminosæ.
21. *Ipomœa reptans.* Wild Potato.
22. *Chenopodium auricomum.* Blue bush.
23. *Sesbania ægyptiaca.* Both this and *S. aculeata* are known throughout the West as "Sesbania Pea."
24. *Aristida Behriana?* Feather Cap. A 3-pronged spear grass. The Australian grasses belonging to this genus are but poorly classified; they are at present being monographed by a specialist, and when his account is published we may be able to give specific determinations with greater certainty.
25. *Cyperus* sp.
26. *Andropogon intermedius.*
28. *Aristida leptopoda?* See note under No. 24.
29. *Pappophorum avenaceum.*
30. *Tragus racemosus.* Small Burr Grass.
31. *Panicum divaricatissimum.*
33. *Eragrostis leptocarpa.*
34. *Chloris pectinata.* Star Grass or Umbrella Grass.
35. *Panicum crus-galli.*
36. *Eriochloa punctata.*
37. *Tribulus terrestris.* Caltrops or Bull-head. The latter name I might say is applied in Queensland to a number of burr plants.
38. Two plants were in this envelope. The one identical with No. 12 the other with No. 37.
39. *Ventilago viminalis.* "Supple Jack" or "Vine Tree."

"Indian Laburnum" or "Golden Shower."

L.B. (Kulara, N.Q.)—

The specimens represent *Cassia fistula*, the "Indian Laburnum" or "Golden Shower," a native of India and Ceylon, widely grown throughout the tropics and sub-tropics as an ornamental flowering tree. In Queensland the long pods are known as "Cascara Beans," but cascara of commerce is, of course, the product of a very different tree.

Whitewood Foliage as Stock Food.

INQUIRER (Brisbane)—

The specimen of "Whitewood" forwarded by you some time ago was too small for analysis. In the course of the reply, which dealt mainly with Gidyea poisoning, we said:—

"A specimen of Whitewood was handed over to me at the same time. It is *Atalaya hemiglauca,* known universally throughout Western Queensland as "Whitewood." It is a good fodder but the young shoots are said to give horses the staggers. This, however, is a question on which we have no very definite information."

It is rather a strange fact that only in Central and North Queensland is Whitewood accused of causing staggers in stock. The tree is abundant throughout Western Queensland and New South Wales, but one never hears of the Southern trees as the cause of any trouble though it is freely fed on everywhere by horses, sheep, and cattle.

"Potato Bush."

N.P. (Townsville)—The three specimens proved to be:—

A. *Andropogon fragilis.*

B. *Andropogon filipendulus.*

C. *Solanum esuriale.* "Potato Bush." Regarding this last I may say it has several times been accused of being injurious to stock. We have no very definite information about the plant, however, based on feeding or other tests. Until tested, practically all species of Solanum can be looked on with suspicion.

Poisoning of Noxious Weeds and Grasses.

E.C. (Bundaberg)—Your inquiry was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises:—

In Hawaii an arsenical solution, containing 3½ lb. of arsenic and 1½ lb. of caustic soda in 100 gallons of water, is used as a spray for killing weeds in sugar-cane crops. This spray is particularly effective for young succulent weeds, but does not eradicate couch grass or nut grass. The quantities used are so small that there is little danger of poisoning the soil and sugar-cane. Of course, any spray falling on sugar-cane will kill the leaves, and therefore care must be taken not to spray the cane. Stray stock eating the poisoned weeds might be killed. The spraying is economic if the weeds are killed in their youngest stages of growth.

Arsenic pentoxide, sold by the Prickly-pear Commission, could be used successfully, and dissolves readily without caustic soda, and as this poison is sold at 3d. per lb., the solution of about 4 to 6 lb. per 100 gallons would be very cheap.

"Khaki Weed."

C.R.D. (Proserpine)—

No. 1.—*Alternanthera Achyrantha.* The Khaki Weed. This has become a serious pest in some districts. It is extremely difficult to eradicate, due to practically every bit of the stem being capable of forming a new plant when cut.

No. 2.—*Tridax procumbens.* A very common weed in Coastal Queensland. We have not heard a local name given to it. It is a native of Tropical America, but is now widely distributed as a weed over the tropical regions of the globe. Apart from its aggressive character as a weed it is not known to possess any harmful properties.

A Weed Spray.

