Supplement to the "Queensland Agricultural Journal," February, 1929.

VOLUME XXX

QUEENSLAND AGRICULTURAL JOURNAL

Issued by direction of

The Hon. the Secretary for Agriculture

Edited by J. F. F. REID

JULY to DECEMBER, 1928

QUEENSLAND AGRICULTURAL JOURNAL.

VOL. XXX. PARTS 1 TO 6.

GENERAL INDEX.

INDEX TO ILLUSTRATIONS.

INDEX TO ILLUSTRATIONS—*continued.*

INDEX TO ILLUSTRATIONS—*continued.*

A. J. CUMMING, Government Printer, Brisbane.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

ANNUAL RATES OF SUBSCRIPTION.
Farmers, Graziers, Horticulturists, and Schools of Art FREE on prepayment of 1/- to cover postage. Members of Agricultural Societies, 5/-, including postage. General Public, 10/- including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXX. 1 JULY, 1928. PART 1

Event and Comment.

Dairying in Queensland.

IT will be remembered that the Minister for Agriculture and Stock (Mr. W. Forgan Smith) announced last year the appointment of a Departmental Committee to make a survey of economic facts relating to some important phases of agriculture in Queensland. The committee has performed a large amount of useful spade-work, and from the vast quantity of material it has collected much valuable data has been extracted. The Minister decided to issue to producers a series of bulletins containing some of the conclusions based upon this data. The first Bulletin "Dairying in Queensland, No. 1 D.," containing a brief review of the present conditions of the industry, has already been distributed, and the main portion of it was published in last month's Journal. The second bulletin is now available, and the full text of it will be a leading feature of our August issue. In it three outstanding factors are elucidated and stressed: The need of herd improvement, the importance of feeding, and the necessity of herd testing. The bulletin not only sets these out as meriting the immediate attention of those engaged in dairying in this State, but also extends a standing invitation to them to take advantage of the helping hand of the Department, and of the facilities which it offers. Facts and figures are cited in support of herd improvement, and particulars of the Better Bull Scheme are also given. The importance of feeding is emphasised, and a list of dairy fodder crops recommended for use in Queensland, together with particulars of their cultivation, are set out. Herd testing, as carried out by officers of the Department, is reviewed, and many cogent and impressive facts are pithily presented. The dairymen of Queensland

are asked to avail themselves of the services which are at their disposal free of any charge. They are also invited to set before themselves the reasonable objective of raising the average annual yield per cow to 260 lb. commercial butter. The attainment of this objective obviously means a greater measure of prosperity to all concerned, and to reach it there should be no difficulty in securing the co-operation of all engaged in the industry.

Queensland Butter Factory Successes.

THE Deputy Premier and Minister for Agriculture (Mr. W. Forgan Smith) followed with much-interest the reports of the proceedings of the Queensland Butter and Cheese Factory Managers' Association Conference which was in session at Brisbane last month. Efforts to improve the standards in the dairying industry generally, and on the manufacturing side in particular, were, he informed the Press recently, worthy of commendation. Evidence of this he observed in some recent successes achieved by Queensland manufacturers in important competitions, in which the butter and cheese of other States have been exhibited.

In the first competition for the World's Butter Championship, conducted at the Auckland Winter Show in August, 1925, the Oakey District Co-operative Factory secured second place with 96 points, the first prize gaining 96½ points.

