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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXIX. 1 JANUARY, 1928. PART 1

Event and Comment.

The Sugar Embargo.

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

Mr. Bruce added that, in considering the future protection of the sugar industry, it had to be borne in mind that the policy which had been pursued in the past with regard to the industry had been based upon the primary necessity for the maintenance of a white population in the vulnerable coastal belt of the tropical north of Australia. The sugar industry was at present operating under a three-years' agreement between the Commonwealth and Queensland Governments, which expired on 31st August, 1928. That agreement provided for an embargo against the importation of foreign sugar, in return for which the Queensland Government, on behalf of the Australian sugar industry, agreed to the limitation of the home consumption prices in all capital cities, the provision of sugar for use in exported manufactured goods at a price equivalent to the world's parity, and the bearing of all export losses by the producers themselves. The present policy had ensured a retail price of the world's best cane sugar in all the capital cities of 4½d. a lb., which represented a percentage increase over the

pre-war price less than the price increase of practically every other foodstuff and commodity. The Ministry had also make provision for the supply of mill white sugar comparable with high-class Java sugar at 4d. a lb. retail, with corresponding reductions to manufacturers and others. The reason which led the Ministry to adopt the policy of an embargo instead of affording protection through the Customs tariff was the wide fluctuations in the world's parity prices of sugar.

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

The Banana Industry—Establishment of Experiment Stations.

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

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

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

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

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

After discussing general matters relevant to the banana industry, those present at the conference with the Minister agreed: (1) That it was desirable to establish an Experiment Station in Queensland. (2) That the Station should be situated in Southern Queensland, preferably on Crown land. (3) That the area should be not less than 100 acres, comprising from 15 to 20 acres of suitable banana land. (4) That the matters for experimentation should include—(*a*) Soil experiments (subsoiling and fertilising); (*b*) selection of plants, suckers, butts and sections of butts; (*c*) the effect of desuckering and the influence of fertilisers on the various plants and on the general and keeping condition of the fruit; (*d*) testing available varieties of bananas for yield, freedom from disease, and hardiness when exposed to transport

conditions; (*e*) the inclusion of a small section of seed producing varieties and their cross-pollination with seedling kinds and the testing out of any seedlings produced therefrom which may promise to be worthy of further consideration; (*f*) the effect of distances between the rows and spacing between individual plants; (*g*) the treatment of soil after cropping by the use of artificial fertilisers, green manures, &c., before replanting under bananas; (*h*) determining the effect of dissected bunches against whole bunches in transport; (*i*) the control or elimination of pests and diseases in bananas.

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

A Board of Agriculture.

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

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

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

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

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

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

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

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

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

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

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

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

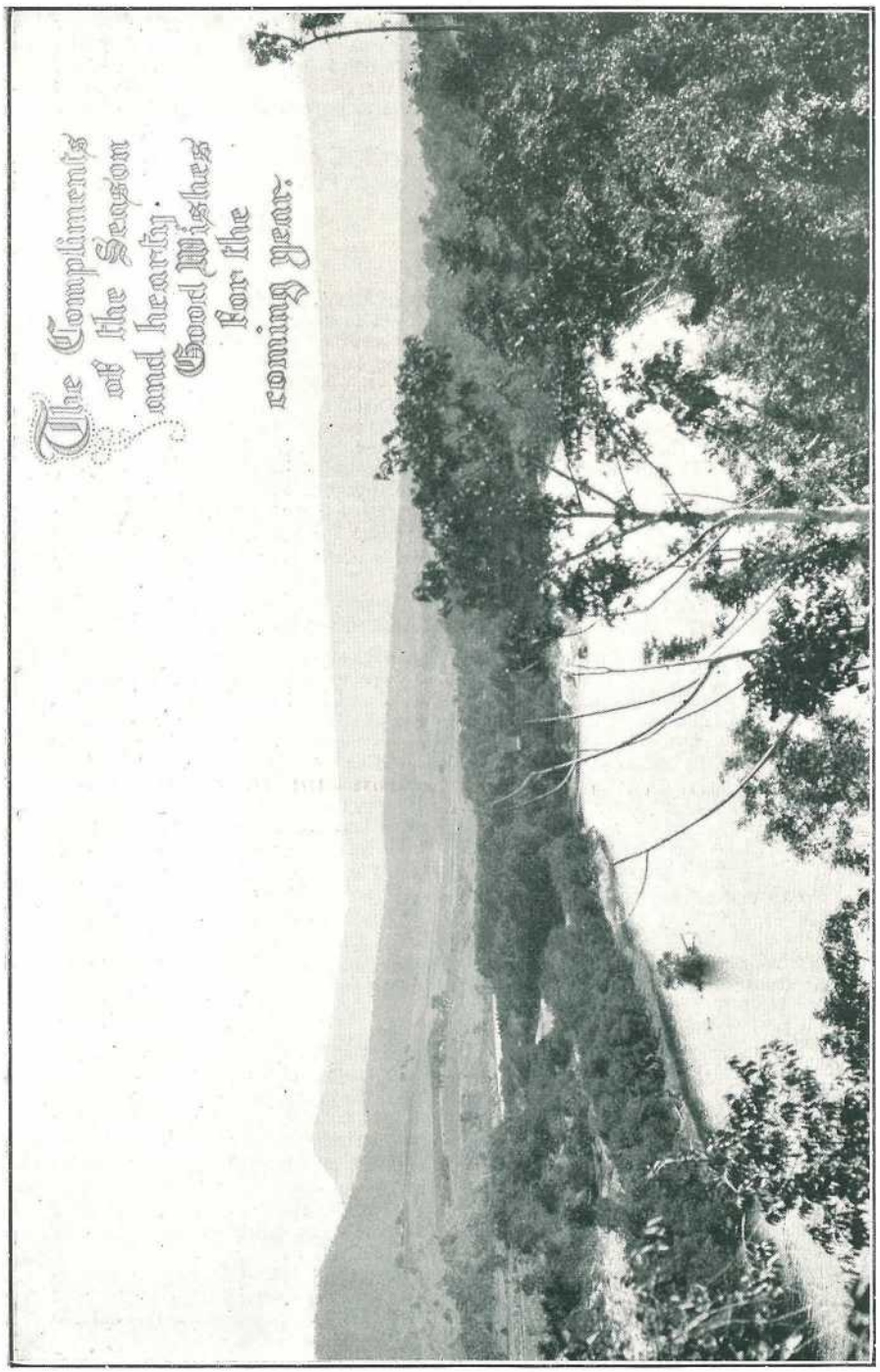

Photo: H. W. Mobsby, F.R.G.S.

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

The Minister's New Year Message

To the Farmers of Queensland.

DEPARTMENT OF AGRICULTURE,

Brisbane, 31st December, 1927.

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

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

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

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

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

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

W. Forgan Smith

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

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

NAMBOUR.

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

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

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

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

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

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

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

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

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

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

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

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Appearance of Small Brown Cockchafer.

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

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

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

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

Prepare for Collecting Cane Beetles from Feeding Trees.

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

Canegrowers Take Notice.

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

Note.—Farmers seeking advice, or applying for the liberation of parasites, are asked to forward at the same time (if not perfectly sure of the identity of the insect in question) a sample of the species or its larval condition. Moth-borer injury is

often mistaken for that due to the beetle borer, as both of these insects bore the interior of cane sticks. No less than six different insects attack the shoots of young ratoon and plant cane, all effecting very similar damage, and being responsible for the occurrence of "dead-hearts."

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

Appearance of Cane Beetles.

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

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

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

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

Collecting Cane Beetles.

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

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

Grubs Controlled by Means of Clean Cultivation.

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

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

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

Protecting Young Ratoon and Plant Cane.

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

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

FIELD REPORTS.

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

CAIRNS.

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

The Crop.

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

Harvesting and Milling.

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

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

Cultivation.

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

Planting.

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

Pests.

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

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

Diseases.

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

Fertilisers.

It seems apparent that much money is annually wasted in the haphazard use of fertilisers. So few farmers avail themselves of the great opportunity of having their different sorts of soil analysis; the results would aid considerably in ascertaining what food constituents are required. A soil may have a superabundance of two of the plant food essentials, yet be deficient in another; this being so makes it unfruitful The tendency is to add more of which there is abundance and neglect that which is lacking. The principle manures being added are sulphate of ammonia as a top dressing, B_2, Howe's mixture, and blood. Molasses had been applied rather indiscriminately over a Mulgrave mill farm in the year 1925 and still refuses to grow cane in the parts having received overmuch.

Leguminous Crops.

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

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

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

MACKAY.

Flaggy Rock.

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

Carmila and Carmila North.

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

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

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

Koumala and Inneston.

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

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

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

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

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

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

Sarina.

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

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

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

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

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

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

Netherdale.

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

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

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

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

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

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

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

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

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

Gin Gin.

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

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

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

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

Nambour.

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

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

Maryborough.

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

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

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

Bauple.

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

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

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

RAINFALL IN THE AGRICULTURAL DISTRICTS.

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

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

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

GEORGE G. BOND,
Divisional Meteorologist.

NOTES ON BANANA INSECT PESTS.

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

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

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

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

INSECTS INFESTING THE BULB.

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

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

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

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

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

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

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

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

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

INSECTS DAMAGING THE FRUIT.

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

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

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

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

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

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

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

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

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

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

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

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

Fruit Flies.

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

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

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

FIG 1 x 6

FIG 2 x 6

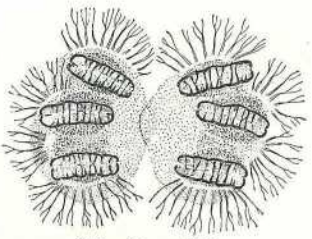

FIG. 2A. x 210.

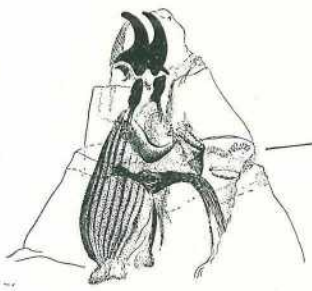

FIG 2B x 30

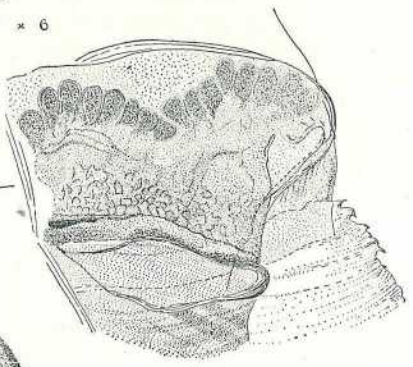

FIG 2C x 210

FIG. 3. x 5

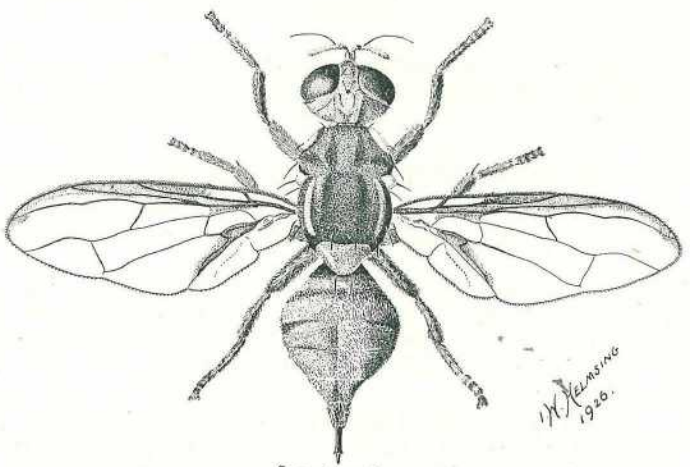

FIG 4 x 6

PLATE 2.

THE BANANA FRUIT FLY (*Chætodacus musæ* Tryon).

Fig. 1. Eggs x 6. Fig. 2. Larva x 6. Fig. 2A. Stigmal discs of larva x 210. Fig. 2B. Jaws of larva x 30. Fig. 2C. Anterior spiracle of larva x 210. Fig. 3. Pupa x 5. Fig. 4. Imago x 6.