INQUIRER (Cooroy)—

The Agricultural Chemist (Mr. J. C. Brünnich) regarding the mixing of arsenic and caustic soda advises:—

For poisoning succulent weeds spray with a solution of 4 lb. of arsenic dissolved by the aid of 1½ lb. of caustic soda in a few gallons of water to make up to 100 gallons. The amount of spray used is so small as not to injure the soil. Washing soda is just as dangerous as caustic soda when used in larger amounts. Grass is not permanently destroyed by this spray.

SHEEP AND WOOL.

Following are selected replies to correspondents by the Instructor in Sheep and Wool, Mr. W. G. Brown, in the course of the month.

Sheep Ailments.

J.R. (Bungunyah)—

The matter of the sheep standing with head high and partially blind points to one or two causes for same. The paddy melon vine is reputedly a poisonous plant, and, personally, I have seen many sheep go blind from eating the plant or the paddy melon fruit, but I have never seen any die from eating it.

In the second case submitted, this matter of the swelling on the face, ears, and lips has been a common occurrence in the Southern districts this year. I believe it to be dietetic or something which they have eaten. The effect of cyanide is sudden death, and I doubt if it is a mineral or any other poison of that kind. It is quite possible that the caustic weed is to blame; it is very plentiful this season.

In regard to the third case where sheep died while being crutched, this is a common thing in very hot weather or if the sheep be bumped on its breech with a stomach full of grass. Sheep, like other animals, which include human beings, sometimes die suddenly from heart failure.

"A MOST USEFUL PUBLICATION."

A Proserpine farmer writes (6th *May,* 1927):—*"I think the 'Agricultural Journal' is a most useful publication to the man on the land. I read mine over many times."*

TE 140.—PORTION OF TYPICAL NORTHERN FARM—THE WOODLANDS—BOWEN, NORTH QUEENSLAND

General Notes.

Tropical Plant Supply.

The Agri-Horticultural Society of Madras, India, which is subsidised by the Madras Government, advises that it will always gladly meet the requirements of Queensland farmers in regard to all seed of tropical plant material, including hedge plants, avenue trees, grasses, and other plants of economic or ornamental value at moderate cost.

Protecting the Peanut Industry.

It has recently been decided, for the purpose of protecting the peanut-growing industry in Australia from various destructive diseases, to modify the Proclamation gazetted on 27th January last (Quarantine Proclamation No. 167) by prohibiting the importation into Australia of peanut plants (including the seed) of the variety *Arachis hypogea,* except by permission of the Federal Authority. The importation of peanuts is being discouraged as much as possible, and permission for the importation of peanuts will be given only in exceptional circumstances.

Royal Society of Queensland.

The ordinary monthly meeting of the Society was held in the Geology Lecture Theatre on Monday evening, 2nd May, 1927. The President, Professor E. J. Goddard, was in the chair.

The following were unanimously elected as ordinary members:—J. H. Smith, Esq., M.Sc.; G. C. Taylor, Esq., M.B., Ch.M.; Miss L. Crawford; Miss M. Fitzgerald, B.Sc.; and Miss G. Jones.

Professor H. C. Richards exhibited a number of lantern slides of the Great Barrier Reef, illustrating its geology, fauna, and flora. Mr. H. Tryon and the President commented on the subjects.

Mr. H. A. Longman exhibited—(1) The spurs of the common game rooster used as weapons by aboriginal women; (2) a pointing bone composed of a tibio-tarsus and fibula of an emu and used by aboriginal medicine men (aboriginals from mission stations visiting the museum avoid contact with these bones, even after lengthy contact with civilisation); (3) an aboriginal calvarium (Q.E. 561) from Wynnum—this was an unusually thick and heavy dolichocephalic skull, probably in the process of becoming fossilized. Comments were made by Mr. Tryon, Dr. Marks, and the President. (The first two exhibits shown by Mr. Longman were presented to the museum by the late Mr. Thos. Illidge.)