At the Royal Melbourne Show last year Queensland factories secured these awards:—Salt butter, suitable for export, won by Oakey District Co-operative Butter Association. The champion prize for cheese of any age, judged on flavour, was awarded to the Pittsworth Dairy Company (Yarranlea factory). The same company took first place in the class for cheese suitable for export, not over three months. The Downs Co-operative Dairy Association (Lillydale factory) was second. The judges stated that the quality of the Queensland butter was very fine, and reflected great credit on the manufacturers and the standard of efficiency attained by the factory managers. In connection with the competition of Australian butters entered in the Orient Line Jubilee Export class, in which sixty-one factories competed, recent cable advices from London indicate that the Downs Co-operative Dairy Association (Goombungee factory) tied with the "Norco" Corndale factory (N.S.W.) for the highest aggregate points in the Sydney and London judgings in both salted and unsalted classes. In the salted classes Queensland Farmers' Co-operative Association (Grantham factory) came second with 191 points, while the Goombungee factory also secured fourth place with 189½ points in conjunction with the Uki (New South Wales) factory. In the unsalted classes the Maryborough Co-operative Dairy Association (Kingaroy factory) shared second place with the "Norco" Company's Channon factory (New South Wales), while the Downs Co-operative Dairy Association (Goombungee factory) was equal for fourth place with two other New South Wales factories.

To enable the industry to secure the full benefits of the improvements being effected on the manufacturing side, added the Minister, there must be complete co-operation by the farmer with the factory, for in order to produce the highest quality butter and cheese it is necessary that the producer should supply cream and milk in the best possible condition. He complimented the Manager's Association on its activities and for its efforts to further improve manufacturing standards.

Colour Prejudice in Corn.

THE Director of Agriculture (Mr. H. C. Quodling) has informed us that the proportion of red-tinted and red-coloured maize being marketed this season in Southern Queensland is so pronounced that buyers, who are on the lookout for yellow grain, have experienced great difficulty in getting even, whole coloured lines. The prejudice against this red-coloured grain is not confined to the interstate trade, as it is understood that distinctly coloured yellow grain is also being sought after for the overseas trade. Actually, there is little or no difference in quality between red and yellow grain. Growers, however, would be well advised when selecting their seed corn for the approaching season's planting to make sure that it is a whole coloured yellow variety. If action in this direction were general, there would be fewer complaints by buyers and better and more satisfactory marketing conditions could be anticipated in the future. It is hardly necessary to stress the importance of everyone concerned assisting in the "swing over" from red to yellow coloured grain, and in this direction the helpful efforts of seedsmen would be invaluable. A word of warning in relation to the source of seed supplies may not be out of place, so that diseases not known now in Queensland may be kept out. One serious disease

coming under this category is known as "root, stalk, and ear rot," which is readily set up by infected grain. Loss from this particular disease in New South Wales alone has been estimated on occasion as from 5 to 10 per cent., and it is practically impossible to tell whether or not apparently sound, healthy-looking grain is free from infection.

The Position of the Sugar Industry.

A SURVEY of last year's operations generally reveals the present position of the sugar industry in Queensland. With the exception of that of 1925 the 1927 crop was the best yet harvested. The Statistician's figures for the term are not yet available, so the results now given must be regarded as approximate only. The present embargo on imported sugar expires next month, and the Federal Government has determined that it shall be renewed for a further term of three years as from August, subject to the same prices and conditions that obtain under the existing embargo. This was essential to the Queensland industry, and its renewal gave the greatest satisfaction to all sections employed in it, besides winning the approval of all who take the long view of national affairs.

In 1927 the total area under cane was just about 300,000 acres, an acreage considerably in excess of that of the previous year. The area from which cane was crushed was 211,762 acres, also an excess over the 1926 figures by 22,450 acres. The total tonnage of cane harvested was 3,554,289 tons, from which it is estimated that approximately 483,000 tons of 94 n.t. raw sugar were extracted. This yield was much higher than that of 1926, exceeding it by 94,000 tons. It was just short of the 1925 record, which was 485,585 tons. The acreage yield was about 16.7 tons, as compared with 15.45 tons per acre in 1926. The sugar yielded per acre, 2.2 tons, was also better than that of the previous year. The quantity of cane required to make 1 ton of sugar was about 7.3 tons, which was the lowest on record, the commercial cane sugar in the product last year being particularly good. In this factor much improvement has been shown in recent years, which is due to the higher efficiency of the raw sugar mills, better varieties of cane, the regulation of cane prices, and the work of the Bureau of Sugar Experiment Stations. The excess of the sugar produced over home needs amounted to 152,400 tons. The price paid to the mills was £22 0s. 4d., or £2 10s. 6d. less than in 1926. The percentage which went into home consumption was 68.8181, while the net value of the sugar exported was £12 2s. 6d. per ton n.t. The estimated consumption in the Commonwealth is somewhere around 333,000 tons per annum. There is no information at present available on the molasses output, but it is anticipated that, with power alcohol plants operating at Sarina and elsewhere, this will be an important industrial and economic factor in the near future.