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

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

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

Fruit Spotting Bugs.

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

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

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

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

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

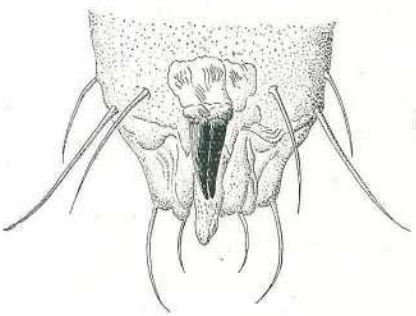

FIG. 1 × 225

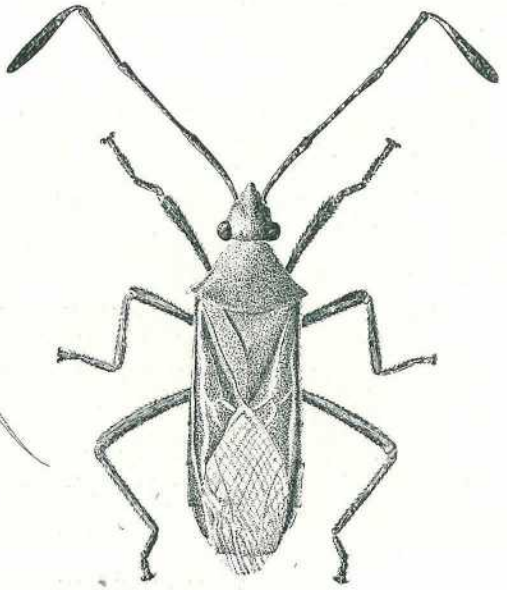

FIG. 2 × 4

FIG. 3 × 1½

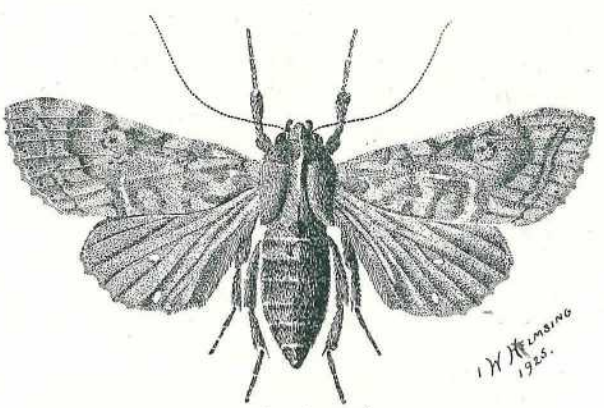

FIG 4 × 1½.

PLATE 3.

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

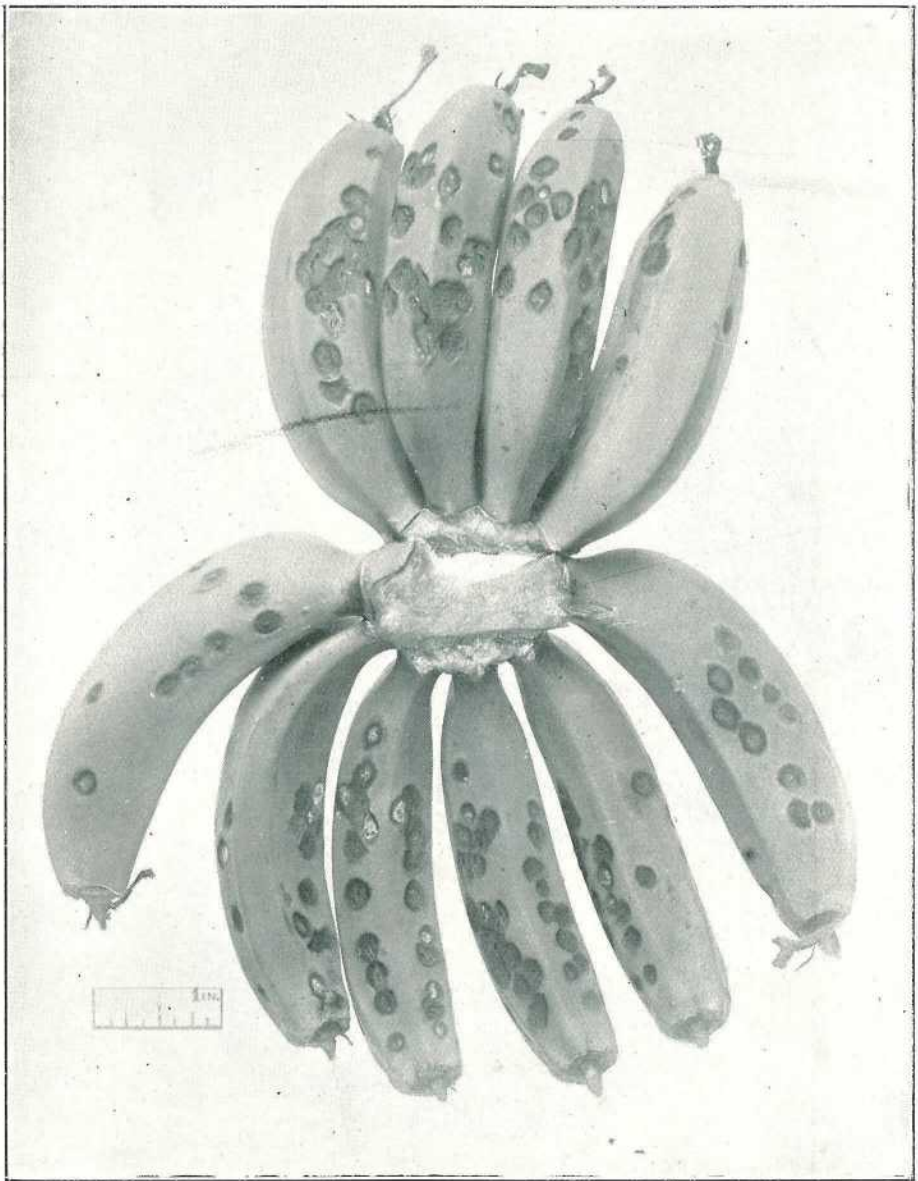

PLATE 4.—DAMAGE CAUSED BY FRUIT-SPOTTING BUGS.

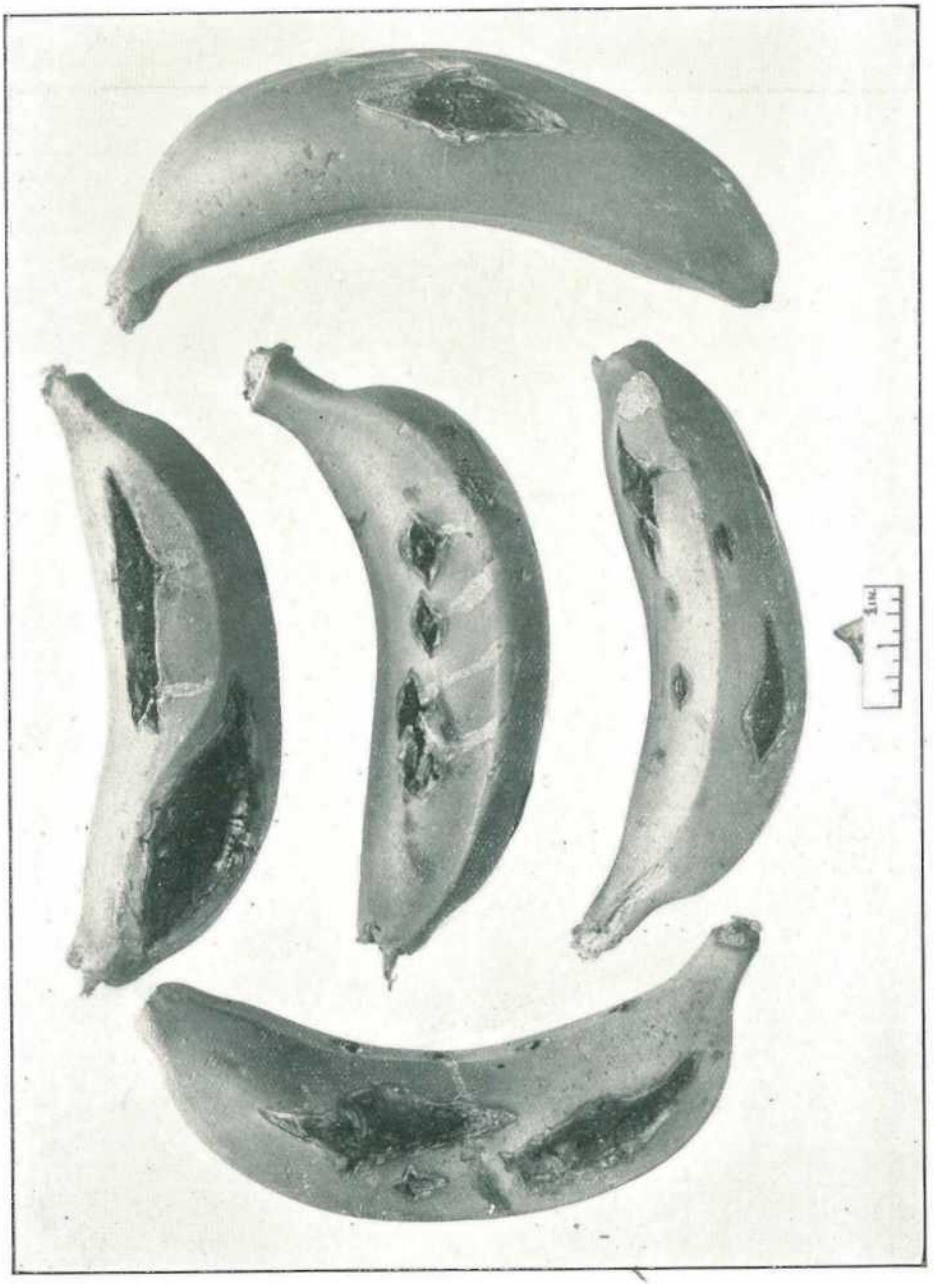

PLATE 5.—DAMAGE CAUSED BY FRUIT-SPOTTING BUGS.
Note the splitting of skin across corky pits.

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

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

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

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

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

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

Fruit-eating Caterpillars.

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

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

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

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

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

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

Tiracola plagiata Wlk.

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

Notarcha octosema Meyr.

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

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

PLATE 6.—DAMAGE CAUSED BY FRUIT-EATING CATERPILLARS (*Tiracola plagiata* Wlk.).

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

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

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

Plusia chalcites Esp.

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

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

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

Aginna circumscripta Wlk.

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

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

Simplicia robustalis Guen.

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

FIG 1

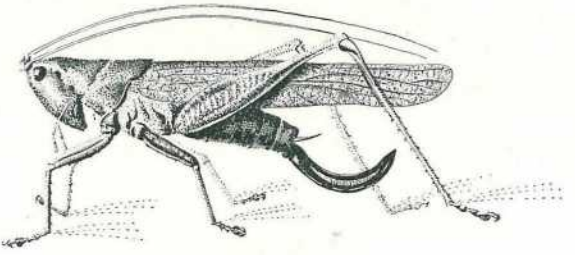

FIG 2

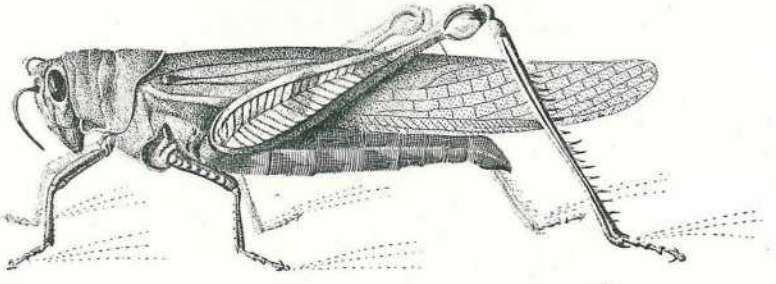

FIG 3.