Dr. Bryan exhibited fossil plants typical of the Ipswich series from the north bank of the Pine River almost opposite the confluence of the North Pine and South Pine Rivers. This forms a new locality record, as the area has been mapped as of Tertiary age. The chief plant present is *Cladophlebis australis.*

Dr. F. W. Whitehouse exhibited a collection of Cambrian trilobites from most of the known Australian localities. Thirteen genera, six of them being new, were represented. Among the new locality records were the following:—(*a*) Species of *Dinesus* and (?) *Notasaphus* from the South Templeton River (N.W. Queensland), in a Middle Cambrian fauna; (*b*) specimens of *Eodiscus significans* (Eth. fil.) and *Agnostus elkedræensis* (Eth. fil.), from the South Templeton River (a new record for Queensland); (*c*) a species of *Tsinania* from Caroline Creek, Tasmania. This genus, from the top of the Cambrian, is known otherwise only in China and North America. The following stratigraphical correlations were suggested:—*Upper Cambrian:* Beds of Florentine Valley, Caroline Creek, and Dolodrook; *High in Middle Cambrian:* Beds of Alexandra Station (N.T.), Elkedra (N.T.), Templeton River, and Heathcote; *Low in Middle Cambrian:* Beds of Yelvertoft (N.W. Queensland), Parara, and near Wirrialpa (South Australia), and Mount Panton (N.T.).

The Secretary communicated a paper by Dr. Thos. L. Bancroft entitled "Preliminary Notes on the Occurrence of Flagellates in the Juice of Certain Queensland Plants." A flagellate was found in the latex of the Asclepiadaceous plants *Sarcostemma australe* and *Hoya australis,* a larger species in *Secomone elliptica,* and a different kind again in *Ficus scabra. Oncopeltus quadriguttatus,* a bug which sucks the juice of the first two plants, had flagellates in its intestines. Microscopic preparations and specimens of the bug were exhibited. Comments were made by Messrs. Tryon and Herbert and the President.

Night Ploughing by Tractor.

With tractors working night and day large areas are being sown to wheat in the western districts of New South Wales. Weather conditions for sowing are ideal, and as soon as one man comes off the tractor another takes his place. It is apparent that many wheatgrowers who were not advanced with their sowing operations last season, when there were weeks of wet weather, do not desire to be caught unprepared on this occasion.

Staff Changes and Appointments.

Messrs. V. Ganter, E. Meilland, W. M. Mortensen, and F. A. Richter, of Byfield, *viâ* Yeppoon, and Mr. J. P. J. Sexton, of Maryvale, have been appointed Officers under and for the purposes of the Animals and Birds Acts.

Mr. L. P. Doyle, Inspector of Stock, Cooyar, has been also appointed Inspector of Brands.

It was recently approved that Mr. J. A. Stockdale, Inspector, Diseases in Plants Act, of Wallangarra, be transferred to Stanthorpe. It has, however, now been approved that Mr. Stockdale be transferred to Brisbane.

Broom Millet Board Election.

The result of the annual election for the appointment of two members to the Broom Millet Board was:—

Hans Niemeyer (Hatton Vale)	139	votes.
Erich M. Schneider (Binjour Plateau)	107	„
Frederick H. V. Goodchild (Degilbo)	102	„
William M. Hutchinson (Duleen)	76	„
James Scanlan (Flagstone Creek)	50	„

The two first-named candidates will be appointed for a term of one year. Messrs. Niemeyer and Goodchild were the retiring members.

The University and the Nation.

The University has a national purpose. Year after year she takes from the nation an ever-increasing company of the aspiring youth, passes them through a process of training, and sends them forth upon their mission in the world. The University is thus the masterpiece and the crown of a national system of education.

It is therefore the duty of the nation to see that her needs are satisfied and her standards maintained; and the nation which fails to cherish the University will lack both the thinkers and the artisans of progress. Modern civilisation is the offspring of science in all its forms, and the offspring cannot flourish unless the parent is sustained.—''Dominion'' (New Zealand).

Human Kindness.

There is no such thing as absolute individualism. Our influence, conscious and unconscious, is far-reaching, and we cannot ever bury it with us. It goes on for good or evil. Our opportunities to encourage others, to cheer them with a kind word and a gracious deed, bring with them a challenge and a destiny. We may or may not succeed in what we aim at, but we are the gainers by the effort. We are repaid a hundred-fold whether our work prospers or not. It is always open to us to help others by pointing out that they possess qualities which, if developed, would bring them to the success they covet. Kind words are worth much, and cost little—

It is a little thing to speak a phrase
Of common comfort, which by daily use
Has almost lost its sense; yet, on the ear
Of him who thought to die unmourned, 'twill fall
Like choicest music.

It is related that on a winter day that great preacher, Henry Ward Beecher, said to a newsboy, ''Are you not cold?'' ''I was, sir,'' said the boy, ''till I saw you.'' A kind smile, a kind word, a kind heart, will change a winter into summer.—''Age'' (Melbourne).