The Present Seasonable Outlook.

THE present sugar season has opened out very promisingly, and it is expected that the 1925 record should be exceeded. Grub damage, however, has been severe, particularly in the North, and grubs have also appeared in districts hitherto regarded as quite free from the pest. Their prevalence this year is due largely to congenial seasonal conditions. The Bureau of Sugar Experiment Stations, which is part of the excellent organisation which is characteristic of the whole industry in Queensland, is extending somewhat its beneficial influence. Its staff of trained men has been largely increased, and the services of student scientists who were sent abroad as the holders of Travelling Scholarships are now available to the growers and millers. Of the travelling scholars two, Messrs. Bell and Bennett, whose work has been in cane pathology and sugar technology respectively, are now actively employed. A third, Dr. Kerr, whose oversea studies have taken in soils physics and chemistry, is expected to return this year. The work of these young and gifted Queenslanders should be of the greatest value to the industry.

The propagation of new seedling canes is being carried out on an extensive scale, and this activity is of the utmost importance to the farmers. The new canes are, of course, tested for their commercial value as well as to their resistance to disease.

In respect to general educational guidance, the Queensland sugar-grower has very little to complain about, and probably no primary industry in Australia is so well advanced along the lines of scientific organisation. This is as it should be, and, in fact, the sugar-growers have set a high standard and an impressive example to farmers in the other departments of rural enterprise.

Bureau of Sugar Experiment Stations.

FERTILISER RESULTS AT BUNDABERG.

The following data on the use of fertilisers in sugar-cane cultivation have been supplied by several Bundaberg farmers to the Bureau of Sugar Experiment Stations, and in every case show a profit that has well paid the grower for manuring. These are the results of local experiments that have been mentioned by Mr. J. C. Murray, Southern Field Officer to the Bureau, in his reports from time to time. As the growers concerned have requested that their names should not be mentioned, a distinguishing letter is affixed to the various examples:—

FARM A, BUNDABERG.

Soil, red scrub loam. Cane value at mill, 37s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	(*a*) Cost of Manures, and (*b*) Application.	Increase in Values of Crop due to Fertilisers.
			£ s. d.	£ s. d.
Bonemeal, 6 cwt.	25·0	5·0	(*a*) 5 8 0	3 12 0
Sulphate of Potash, 3 cwt. ..			(*b*) 0 5 0	
			5 13 0	
No Manure	20·0	..	..	..

FARM B, BUNDABERG.

Soil, red scrub loam. Cane value at mill, 37s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(*a*) Cost of Manures and (*b*) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. Mixed Manure containing—				
9% Nitrogen				
7% Phosphoric Acid (as bone)	22·0	4·0	(*a*) 3 4 0	3 19 0
11% Potash as Muriate			(*b*) 0 0 5	
			3 9 0	
No Manure	18·0	..	..	

FARM C, BUNDABERG.

Soil, red forest loam. Cane value at mill, 36s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(*a*) Cost of Manures, and (*b*) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. Bonedust	20·0	2·0	(*a*) 2 0 0	1 7 0
			(*b*) 0 5 0	
			2 5 0	
No Manure	18·0	..	..	..

FARM D, BUNDABERG.