PLATE 7.

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

Tirathata rufivena **Wlk.**

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

Conogethes punctiferalis **Gn.**

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

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

Locustidae.

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

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

Snails.

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

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

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

Fruit-sucking Moths.

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

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

INSECTS ATTACKING THE FOLIAGE.

Acridiidae (Short-horned Grasshoppers).

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

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

Prodenia litura Fabr.

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

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

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

FIG 1 × 1½

FIG 2 × 1½

FIG 3 × 1½

FIG 4 × 1½

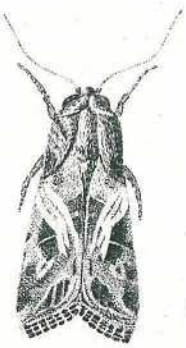

FIG 6 × 1½

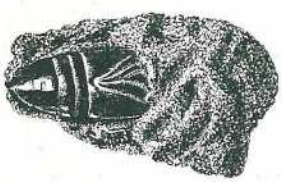

FIG 5 × 1½

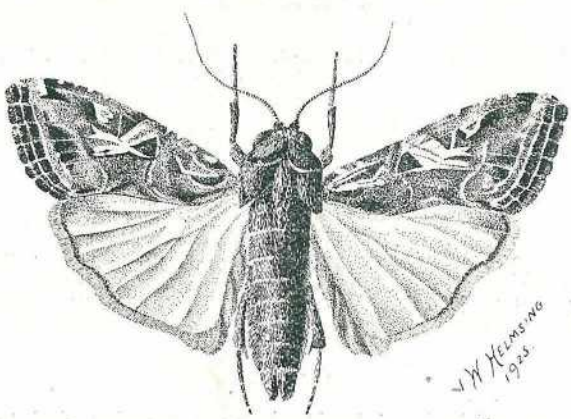

FIG 7 × 2

PLATE 9.

Prodenia litura Fabr.

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

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

Rhyparida discopunctulata Blackb.

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

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

Rhabdocnemis obscura Boisd.

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

Opogona glycyphaga Meyr.

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

Aphididae.

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

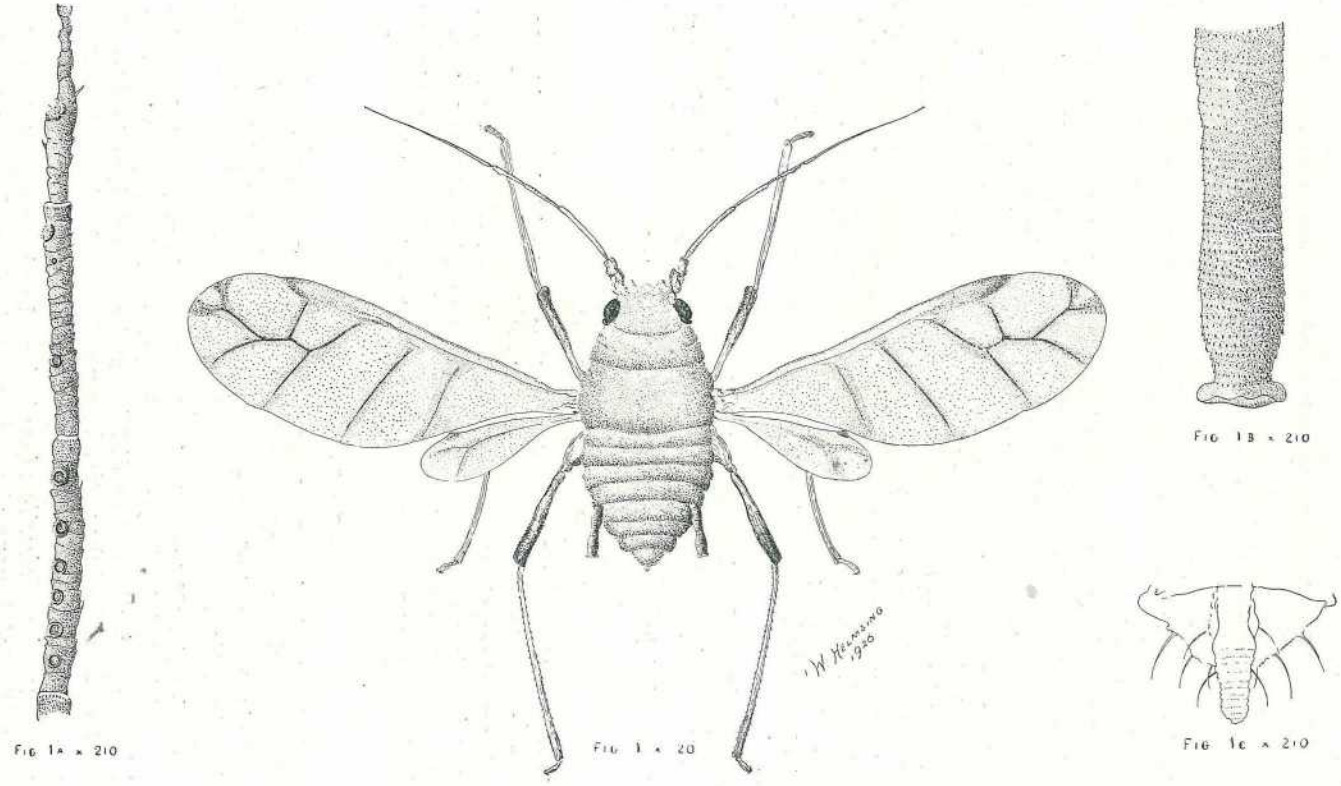

PLATE 10.

THE BANANA APHIS (*Pentalonia nigronervosa* Coq.)

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

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

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

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

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

Monolepta rosea Blackb.

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

Scale Insects.

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

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

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

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

Nematodes (or Eel Worms).

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

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

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

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

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

PAYABLE SIDE CROPS FOR THE NORTHERN BANANA GROWER.

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

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

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

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

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

HOME-MADE CHEESE.

METHOD OF MANUFACTURE.

By C. F. McGRATH, Supervisor of Dairying.

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

Careful Attention Necessary.

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

Draining off the Whey.

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

Hooping and Pressing.

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

PRIMARY EDUCATION IN QUEENSLAND.

A COMPREHENSIVE CO-ORDINATED SYSTEM.

COUNTRY CHILDREN SHARE EQUALLY IN EDUCATIONAL OPPORTUNITY.

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

Rural Schools.

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

Home Projects Scheme.

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

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

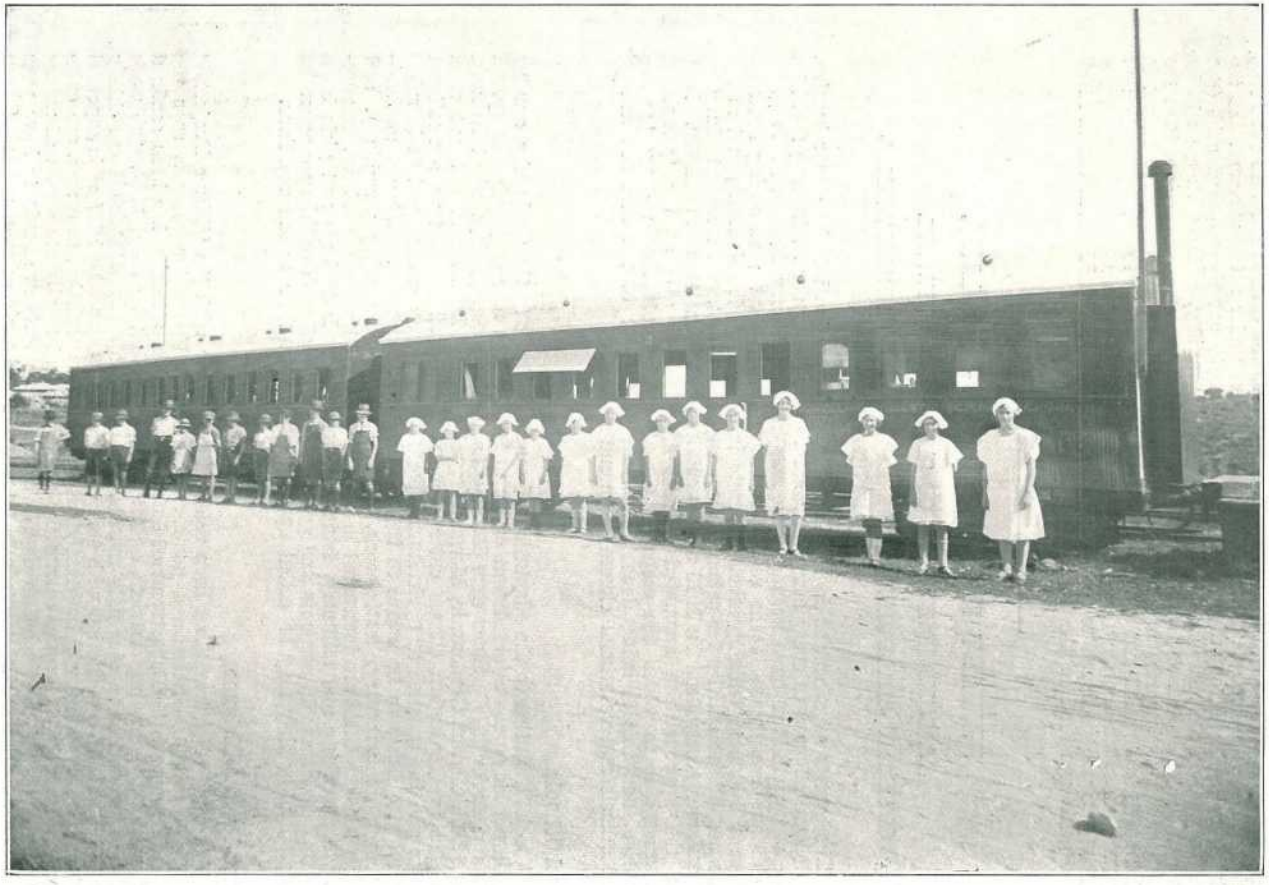

PLATE 11.—A TECHNICAL SCHOOL ON WHEELS—QUEENSLAND'S ENTERPRISING EDUCATION SERVICE.
Cars in position at Railway Siding—Pupils in attendance, Herberton, North Queensland.