Potted Asparagus—A New Industry.

Bathurst (N.S.W.) has a new industry, that of canning asparagus. Messrs. Gordon Edgell and Sons have installed on their orchard at Bradwardine, about three miles from Bathurst, a modern canning plant, housed in a model factory of reinforced concrete, with a floor area of 3,000 square feet. Mr. Maxwell Edgell, when touring America, made a study of the asparagus canning business in the largest works in California. This was equipped with the very latest in canning machinery, all the cooking, blanching, and exhausting processes being done by steam. His factory is modelled on this plan.

Bathurst asparagus, in its fresh state, has topped the Sydney market for some years, and it has been found that the asparagus grown on the fertile river flats of Bradwardine, particularly since the more recent method of planting in long rows instead of broadcast was adopted, is specially suitable for canning. As the season for fresh asparagus in the district is limited to a few weeks each year, in order to utilise the plant during the remaining months, Merssrs. Edgell and Sons intend canning apples.

Paspalum Pasture Renovation.

A constant source of annoyance to dairy farmers on the New South Wales coast has been the old and matted paspalum pastures that fail them in winter, and often in summer also. The paspalum renovation experiments instituted by the New South Wales Department of Agriculture about two years ago on farmers' plots in the Richmond, Brunswick, and Tweed River districts, however, are beginning to show tangible results.

A round of inspection of these plots was made recently by the agrostologist (Mr. Whittet). The superiority of the ploughed areas as regards palatability of growth was very apparent. It was satisfactory also to find that, as a result of their observations of the experiments, many farmers were adopting this method of dealing with matted paspalum where ploughing was possible. The outstanding feature of the top-dressing section of the experiments was the success obtained from the use of a mixture of 2 cwt. of superphosphate and ½ cwt. of sulphate ammonia an acre in alternate years.

Specially noticeable was the growth of white clover on plots that were top-dressed, in August, 1925, thus demonstrating the residual effect of manures and of superphosphate in particular. The adjoining unmanured areas showed no sign of clover. This comparison in favour of top-dressing was of great importance to the dairyman, from the point of view of early winter pasturage, as there is generally a shortage of clover growth at this time of the year.

Overheated Motor Engine.

An overheated engine of a motor-car may be the sign of some serious mechanical difficulty.

Many motorists think that a fresh supply of water will always act as a cure for an overheated engine. This is not true when the overheating has progressed to the stage where it injures the cylinders, pistons, and bearings.

For example, bearings will crack if subjected to intense heat. Heat causes oil to lose its lubricating power, and therefore great heat may cause frictional scoring of the cylinder walls and wearing of the pistons.

On the other hand, overheating may mean that the radiator is leaking or that the driver has forgotten to fill it, or that it is clogged with sediment from dirty water. It may also mean that the car has been driven for a long distance in first or second gear, or that the fan belt is not at proper tension to give an adequate cooling draft.

If overheating occurs on the road the car should be stopped, and an investigation made. If the cooling system be filled up with cold water after the engine has cooled to a certain extent, temporary relief will be afforded.

When it is absolutely necessary to continue the journey the engine should be overfed with oil. Although this may cause it to give off volumes of smoke through the exhaust, the additional oil will protect the cylinders and pistons. In the event of water or oil not being available, and the cause of the overheating cannot be ascertained, help should be obtained from the nearest garage.

As a general precaution, the radiator of the car should always be kept full of water.

The Farm Tractor—Some Don'ts.

Advice is not always acceptable, especially to those who think that they know quite a lot, but the following points state in a very succinct way those things that should not be done with or to a tractor.

Don't try to make a racing car out of your tractor.
Don't drive over rough places when it can be avoided.
Don't allow dirt and oil to accumulate on frame, engine, axles, &c.
Don't forget split pins and lock nuts.
Don't allow the engine to run at high speeds under no load.
Don't neglect the oiling of any part of the tractor.
Don't leave the tractor over night in cold weather without drawing off the water.
Don't run the engine if it is knocking, pounding, squeaking, or grinding.
Don't screw nuts hard enough to strip the thread off the nut or bolt.
Don't blame the tractor or its makers for trouble that has been caused through your own carelessness.

The Compost Heap.

The compost heap is a most valuable adjunct to the vegetable garden, and it is a very great pity that it is not to be found more frequently even on the ordinary farm.