Soil, red forest loam. Cane value at mill, 36s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(*a*) Cost of Manures, and (*b*) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
3 cwt. Bonedust and 1 cwt. Sulphate of Potash	22·0	4·0	(*a*) 2 8 0 (*b*) 0 5 0 2 13 0	4 11 0
No Manure	18·0	..	..	..

FARM E, BUNDABERG.

Soil, red forest loam. Cane value at mill, 37s. per ton.

Manures Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(*a*) Cost of Manures, and (*b*) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. of Mixed Manure, containing— 3½% Nitrogen .. .. 12% Phosphoric Acid (as bone and superphosphate) 12% Potash (as sulphate) ..	20·0	5·0	(*a*) 2 10 0 (*b*) 0 5 0 2 15 0	6 10 0
No Manure	15·0	..	..	..

FARM F, BUNDABERG.

Soil, red forest loam. Cane value at mill, 37s. 6d. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(*a*) Cost of Manures, and (*b*) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. of Mixed Manure, containing— 7% Nitrogen .. .. 10% Phosphoric Acid (as bone) .. .. .. 10% Potash (as muriate) ..	20·0	5·0	(*a*) 2 17 6 (*b*) 0 5 0 3 2 6	6 5 0
No Manure	15·0	..	..	..

THE BUNDABERG EXPERIMENT STATION AND THE GUMMING DISEASE SITUATION.

The Bureau of Sugar Experiment Stations has issued the following report:—

In common with most other farms in the Bundaberg district, gumming disease became established on the Bundaberg Experiment Station a few years ago. The result has been that the hitherto standard varieties have suffered great losses in both tonnage and purity, and have reached the stage where it is impossible to continue to grow these varieties profitably. In order to cope with this situation the Director, in 1926, ordered the ploughing out of all susceptible canes, and their replacement with resistant varieties. Of the latter, Q. 813 appeared by far the most promising, and has accordingly been planted extensively, and is now the main variety on the Station; the only other varieties grown are those which are being tested for resistance to gumming.

Cane may be infected with gumming in a variety of ways, but by far the most important mode of spread is from leaf to leaf during wet windy weather (see an article by Mr. D. S. North in the "Australian Sugar Journal" for August, 1927). The causal bacteria enter the leaves through wounds in the epidermis, and after about two weeks the typical yellowish streaks appear on the leaves. The zone of infection may remain confined to the leaves, but in susceptible varieties it extends down into the stem as soon as the cane receives a check in growth—i.e., during the winter or drought periods. Once the disease has passed into the stem it becomes systemic, and it is in this comparatively late stage that the gum oozes from the cut ends of the stem. There are no commercial canes known to be immune to gumming, but there are a number which are highly resistant, and which, if exclusively grown, would soon serve to eradicate the disease from the district. Q. 813 must be placed in this class of highly resistant canes. When exposed to sources of heavy infection this type of cane will contract the disease, but, apart from exceptional circumstances, the infection is confined to the leaves and does not pass down into the stem. The disease thus fails to become systemic, and the cane should become completely healthy with the shedding of the infected leaves. Since gumming is spread only in wet windy weather, it follows that during a period of dry calm weather there would be no secondary spread, and a crop of a highly resistant cane would soon tend to become quite healthy again. The bacterium which causes gumming appears to live only in the sugar-cane plant, and cannot live in the soil or trash. From these considerations it will readily be understood that gumming could be eliminated from the Bundaberg district if every farmer grew canes which are highly resistant and those canes only. Strict attention must be paid to the eradication of the small collections of nondescript varieties which are found on most farms. After the elimination of the disease it should then be possible to return to the old susceptible varieties if that were desired.

The extensive plantings of Q. 813 will be harvested at the Station this year, and it is confidently expected that the experiment will prove the possibility of growing a comparatively healthy crop of a resistant cane even when surrounded by badly diseased fields. As long as the growers immediately adjacent to the Station continue to plant susceptible varieties it will be impossible to maintain the Station fields in a disease-free condition, as it is known that the causal bacteria are carried by flies over considerable distances. It must be emphasised here that all attempts at the control of gumming should not be sporadic but must be practised simultaneously over the entire district.