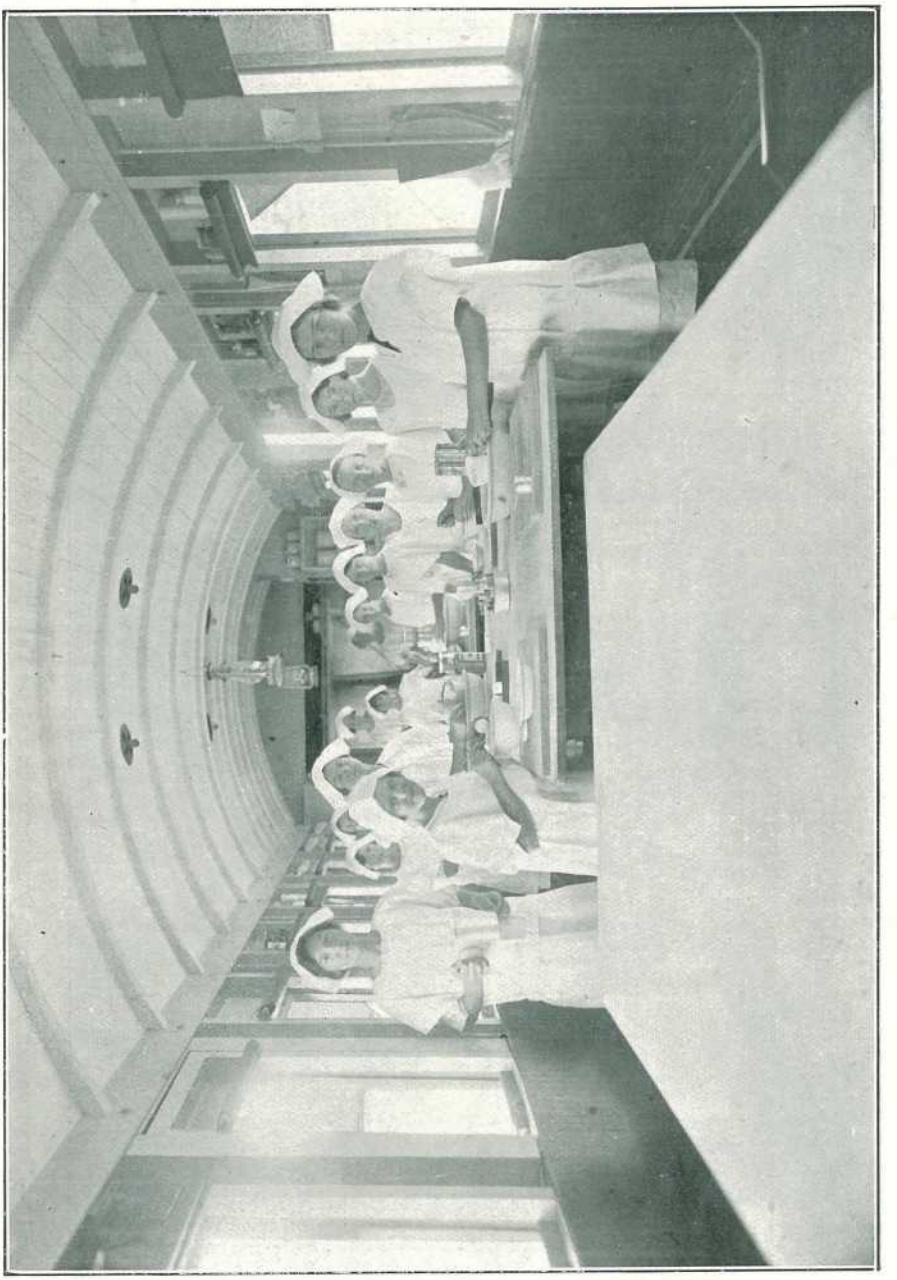

PLATE 12.—TRAVELLING DOMESTIC SCIENCE SCHOOL—A COOKERY CLASS.

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

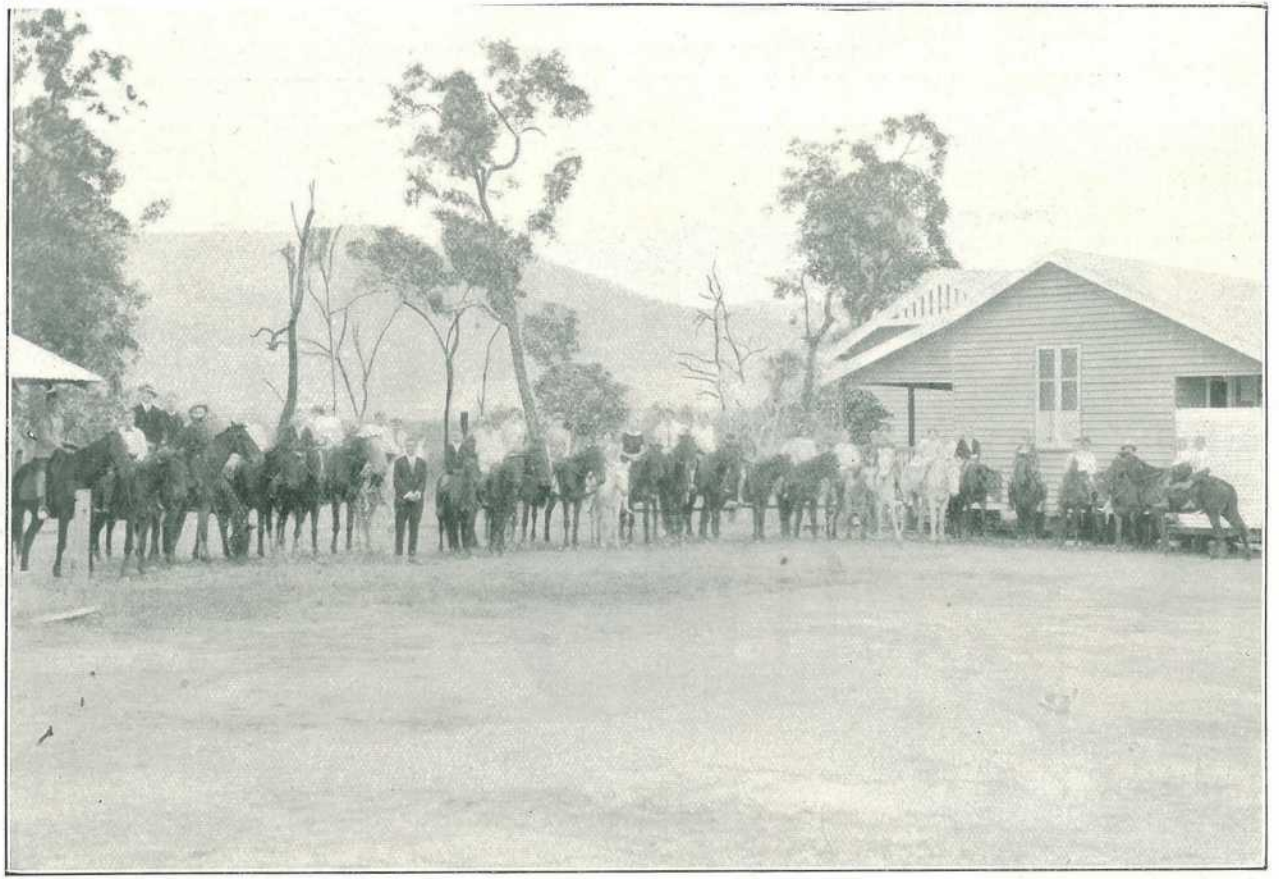

PLATE 14.—READY FOR HOME—STONE SCHOOL, NEAR INGHAM, NORTH QUEENSLAND.

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

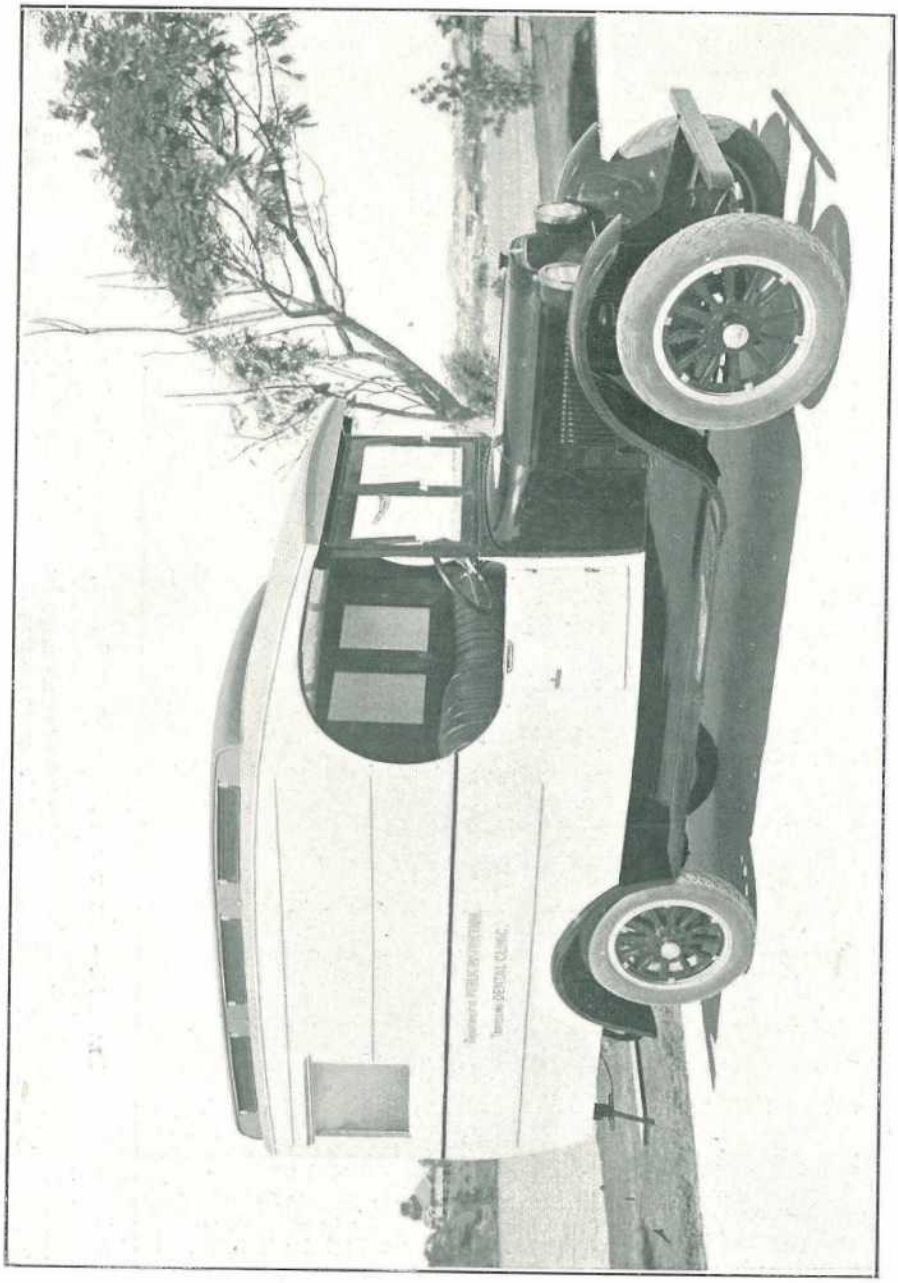

PLATE 15.—READY FOR THE ROAD. SPECIAL PANEL BODY, EQUIPPED AS DENTAL SURGERY. Department of Public Instruction, Queensland.