A heap or pit can be made very economically, and is of special value in that it utilises all sorts of vegetable and animal refuse, which would otherwise be wasted, and converts it into a valuable manure, rich in vegetable matter and eminently suited for intensive cultural conditions.

The principle upon which the compost heap acts is the fermentation of easily decomposed vegetable material in the presence of earth and lime. Not only are substances like peat and straw, which form the usual basis of compost heaps, thus decomposable, but almost every kind of organic substance, both of vegetable and animal origin, can be composted. Dead leaves, bush scrapings, weeds, tops and stalks of vegetables, as well as bone and animal refuse, can be treated in this manner. In the case of animal refuse the operation is much slower, and substances like bones should be crushed first. It is also important to be sure that animal refuse so treated is not derived from a deceased source.

The method of making and maintaining the compost heap will vary largely with local surroundings. As a general method of procedure the following will be found satisfactory:—Make a heap with alternate layers of earth, refuse, and lime. Under the term refuse is included all the waste material, either animal or vegetable, mentioned above. Cover the whole with a layer of earth. When a sufficient quantity of refuse is again collected, place it on top of the heap and cover with a layer of lime, and lastly of earth, until the heap is 3 to 4 feet high. The heap should be kept moist, and for this purpose all refuse water from the house, slops, urine, &c., should be added. The heap may be conveniently watered by making a hole into the interior and pouring the liquid in. The final covering with earth has the object of absorbing any ammonia which is evolved in the process of fermentation and by the action of the lime.

When the heap has been prepared it must be left for some time to allow fermentation to take place. Probably a few months will be sufficient, unless very refractory substances, such as bone, &c., are present. Then it should be well forked over and another layer of lime and finally one of earth should be added. In the course of another month or two it should be ready for use, and will provide an excellent manure, rich in humus, at a very slight cost. It will have utilised for the purpose a great amount of material that would otherwise be lost or burnt. When refuse material is burnt the ashes, though still possessing manurial value on account of the lime, potash, and phosphates they contain, are of incomparably less value than the original substances out of which they are derived, owing to the absence of humus material and of nitrogen, which have been lost in the process of burning.

Instead of a heap the compost may be conveniently prepared in a pit. In either case the bottom should be cemented, or so drained that the liquid escaping from the mass can be collected and returned to the compost.

A second heap should be prepared while the first one is ripening, and being used. If it is desired to use superphosphate, potash, ammonium salts, and other concentrated fertilizers, they may be mixed with compost manure before it is added to the soil. Used in this way greater benefit will be derived than if they were applied direct to the soil, and there will be less danger of leaching.

Toil or Talk?

This from the "Southland Times" (N.Z.). For "New Zealanders" we could well read "Australians": New Zealanders must overcome the prejudice against goods made in their own country and become more self-reliant. Undoubtedly hard work is essential, but intelligence and the application of science are equally necessary. Our Prime Minister assures us that good times are ahead. While there is no reason to doubt this, we must not forget that prosperity will not come merely through the toil of the farmer and the talk of the rest.

Facts Wanted.

"Accurate observation in social life is one of the great things needed in the present day. In economic questions it is obvious to me that people confuse what they would like to be with what they think is. That is particularly so in such questions as the standards of life, the levels of wages, and in all questions relating to money. Half of our economic fallacies are rooted in the problems of the changes in the value of money. We cannot get any fact in relation to modern life in its right sense unless we throw up the purely selfish standpoint. We want in our solution of social questions a passion for facts and not for blame, and the power to appreciate their setting in the complete system of thought."—Sir Josiah Stamp, in the "Dominion" (N.Z.).

Looking Forward—A New Spirit of Co-operation.

I think the outlook for the future affords grounds for reasoned optimism. It may be that it is brighter when we look back and compare it with the troubled times from which we have emerged. First and foremost there is the new spirit of co-operation and goodwill between employer and employed in which the human element is the key-note. The human element plays an enormous part in industrial relations. It is as necessary to study that human element as regards the workers as it is to study new methods, new ideas, and new organisation. The status of being consulted, where appropriate and where possible, is the natural aspiration among the workers. The tendency in this direction must help forward the improved relations in industry.—The Prince of Wales, in a recent important public address.

Lucerne Land.