Unfortunately, the problem of securing resistant varieties which are suitable for the particular class of soil is exceedingly difficult in some sections of the Bundaberg district. Q. 813 is quite unsuitable in some areas, but should be grown wherever possible, as, in addition to being highly resistant to gumming, it is also resistant to Mosaic and Fiji diseases. The Bureau has recently imported from the West Indies two canes which there are resistant to gumming, and yield high tonnages of sugar; these will soon be available for field tests at the Station. In March a shipment of the famous Java cane (P.O.J. 2878) was received; Javanese experience suggests that this cane should do well under somewhat adverse conditions, but naturally nothing is known of its resistance to gumming. Arrangements have been made to introduce a number of specially selected canes next spring; the parentage of these canes leads us to believe that the majority of them should prove resistant to gumming. In addition, a number of the South Johnstone seedlings are already undergoing field tests for gumming resistance, and several varieties are showing promise.

Next year it is hoped to extend the breeding programme of the Bureau, and special attention will be paid to breeding canes for the double purpose of gumming resistance and tolerance of unfavourable climatic conditions.

THE ATHERTON TABLELAND.

Mr. J. H. Buzacott, Assistant Entomologist to Mr. E. Jarvis, Entomologist of the Bureau of Sugar Experiment Stations, reports:—

Atherton Tableland was visited in order to make a study of the insect pests affecting sugar-cane growing in the district, and also with a view to comparing pests found there with those occurring at lower altitudes.

Unfortunately, wet weather was experienced throughout the whole duration of the visit (March, 1928), and thus little opportunity was afforded for the collection of a representative group of insects.

There is very little cane grown on the Tableland now, although many of the farms have a small patch for feeding pigs and stock, but most of this was poorly

cultivated, and Mosaic was common. On account of the small plots of cane insect pests were also collected from nearby maize, but the number of serious pests encountered was few.

The chief insects met with are listed below:—

Orthoptera.

Grasshoppers were doing the most damage, mainly *Locusta danica*, *Locusta australis*, and a thin long-legged green grasshopper which was far more prevalent on the Tableland than on the coastal lowlands.

The common cane cockroach (*Ellipsidion* sp.) was on the cane and corn in large numbers.

Army Worms.

Various species of army worm caterpillars were collected, and among the adults bred out have been *Cirphis unipuncta* and *Mocis frugalis*.

A fungus disease was found to be attacking many of the caterpillars there—this disease somewhat resembling the green muscardine fungus (*Metarrhizium anisopliæ*) which attacks cane grubs and other insects.

Other Pests.

Aphides were present in large numbers on the maize, whilst on surrounding grass land the small black leaf-eating beetle (*Rhyparida morosa*) was very numerous.

Judging by the presence of click-beetles in the corn, their larvæ, known as wire-worms, were probably operating at the roots.

Specimens of a skipper butterfly (*Parnara mathias*) were captured in cane, and also two larvæ of it, one of which was parasitised by a Braconid wasp, were found on cane leaves. This skipper has been recorded before as attacking sugar-cane in North Queensland.

Among the beneficial insects observed were male digger wasps (*Campsomeris* sp.), Robber flies, and earwigs.

As stated above, on account of the wet weather, this could hardly be termed representative of the Tableland insects, and of those specimens collected or seen there was not one species which is not known to commonly occur on the lowlands in the Cairns district.

CANE CULTURE IN THE PHILIPPINES.

By ARTHUR F. BELL.