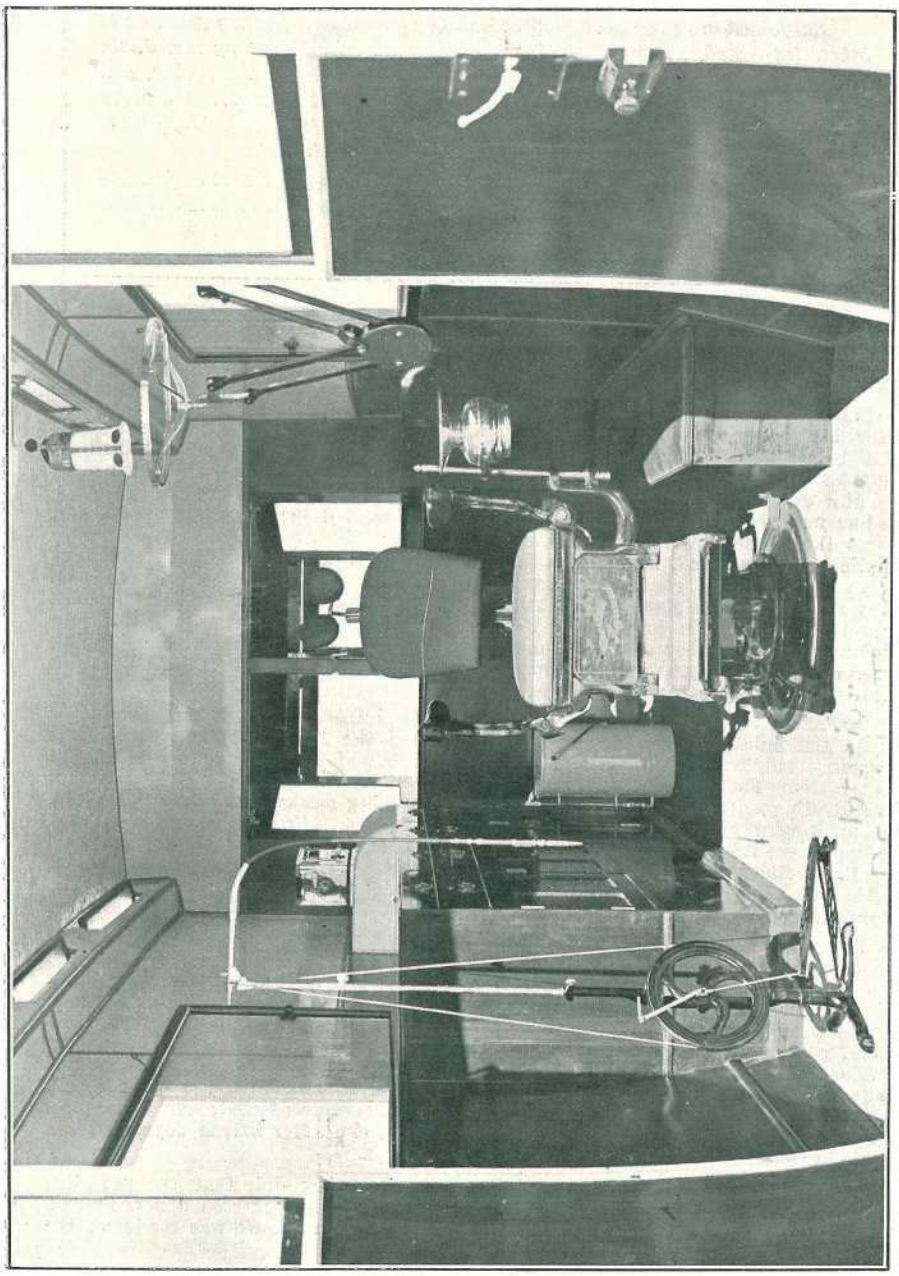

PLATE 16.—INTERIOR, DENTAL TRUCK.
In use in Queensland's back country by the Department of Public Instruction.

EYE WORM OF POULTRY.*

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

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

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

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

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

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

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

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

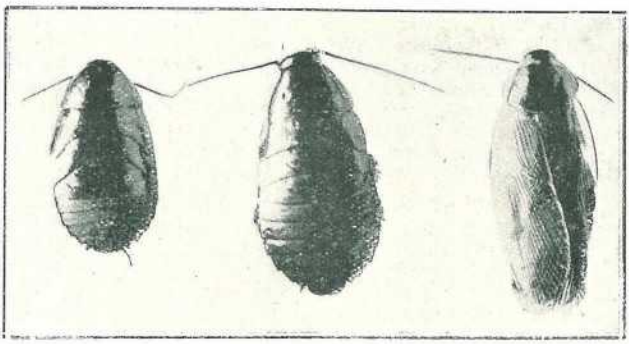


Fig. 1. × 1·7.

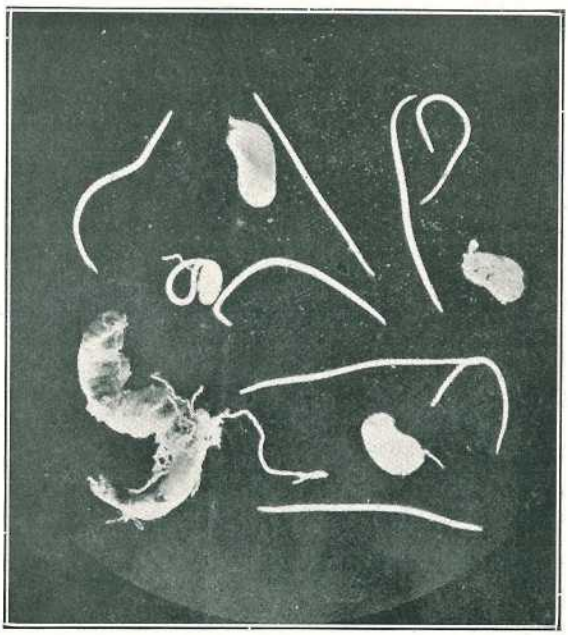


Fig. 2. × 3·8.

Photos.: F. H. Taylor.

PLATE 17.

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

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

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

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

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

(*a*) Young and very young forms, no infection present.

(*b*) Intermediate forms showed an infection rate of 38 per cent.

(*c*) Adult forms, an infection rate of 93 per cent.

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

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

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

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

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

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

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

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

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

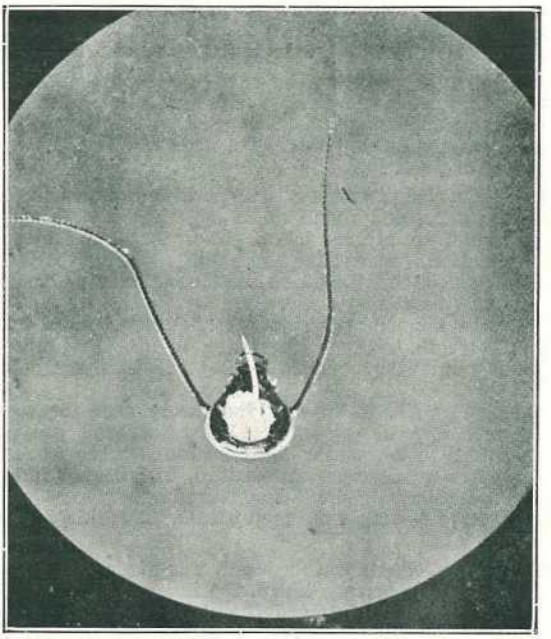


Fig. 3. × 3·8.

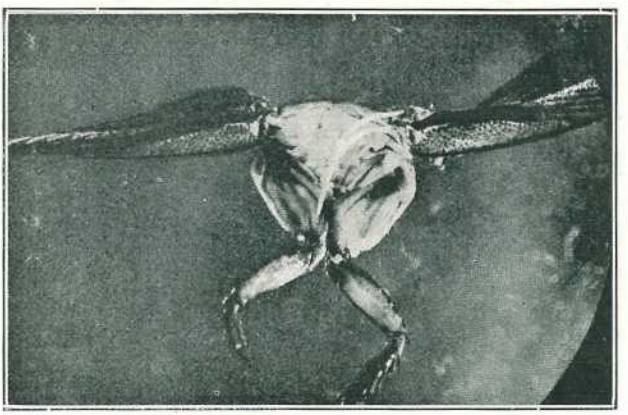


Fig. 4. × 3·8.

Photos. : F. H. Taylor.]

PLATE 18.

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

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

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

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

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

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

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

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

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

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

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

From the foregoing experiments there appears to be indisputable evidence that the cockroach, *Leucophæa surinamensis* Linn., is a responsible agent for the transmission of the eye worms of fowls and ducks. The cockroaches apparently ingest the young larvæ from the droppings and from the ground. Having attained their objective, the larvæ then pass through the wall of the alimentary tract, on the outside of which they encapsulate. In the capsules development takes place, and on attaining the stage of infectivity they leave the capsules and wander about in the body cavities. They have been recovered from both the thoracic and abdominal cavities, as well as the legs. The infected cockroaches are in their turn taken up by the poultry, and in our opinion do not pass further than the crop before the worms which have attained the infective stage escape from the

intermediate host; the parasites then pass up the œsophagus to the mouth, and eventually through the naso-lachrymal duct to their destination. There now remains to examine in detail two stages in the life history of this parasite. It is anticipated that this will take some considerable time to complete, as in (*a*) it will be necessary to feed one or two fowls with large numbers of infected cockroaches, so that heavily infected birds may be available for ascertaining the life history of the worm in the fowl, particularly the number of ecdyses and changes that occur in the worms before they attain maturity and reproduction begins, and (*b*) to obtain information regarding the time taken by the larvæ to reach the infective stage after entering the cockroach.

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

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

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

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

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

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

Treatment.

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

RADIO LECTURES ON AGRICULTURE.

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

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

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

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

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

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

RURAL ROUTES IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

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

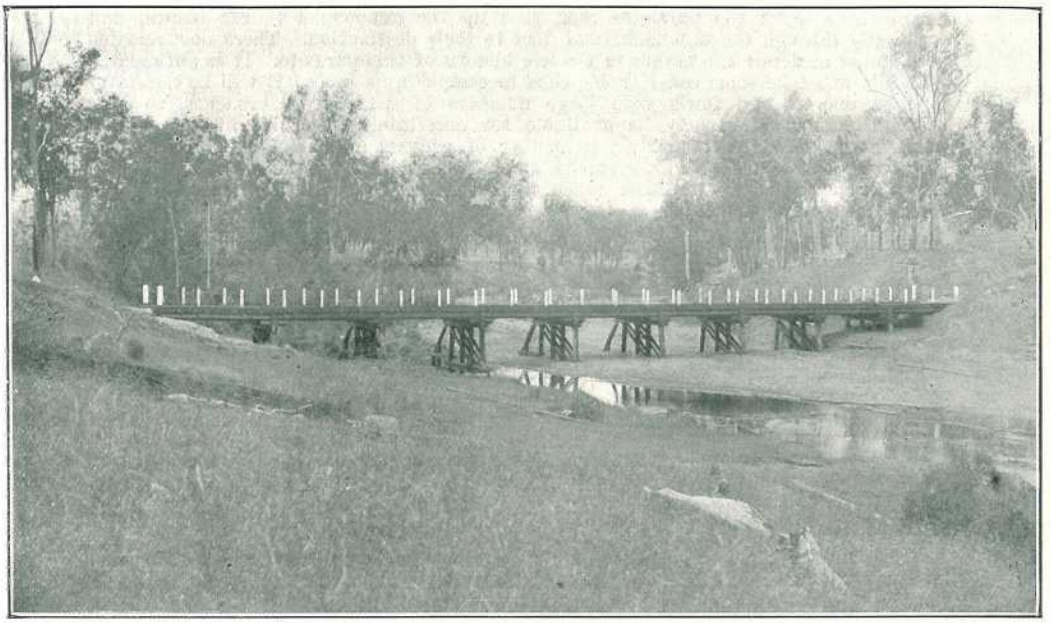


PLATE 19.
LOW-LEVEL BRIDGE, STUART RIVER.

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

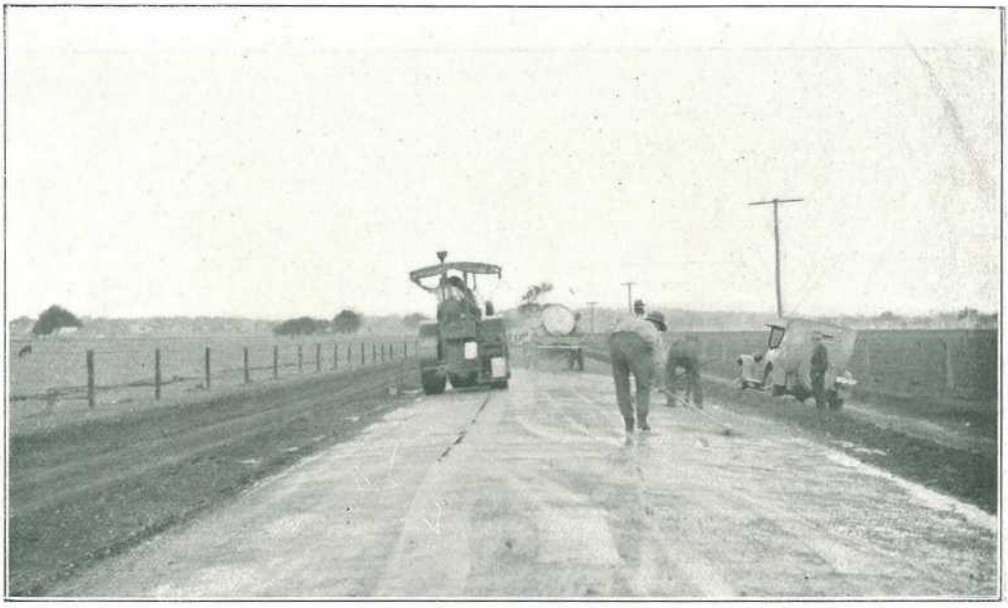


PLATE 21.
ROLLING, WATERING, AND BROOMING, HARRISVILLE-ROSEVALE ROAD.