It is seldom safe for a farmer to say that lucerne will not grow profitably on his land before he has tried it. It is usually associated with rich alluvial soils, but while the best results are obtained from such land, it also thrives on a wide range of soils that do not possess the depth or fertility of the rich alluvials. It is sensitive in certain respects, and disregard of its special susceptibilities will result in reduced yields, but payable results may be expected from almost any land except that which is badly drained or is very sandy. The plant roots very deeply, and it is obvious that a deep, permeable subsoil contributes to maximum results; but this is not an absolute essential to successful growth, as is proved by the results obtained on soil that at one time would have been considered quite unsuitable.—A. and P. Notes, N.S.W. Dept. Ag.

Car Springs—Lubricating the Leaves.

Springs, as a rule, unless in use for a considerable period, do not call for much attention from the owner-driver, other than the shackle bolts. After a car has, however, been in use for some considerable time, the springing usually becomes harsh, due, of course, to the lack of lubricant between the leaves. The only satisfactory way to overcome this defect is to dismantle the springs and to clean all the rust away thoroughly, filling the interstices with grease afterwards. The tip end of each leaf, however, will usually be found to have dug into the fellow leaf above it (in the case of semi-elliptic springs), which gives rather a jumpy movement to the spring when it has been greased. The best thing to do (while the spring is dismantled) is to hammer back the tips of the leaves so that the grooved portion of the next leaf will not foul the tip. In this way a means of lubricating the extreme end of the leaf is made, which operation can be effected by sliding the hand or rag covered with grease along the underside of the spring. The outer tip is a very heavily loaded part, and is very often the cause of squeak. By employing the method outlined, this can be avoided entirely.

Motor Car a Rural Necessity.

One of the most natural tendencies of healthy-minded, civilised citizens is to fraternise, to discuss their avocations, the topics of the day, politics, and pastimes.

Such intercourse is in itself a sign of civilisation and a most desirable condition among residents of widespread, rural districts.

The advent of the motor-car has made reasonable intercourse among country people practicable and thus has largely removed the isolation and privation that breeds desolation and despair.—"Country Life."

The Making of Men.

When a man leaves school or college his education is not complete—it is merely beginning. Other things being equal, the university man should have a better foundation on which to build than his rival straight from school, but if in after life he neglects his opportunities that foundation alone will not carry him very far. There are born leaders of men and there are born administrators, but we cannot trust to a sufficient supply from that source, and it is desirable that men should be trained. The tragedy of our time is that in every sphere of life many good men of great natural ability are condemned to comparative obscurity by the jealousy and ignorance of those who have it in their power to keep them back. It is a fallacy to suppose that good men always come to the top. Some are broken by the way.—"The Times Engineering Supplement."

TOP-DRESSING.

A SOUTHERN GRAZIER'S EXPERIENCE.

Interesting tests to ascertain the value of top-dressing grass lands have been conducted during the past year by Mr. E. H. B. Weaver, on his Wynola property. A paddock of 300 acres was selected for the purpose, and the owner decided to keep strict records concerning this area. It was top-dressed with superphosphates at the rate of 1 cwt. to the acre, and for the purpose a special machine was purchased, said to be the first of its kind sold in New South Wales.

Rainfall records showed that 1,198 points of rain fell from April to September, a period of six months, and the carrying capacity of the paddock was definitely trebled. The best results, however, were obtained during the last six months, from October to the end of March, when the total rainfall was 835 points—slightly below the average.

The top-dressed paddock responded to every shower of rain, and the carefully kept records show that the carrying capacity averaged four sheep to the acre for the whole period. This allows for ten to fourteen days' spell following each fall of rain.

Mr. Weaver states that he has carried 800 to 1,400 sheep on the 300 acres for the twelve months, and the longest period the sheep have been out of the paddock was fourteen days. From information obtained in Victoria it is understood that the effect of the manure will last for two years. The total cost of top-dressing, including the cost of manure and a man's wages, amounted to 7s. 6d. an acre. Even if the carrying capacity were only increased to the extent of doubling it, it is a better investment than buying an additional property with all its extra costs and more difficult control.

As previously stated, the rainfall from April to September, 1926, was heavy, and there was an abundance of grass everywhere without the aid of manure, but for the remaining six months of the year the fall was below the average, and the manure had the effect of sustaining a good coat of grass right through.

Mr. Weaver states that the grass paddock in which the experiment was carried out was the only one on "Wynola" to escape damage by bush fires, and as a result he was enabled to complete his test for the year. Many persons contend that the Forbes district is not suitable for top-dressing (Mr. Weaver says), but he is of the opinion that the carrying capacity can comfortably be doubled by carrying out treatment such as described. He intends to top-dress additional areas with the aid of superphosphate, and he is certain there will be no difficulty in increasing the average carrying capacity of the whole property.—"Farmer and Settler."