The Philippines constitute a large group of islands lying to the south-east of continental Asia, and extending from latitude 4 degrees north to 20 degrees north. The group contains over 1,400 islands, with an aggregate area of over 120,000 square miles. The native population is of the Malayan race, and has many characteristics in common with the Javanese; the type of native and the dialect spoken vary somewhat as one passes from island to island. In the sixteenth century the Philippines came under the domination of the Spaniards, and the Spanish rule persisted until the Spanish-American war of 1898, when the group became an insular possession of the United States. Since that time the development of the country has been greatly accelerated, due to the introduction of American system and capital, and the exemption of Philippine products from payment of the heavy import duties of the United States. With the exception of the very small islands of Porto Rico and the Hawaiian group, the Philippines constitute the sole tropical possession of the United States, and as such are of great importance to that country. It is well known that continental United States is dependent upon other countries for its enormous requirements of coffee and rubber, and to a large extent sugar, and the Philippines are potential suppliers of the entire needs of these tropical commodities.

Economic Conditions.

Although sugar-cane has been grown commercially for very many years, the Philippine industry must be considered as being in the infancy of its development. Only a small proportion of the available land is at present devoted to cane culture, and this land is confined to the two islands Luzon and Negros, the latter being the

more important. For the season 1926-27, the total production was nearly 500,000 tons of raw sugar, the greater part of this being exported to the United States. There has recently been some agitation to persuade the United States Congress to limit the quantity of Philippine sugar which shall be admitted duty free, and the amount suggested was 500,000 tons. Should this proposal come into effect, it will naturally be a serious blow to the future of the Philippine sugar industry. On the other hand, next to Java, the labour is probably the cheapest in the sugar world, and the profitable production of sugar should soon be achieved even without the assistance of the American tariff barrier.

Cane Varieties and Yields.

To achieve this end it will be necessary to bring about an almost complete change-over in the varieties of cane grown. At the present time the bulk of the crop is composed of the so-called "native" canes, Luzon White, Luzon Red, Cebu Purple, Negros Purple, &c., canes which yield neither heavy crops nor rich juices, and which cannot be ratooned successfully. It seemed to me that the yield per acre could probably be increased by at least one-third, merely by the substitution of varieties which are already in the country. Moreover, these varieties will yield two or three ratoon crops, thus eliminating the necessity and cost of planting every year. Of these new varieties, Badila is one of the most promising varieties being grown on the island of Negros, and is giving an average yield (both plant and ratoon) of about 25-30 tons per acre for a twelve months crop. Whether Badila will become the standard variety, or whether it will be but a transition variety while other varieties are developed and tested, remains to be proved.

Exhaustive tests of the yielding capacities of different varieties are now being carried out under the direction of H. Atherton Lee, late Chief Pathologist to the Hawaiian Sugar Planters' Association, and now Director of Research to the Philippine Sugar Association. In addition to his high scientific attainments, Mr. Lee is equipped with sound practical knowledge and judgment, and I consider that the experiments which he has just set out promise to be among the most thorough which I have ever seen in any sugar-cane country. His current programme consists of at least one variety trial and one fertiliser trial in the lowlands and uplands of each mill district. Each experiment is laid out so that there are ten plots of the control and ten plots of each of the experimental treatments. Each plot occupies an area of a quarter acre; these will be harvested separately, the results examined mathematically, and the true significance of any differences in results ascertained. After the standard varieties and the best fertiliser practices have been determined, the programme will be extended to include experiments on cultural operations, &c.

Farm System.

Unlike Java and Hawaii, the industry is not conducted on the estate system, but approximates to the farm system of Australia. The mill owns the permanent tramways, hauls the cane from the tramway siding, and is responsible for the allocation of cane cars to the individual farmers. At the beginning of the season an estimate is made of the total yield, and of the probable yield for each farm, and on this basis each farmer is allotted so many cars per day. This means, of course, that harvesting is going on each day on practically every farm. Each car is weighed as it comes into the mill and as a general rule the farmers are paid on the basis of 55 per cent. of the value of the sugar extracted from their cane, the mill retaining 45 per cent. Until comparatively recently the Calamba Sugar Company ran their properties on the estate system, but have now subdivided into farms of 15 acres, which are leased out to the Filipinos. This type of farmer is called an Aparcero, and pays a fixed rent according to the quality of his land; he may provide his own animals and implements, or these may be leased from the company. The company pays the Aparcero a flat rate of about £13 per acre for plant cane, providing the returns are up to standard; for every ton over 20 tons per acre on first-class land, and 18 tons on second-class land, the Aparcero receives a bonus. The contracts dealing with the leasing of the land specify that the Aparcero must do certain amounts of weeding and cultivation. The estate is divided up into a number of divisions, and in each division there is one farm set aside for experimental and demonstration purposes.