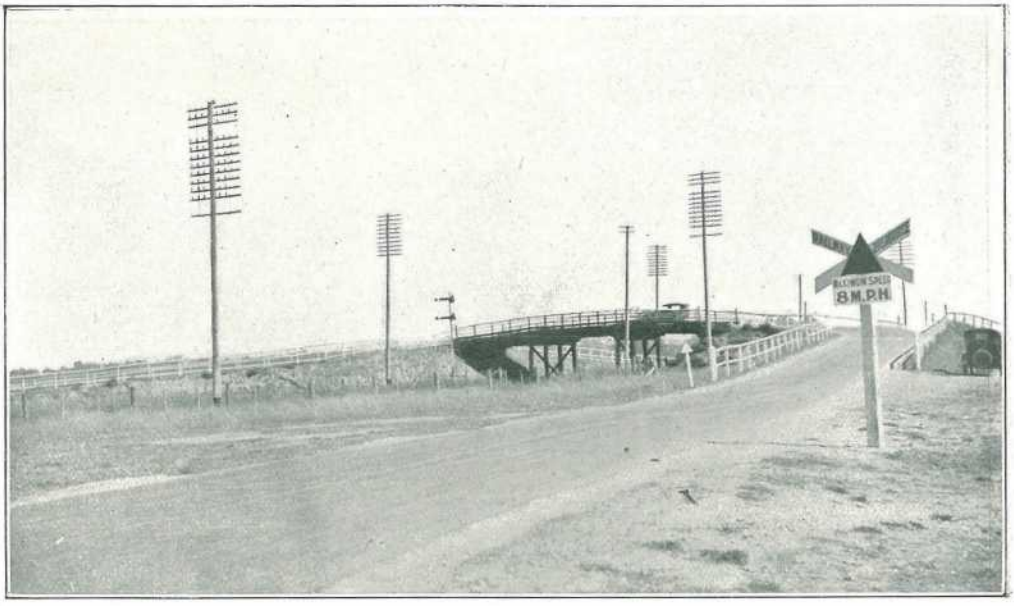


PLATE 22.
IPSWICH ROAD, REDBANK, AFTER CONSTRUCTION, SHOWING CONGLOMERATE ROAD SURFACED WITH BITUMEN. STANDARD WARNING SIGN DISPLAYED.

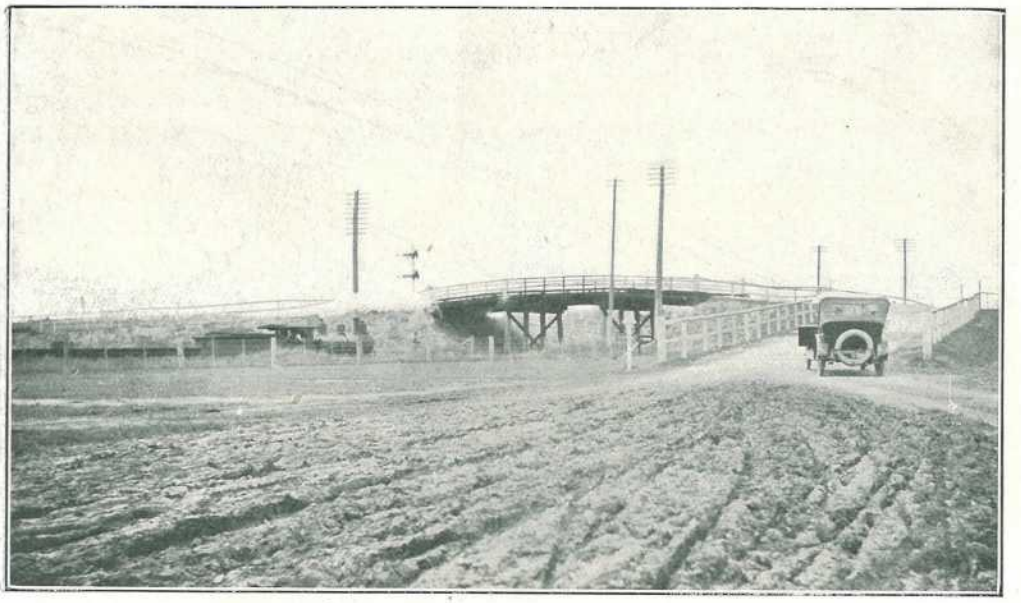


PLATE 23.
IPSWICH ROAD, REDBANK, BEFORE CONSTRUCTION.

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

PLATE 25.

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

PLATE 26.

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

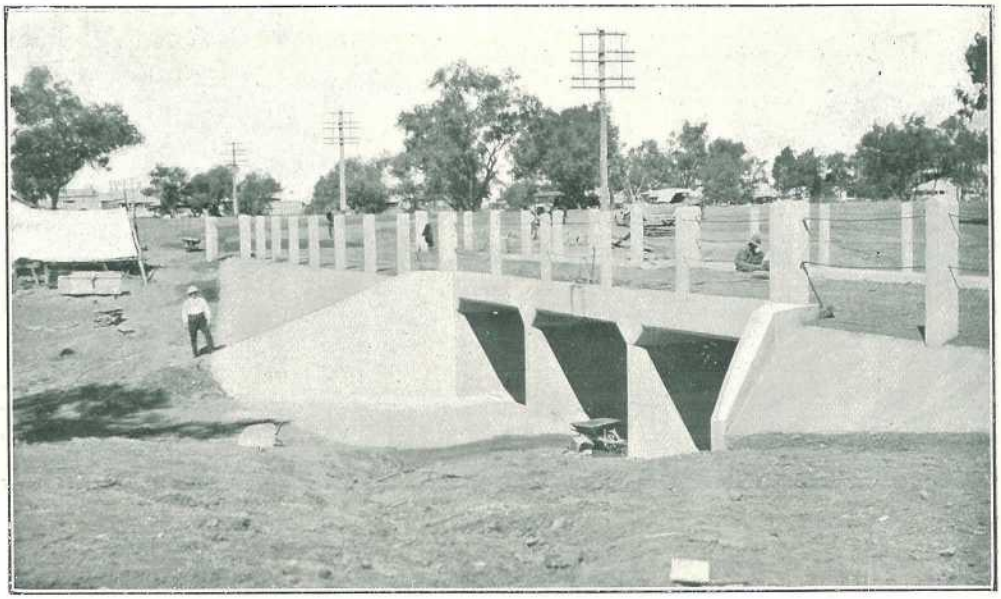


PLATE 27.

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

PLATE 28.

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

SELECTING THE BREEDING SOW.

POINTS TO BE OBSERVED.

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

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

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

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

(1) Hereditary Factor.

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

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

(2) Strong Constitution.

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

(3) Easy Feeding.

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

(4) Capacity to Produce and Rear.

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

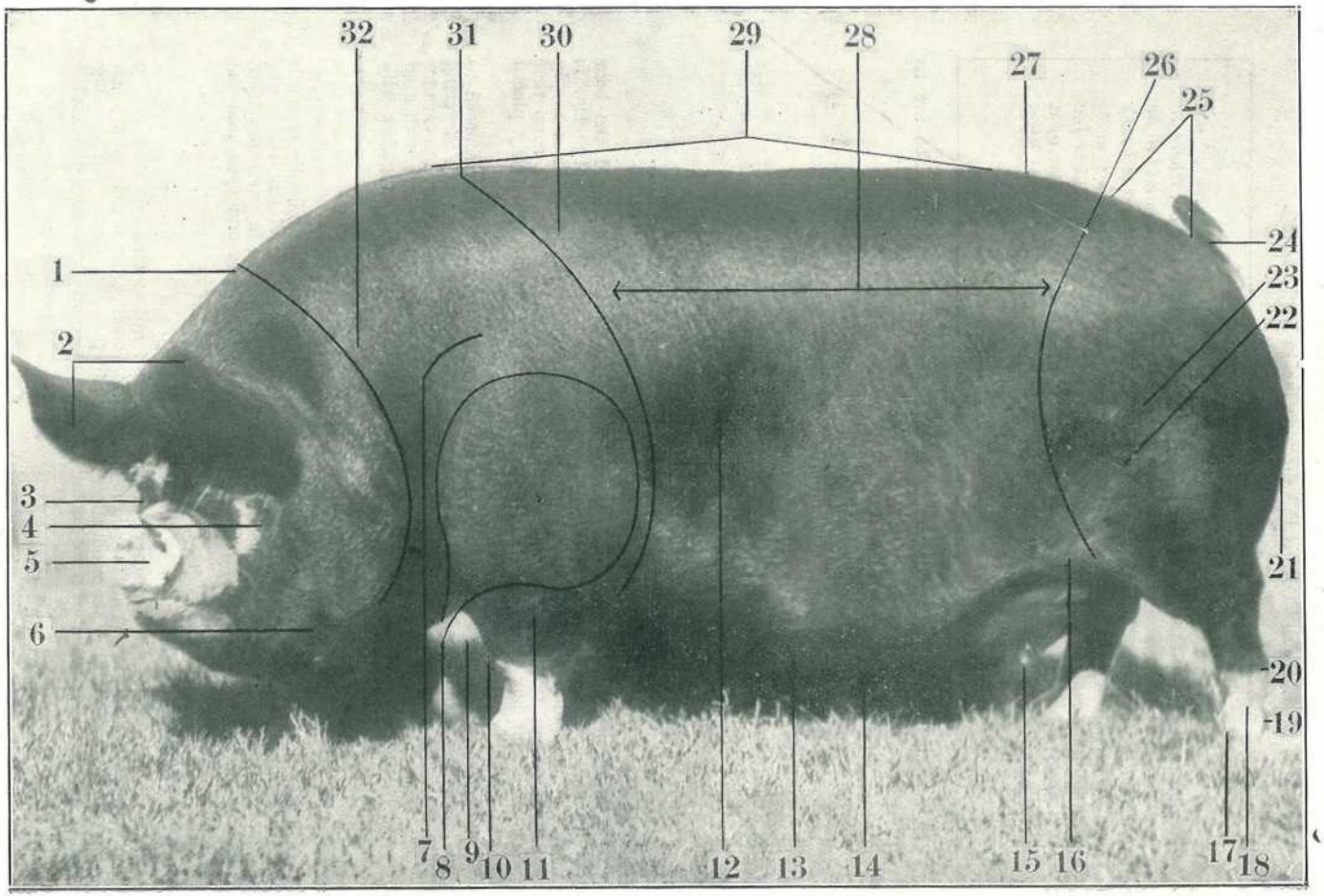


PLATE 29 (Fig. 1).—THE POINTS OF A PIG.

DESCRIPTION OF PLATE 29.

Principal Points of the Pig.

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

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

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

(5) Heavy Milk Production.

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

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

(6) Even Temperament.

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

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

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

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

(7) Evenness of Type and Conformation.