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 applies 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 and Garden 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.

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, holy-hocks, 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.

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, especially on the light sandy mallee lands, 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.

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.

1927.	MAY.		JUNE.		MOONRISE. May.	MOONRISE. June.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.19	5.19	6.38	5.2	a.m. 5 31	p.m. 9.50
2	6 20	5 18	6.38	5.2	6.39	10 55
3	6 21	5 17	6.38	5.1	7.46	11.57
4	6.22	5 16	6.39	5.1	8.53	..
5	6 22	5.16	6 39	5.1	9 55	a.m. 1.0
6	6 23	5.15	6.39	5.1	10.54	2.1
7	6 23	5.15	6.40	5.1	11 47	3.2
8	6.24	5.14	6.40	5.1	p.m. 12 33	4.3
9	6.24	5 13	6 41	5.1	1 11	5 2
10	6 25	5.12	6 41	5.1	1.50	6 1
11	6 25	5.11	6 41	5.1	2 23	6.58
12	6 26	5.11	6 42	5.1	2 54	7.54
13	6 26	5.10	6.42	5 1	3.24	8 45
14	6 27	5.10	6 43	5.1	3.53	9.32
15	6 27	5.9	6.43	5.1	4.24	10.14
16	6 28	5.9	6.43	5.1	5.0	10.53
17	6 29	5 8	6.44	5.1	5.36	11.28
18	6 30	5.7	6.44	5 2	6.19	p.m. 12.2
19	6 31	5.6	6 44	5.2	7 5	12.33
20	6.32	5 6	6.44	5.2	7 58	1.6
21	6.32	5.5	6.44	5.2	8.55	1.39
22	6 33	5 5	6.44	5.3	9.55	2.16
23	6.33	5.5	6 44	5.3	10.58	2.56
24	6.34	5.4	6.45	5.3	...	3.41
25	6.34	5.4	6.45	5.3	a.m. 12.19	4.30
26	6 35	5.3	6.45	5.4	1.5	5.29
27	6.35	5 3	6.45	5.4	2.9	6.31
28	6.36	5.3	6.45	5.4	3.14	7.38
29	6.36	5.2	6.45	5.5	4.19	8.45
30	6.37	5.2	6.45	5.5	5.25	9.50
31	6.38	5.2	...	...	6.32	...

Phases of the Moon, Occultations, &c.

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

7	June	☾	First Quarter	5 48 p.m.
15	,,	○	Full Moon	6 19 p.m.
22	,,	☽	Last Quarter	8 29 p.m.
29	,,	●	New Moon	4 32 p.m.

The greatest astronomical event of this month will be the total Eclipse of the Sun on the 29th observable across the narrowest part of England, Scandinavia, etc,, but not in Australia. The previous total Eclipse of the Sun in England was in 1724, and the next will be in 1999.

A fortnight earlier an interesting total Eclipse of the Moon will occur—eighteen minutes before the moon rises at Warwick it will enter the Umbra or the darkest part of the earth's shadow. An hour and a half later it will be totally emersed and a total Eclipse will occur. Instead of the usually bright, full-orbed Moon it will most probably have a darkened, copper-coloured appearance.

The occultation of Iota Leonis on the 7th about 8.30 p.m. will be observable in Southern Queensland. It will be about 50 degrees above the horizon in the north-west, and in a favourable position for observation.

The occultation of Saturn about 4 o'clock in the morning on the 14th will form an interesting spectacle in the west. The planet will disappear near the southern edge of the Moon at any place as far south as Toowoomba and Warwick.

The conjunction of Venus and the Moon at 4 p.m. on the 3rd, being at an angle of 45 degrees from the Sun should afford an interesting daylight spectacle towards the north-north-west.

Venus and Mars will be apparently very close to one another in the west-north-west soon after sunset on the 9th, 10th and 11th.

Mercury will be at its greatest elongation, twenty-five degrees east on the 22nd, when it will be in the Constellation Gemini near the left feet of Castor, which is marked by two stars of the third and fourth magnitudes. As the twilight deepens Mercury will be the most noticeable object towards the horizon north of west, while a good way above it will be Mars and the still brighter planet Venus.

The Sun will reach its greatest northern declination on the 22nd when the Australian Winter Solstice will occur.

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.