Climatic Conditions.

The two islands of Negros and Luzon differ considerably in so far as their climates are concerned. Although the total rainfalls are of the same order, the distribution is more even on Negros, and there is not the pronounced dry season to be found on Luzon. There are small irrigation schemes for the purpose of

growing rice—the staple food of the country—but all cane is grown under the conditions of natural rainfall. The planting season is during the dry months, and this is no doubt one of the reasons why Badila is not grown with much success on Luzon. It is the general practice to use top seed; special gangs go in one or two days ahead of the canecutters, and top the cane, so that planting and harvesting must be carried out at the same time. In some places the seed is soaked in water for about twenty-four hours before planting, but the majority of farms have not the facilities for doing this. (With reference to this practice, it is interesting to note that in Java, where hot water treatment of seed was beginning to be adopted for the control of sereh, it was advised that the seed should be dried for twenty-four hours after this treatment.) It is claimed that if top seed is well covered with trash it will keep in good condition for a period of about three weeks. Owing to the weed problem, the cane is planted very closely and some 10,000-12,000 seed pieces are used per acre. Since this is all top seed, and since a good proportion of the cane tops are unsuitable for seed (e.g., cane which has arrowed), it will be evident that many areas suffer from a shortage of seed. One of the natural results is that seed selection against such diseases as mosaic is rendered difficult, and it is becoming necessary for a certain amount of body seed to be used in order to permit of the necesary seed selection.

The comparatively high rainfalls are responsible for the rapid growth of weeds, and the control of these presents a serious problem, especially on Negros, and represents a considerable item in the costs of production. In order that the cane will close in as quickly as possible, it is the practice to place the rows only about 4 feet apart.

Methods of Cultivation.

Tractors are not in wide use, except on the Calamba Estate, but their numbers are increasing; on Calamba the tractors are owned by the estate, and the ploughing is done for the Aparcedo at approximately cost rates. At present, most of the cultivation is done with small native ploughs drawn by caribao (water buffaloes), and while the rows are spaced only 4 feet apart, it is unlikely that light tractors can be used successfully for cultivating between the rows. It is the custom to burn off all trash, but fallowing is practised to some extent, and the use of artificial fertilisers is increasing each year. Recent experiments on the Calamba Estate have demonstrated the advantages of cultivation for ratoons immediately after the cane has been cut. The management has now made it a rule to cultivate with a disc harrow within two days of harvesting; this is done diagonally across the field twice and then off-barring is carried out as soon as possible, and at least within two weeks. From the standpoint of cultural methods, the limiting factor in the Philippines is undoubtedly the vary poor drainage found in most parts of the islands, standing water being a common sight even after only moderate falls of rain.

Diseases and Pests.

Although a large proportion of the more serious sugar-cane diseases is present in the Philippines, nevertheless, the aggregate loss due to disease does not appear to be very great, except in the districts heavily infected with mosaic. Whether this condition will continue in the face of the change-over to sweeter varieties of cane is another question, but no doubt adequate tests will be made for disease resistance before the planting of any particular variety is advised. Leaf-scald, mosaic, Fiji, smut, and Bunga are the most important diseases present; downy mildew was found on one property in 1921, having been introduced from Formosa, but now appears to have been eradicated by roguing.

Field Experimental Work.