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

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

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

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

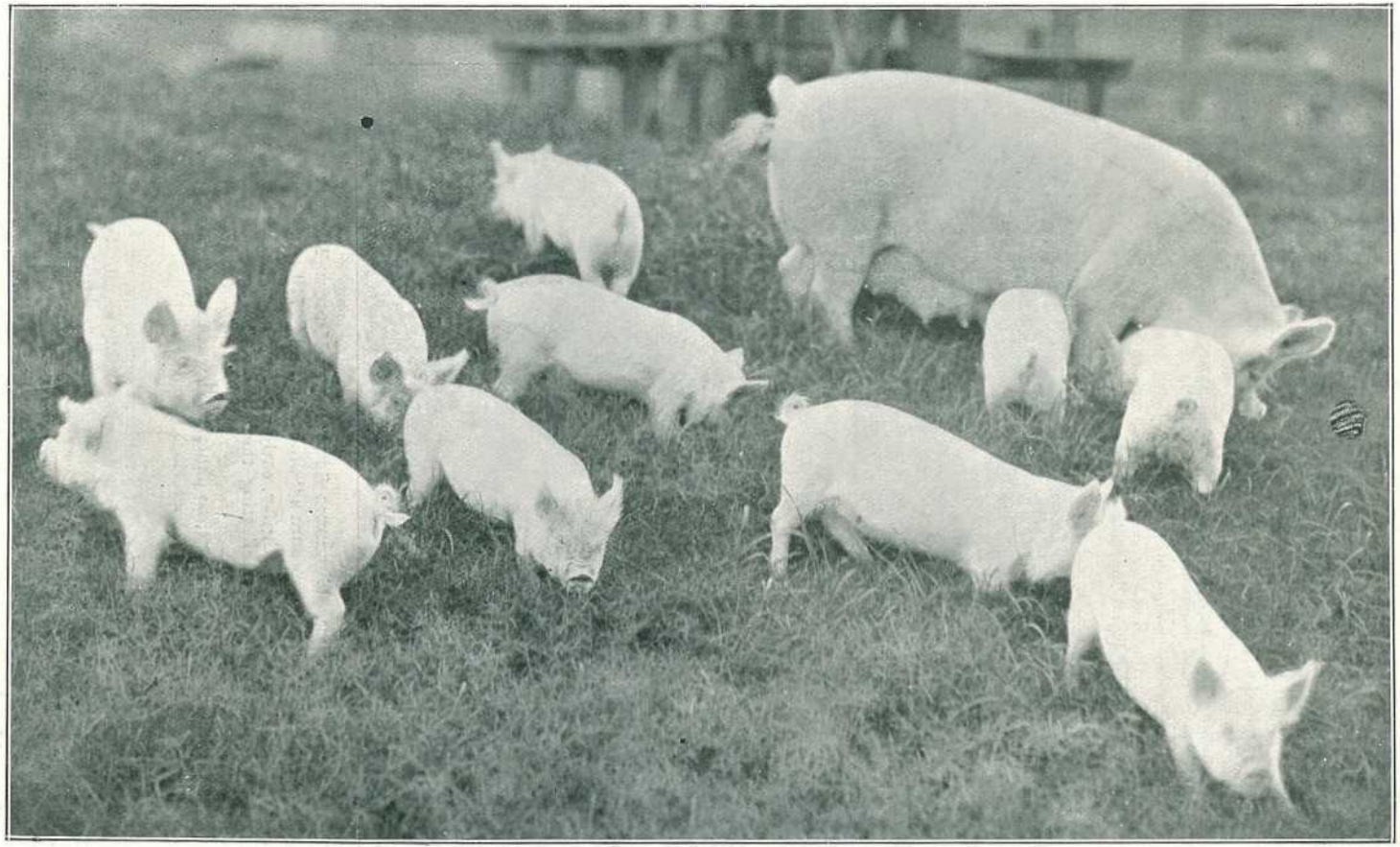


PLATE 30 (Fig. 2).—A BONNY LITTER JUST READY FOR WEANING.

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

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

The Teeth, Tongue, and Eyes.

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

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

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

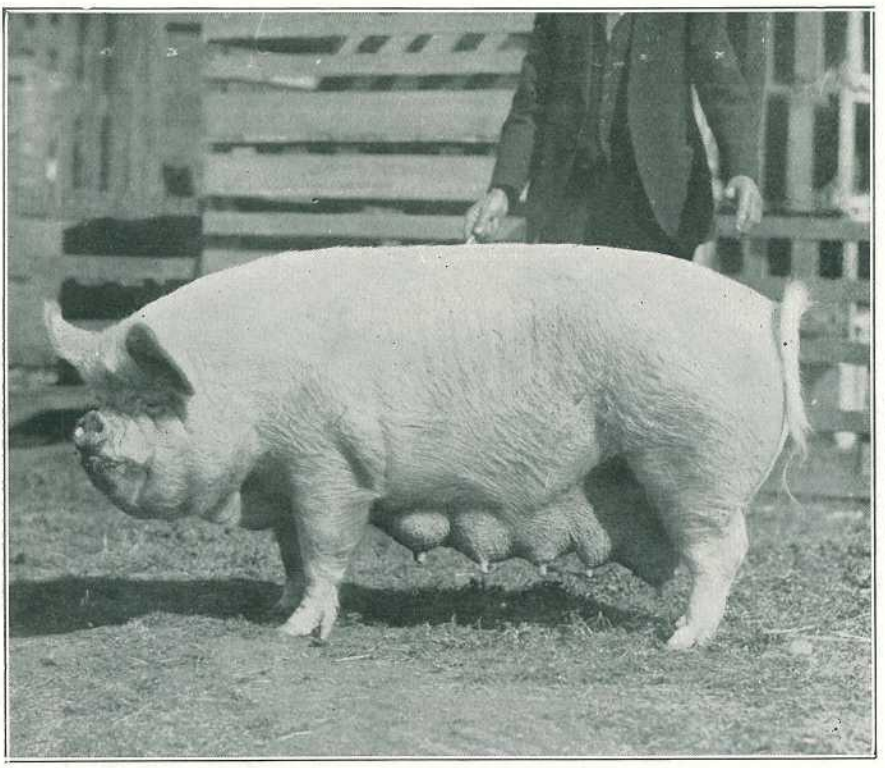


PLATE 31 (Fig. 3).—TYPICAL BREEDING SOW OF THE MIDDLE YORKSHIRE BREED. Mr. J. H. Thorburn's "Oatlands Enid" 2740.

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

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

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

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

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

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

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

8) Value of Breeding Sows.

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

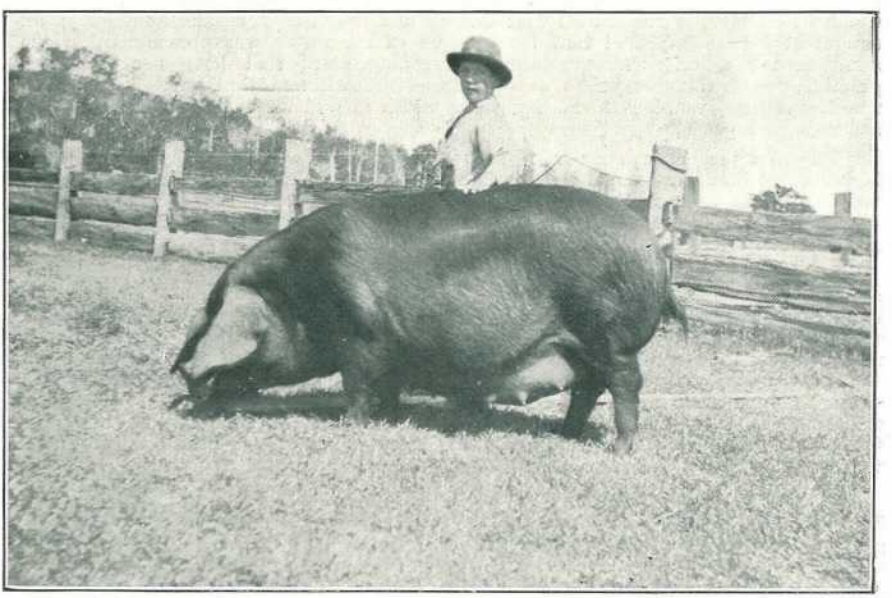


PLATE 32 (Fig. 4.).—A MATRONLY LARGE BLACK SOW, TWO YEARS OLD, PROPERTY OF MASTER GEORGE DAVISON, OF THE NORTH ARM PIG CLUB, QUEENSLAND.

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

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

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

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

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

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

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

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

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

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

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

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

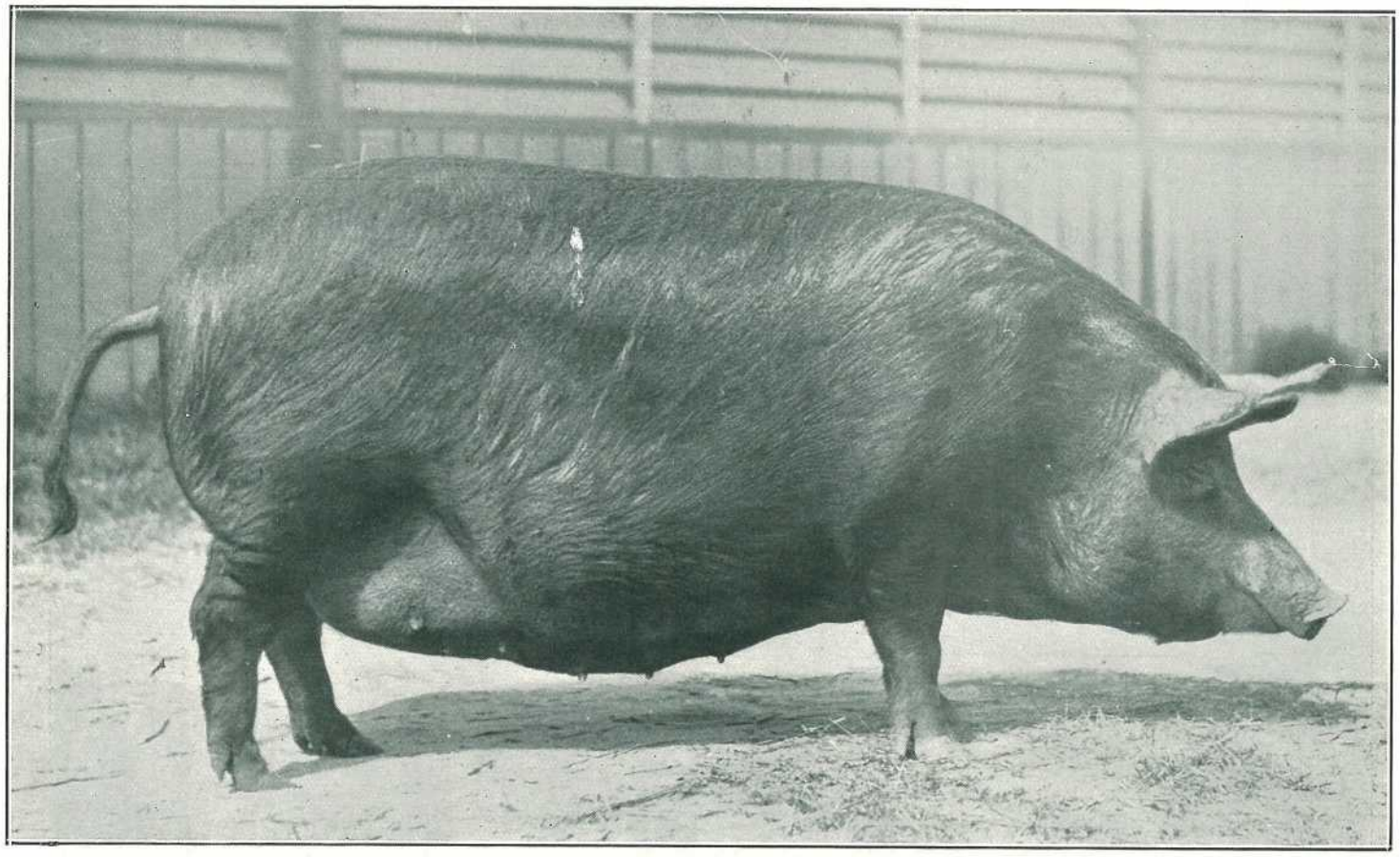


PLATE 34 (Fig. 6).—CHAMPION PRIZE-WINNING TAMWORTH SOW "MANNING ELNORA" (243).

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

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

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

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

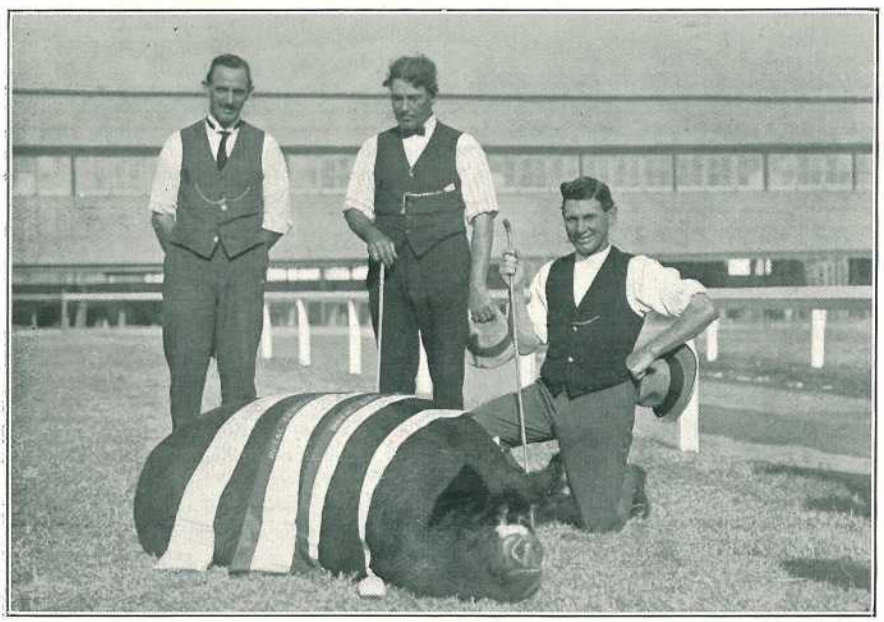


PLATE 35 (Fig. 7).—THE CHAMPION OF CHAMPIONS.

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

Flushing the Breeding Sow—An Old World Practice.

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

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

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

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

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

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

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

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

FARM TRACTORS.

By E. T. BROWN.*

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

Fuel Storage.

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

A Tractor's Capacity.

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

Starting Troubles.

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

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

Priming.

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

* In the "Farmer and Settler."

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

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

SILAGE FOR DAIRY COWS.

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

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

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

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

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

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

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

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

THE 1927 WHEAT CROP COMPETITION.

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

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

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

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

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

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

Methods of Judging.

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

Objects of the Competition.

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

Briefly, these were interpreted as having been designed—

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

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

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

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

Comments.

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

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

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

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

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

Summary.

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

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

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

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

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

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

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

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

PLATE 36.—"CLARENDON" WHEAT.

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

PLATE 37.—"CLARENDON" WHEAT.

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

PLATE 38.—"WARATAH" WHEAT.

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

PLATE 39.—"CURRAWA" WHEAT.

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

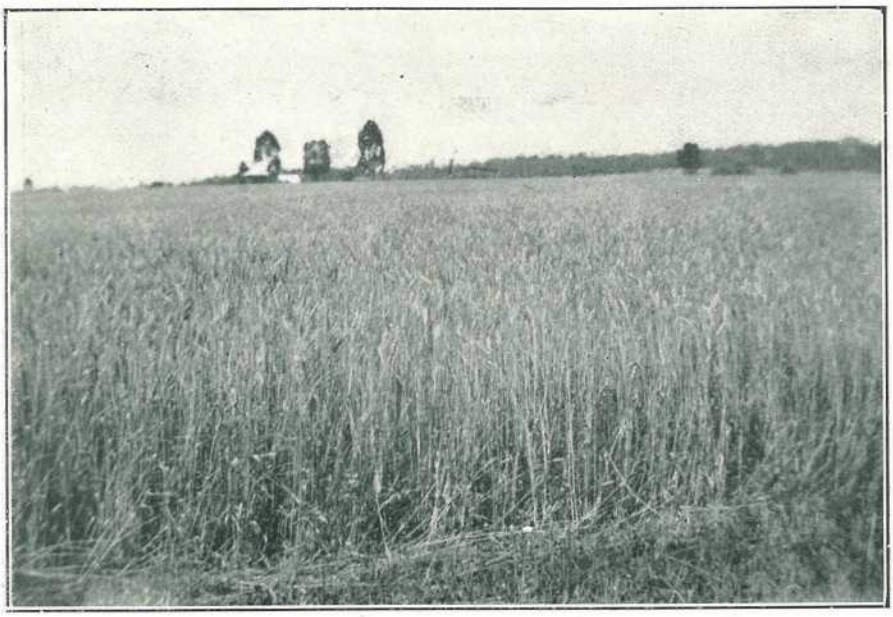


PLATE 40.—"WARRIOR" WHEAT.

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

PLATE 41.—"WARREN" WHEAT.

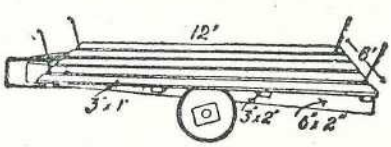
Grown by Messrs J. Ritson and Sons, Clifton. Third in Toowoomba District Crop Competition.

PLATE 42.—"CEDRIC" WHEAT.

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

A LOW TROLLEY.

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



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

VALEDICTORY.

RETIREMENT OF WELL-KNOWN DEPARTMENTAL OFFICERS.

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

Mr. J. B. HENDERSON.

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

Mr. JOHN LIVERSEED.

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

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

Mr. W. G. BROWN.

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

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

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

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

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

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

PLATE 43.—MR. W. G. BROWN.

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

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

Answers to Correspondents.

PIG RAISING.

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

Pig Management.

A.H.J. (Perriman)—

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

Pig Breeding.

M.R. (Gayndah)—

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

Overheated Bacon Pigs.

A.O.H. (Brooloo)—

There is little or no treatment than can be relied upon to relieve and save very fat bacon pigs that have become overheated as a result of being forced to travel during the heat of the day. It does not pay to attempt to drive fat pigs over long distances during very hot weather, though it is fairly safe if they are moved along quietly during the late afternoon or early in the morning. It is better to cart them to the station than to drive them, and in any case they should have ample water and be protected from the sun. The loss of bacon pigs such as those to which you refer would more than pay a good deposit on a suitable pig wagon; in fact, it would go a long way towards paying the total cost. Bleeding by slitting the ear or the tail is attempted as a last resort in some cases and with success, but in many cases these pigs do not live through the night, and are dead in the trucks on arrival at the factory. It is better to see that the pigs are not

too fat, and that they have plenty of exercise in a good roomy yard during the topping-up stages than to pen them up in a cool protected pen, force them into an over-fat condition, and then, after all the trouble and expense associated with their preparation for market, expose them to the sun and to the risk of heat apoplexy by driving them during a hot summer morning. Bacon pigs are too valuable nowadays to risk their loss through neglect and mismanagement. At any rate, it is quite useless depending upon any form of treatment to restore to normal condition a pig—whether fat or otherwise—that has become overheated and that is down and out to it before treatment is commenced. Bacon pigs worth between £3 10s. and £4 each are deserving of better attention than this.

BOTANY.

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

Zamia Palm.

R.W.H. (Cairns)—

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

SHEEP AND WOOL.

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

Blindness in Hoggets.

H.W.P. (Brookstead)—

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

Sheep Lick.

H. and L. (Hughenden)—

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

General Notes.

Staff Changes and Appointments.

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

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

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

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

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

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

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

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

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

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

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

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

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

Obituary.

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

A Stanthorpe Sanctuary.

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

A New Sugar-cane Harvester.

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

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

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

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

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

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

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

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

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

Corn in Egypt—from Australia.

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

The Leasing of State Farms.

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

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

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

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

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

Plant Diseases.

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

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

Farmers and Co-operative Service.

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

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

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

Farming on the Film—Educational Enterprise.

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

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

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

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

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

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

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

Mosquito-infested Swamp Land Sprayed from Aeroplanes.

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

Experimental Oversea Consignment of Australian Oranges.

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

Standardisation of Perishable Products.

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

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

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

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

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

Helping the Pig Industry—£30,000 Subsidy.

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

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

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

Disease-resisting Bananas for Panama.

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

Butter Board.

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

Special Classes in Pig Section, Brisbane Show, 1928.

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

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

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

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

A New Cotton Harvester.

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

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

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

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

A Cool Food Safe.

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

Canary Seed Board.

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

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

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

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

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

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

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

Oil from Coal.

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

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

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

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

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

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

Australia's Trade with India.

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

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

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

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

Egg Board Election.

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

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

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

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

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

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

One member is required for each district.

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

Spoilt Hay Turned to Good Use.

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

Spare that Tree—Valuable Kurrajongs.

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

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

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

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

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

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

Farm Notes for February.

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

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

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

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

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

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

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

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

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

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

Orchard Notes for February.

THE COASTAL DISTRICTS.

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

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

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

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

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

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

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

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

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

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

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

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

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

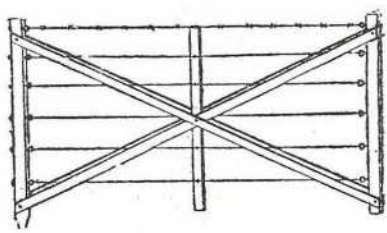
Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual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

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

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

A USEFUL GATE.

This serviceable gate, designed by the instructor in building construction at Dookie Agricultural College, may be easily made by any handy man. Planed timber should be used, hardwood for preference. The ends are 3 inches by 3 inches, the centre, 3 inches by 2 inches, the length over all being 10 feet and height 4 feet. The four diagonal braces are 3 inches by 1½ inches, and are notched ⅜ inch deep to make a snug fit over the stiles or ends, but are simply sprung over the centre upright without notching or checking the timber. A 6½-inch bolt at each corner, and a 9½-inch bolt in the centre holds the frame securely. All joints should be coated with good lead paint to keep out the wet. The first wire is 4 inches from the bottom, the spacing of the others being 5½ inches, 5½ inches, 5½ inches, 7 inches, 7½ inches, and a barb wire 2 inches from the top. Eye-bolts of ¼ inch iron are used for holding the wires, and by leaving a long tread on one end the wire can be drawn up as tightly as necessary, and the projecting ends cut off. The cost



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

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

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1928.		February. 1928.		MOONRISE. Jan. 1928.	Feb. 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.1	6.49	5.26	6.46	12.32	2.40
2	5.2	6.49	5.26	6.45	1.35	3.45
3	5.3	6.49	5.27	6.45	2.40	4.46
4	5.3	6.50	5.28	6.44	3.47	5.42
5	5.4	6.50	5.28	6.44	4.54	6.34
6	5.5	6.50	5.29	6.43	5.57	7.18
7	5.6	6.51	5.30	6.42	7.0	7.56
8	5.6	6.51	5.31	6.42	7.54	8.30
9	5.7	6.51	5.31	6.41	8.45	9.8
10	5.8	6.51	5.32	6.40	9.25	9.31
11	5.9	6.51	5.33	6.40	10.2	10.1
12	5.9	6.51	5.34	6.39	10.34	10.30
13	5.10	6.51	5.34	6.38	11.3	11.3
14	5.11	6.51	5.35	6.37	11.33	11.37
15	5.12	6.51	5.36	6.37	...	...
					a.m.	a.m.
16	5.13	6.51	5.36	6.36	12.3	12.20
17	5.13	6.51	5.37	6.35	12.34	1.7
18	5.14	6.51	5.38	6.34	1.9	2.0
19	5.15	6.51	5.38	6.34	1.46	2.57
20	5.16	6.50	5.39	6.33	2.30	3.56
21	5.16	6.50	5.40	6.32	3.20	5.1
22	5.17	6.50	5.40	6.31	4.15	6.6
23	5.18	6.49	5.41	6.30	5.13	7.10
24	5.19	6.49	5.42	6.29	6.15	8.14
25	5.19	6.49	5.42	6.28	7.19	9.19
26	5.20	6.48	5.43	6.27	8.22	10.23
27	5.21	6.48	5.44	6.26	9.25	11.28
					p.m.	
28	5.22	6.48	5.44	6.25	10.26	12.35
29	5.23	6.47	5.45	6.25	11.29	1.40
					p.m.	
30	5.24	6.47			12.32	
31	5.25	6.47			1.37	

Phases of the Moon, Occultations, &c.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.