Most of the field experimental work is conducted under the supervision of the technical staff of the Philippine Sugar Association; this organisation has no experimental station at present, but there is little doubt that one will be established in the near future. In addition to the Director, there is a superintendent on each island and an experimentalist attached to each mill, the latter being responsible for the detailed supervision of any experiments. The Philippine Bureau of Science has been responsible for a considerable amount of work with sugar-cane, especially in sugar-cane pathology. The College of Agriculture at Los Banos provides courses in agriculture, and the technology of sugar manufacture, and has a well-equipped model mill for the instruction of the students. Excellent contributions to tropical pathology have been made from this department of the college. The Genetics Department is carrying out an extensive programme of seedling raising, this being

the only cane-breeding station in the islands. The method of crossing is similar to that adopted in India, i.e., the stalk of the male parent is surrounded by a bamboo cylinder containing soil, and after the production of roots in this soil the stalk is cut off below the cylinder and the rooted stalk and arrow are carried to the female parent which is left growing in the field. Some 50,000 seedlings are germinated annually in flats in the open air, and about 2,000 of these are selected when 12 to 18 inches high, and are then planted out in the field and selected at maturity on the basis of visible characters, weight, and analysis.

Labour Conditions.

The situation with regard to labour is somewhat paradoxical, since the Philippines are "exporters" of indentured labour to the sugar fields of Hawaii and yet most of the Philippine sugar districts suffer from a shortage of labour. This situation arises from the fact that the island of Negros is very thinly populated, and the natives of the neighbouring islands are somewhat averse to leaving their homes for seasonal work. On the other hand they are quite ready to be transplanted to Hawaii where they are assured of continuous work and a wage of about 5s. per day as compared with about 1s. 6d. per day in the Philippines. However, this labour shortage is never likely to be a very serious factor, and the situation will no doubt improve from year to year.

In conclusion, it must be stated that, pre-supposing the continuance of some measures of protection and freedom from serious political strife, the future of the Philippine sugar industry appears to be exceptionally bright.

FIELD CROPS FOR DAIRYMEN.

"I wish that we could get all dairy farmers to realise the advantages to be gained by the growing of wheat, oats, or barley with field peas or vetches, as a means of providing a succulent feed that will be available from August to October, in Queensland," said Mr. A. E. Gibson, Instructor in Agriculture, recently.

"We have prepared a booklet illustrating crops that have been grown, and giving full particulars as to sowing and yields. The Department will be glad to send a copy to any reader of the Journal.

"We have found that 'Prince' and 'Patriot' wheats and 'Skinless' and 'Cape' barley do wonderfully well. So does Ruakura oats.

"In an experiment at Beaudesert, the varieties of wheat—'Prince' and 'Patriot'—made excellent growth, having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

"During the early stages of growth, the barleys suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape barley made most remarkable growth, but that of 'skinless,' subsequent to the first cutting, was somewhat thin.

"The sowing at Beaudesert was made on 16th May. That is rather late. Earlier sowing would be better. We got 18 tons 18 cwt. of Ruakura oats and peas, and 15 tons 2 cwt. of Cape barley and vetches.

"On Mr. A. Hulse's farm at Yandina we got a yield of 16 tons 16 cwt. of 'Prince' wheat and peas, and 12 tons 3 cwt. of Cape barley and peas. These are good yields on rich, alluvial country."

Mr. Gibson recommends the following quantities of seed per acre:—

Wheat, 30 lb., Dun field peas or Black Tares, 20 lb.
Barley, 40 lb., Dun field peas or Black Tares, 20 lb.
Rye, 30 lb., Dun field peas or Black Tares, 20 lb.
Oats, 30 lb., Dun field peas or Black Tares, 20 lb.
Canary seed, 10 lb., Dun field peas or Black Tares, 20 lb.
Wheat, alone, 60 lb. per acre.
Barley, alone, 50 lb. per acre.
Oats, alone, 40 lb. per acre.
Rye, alone, 60 lb. per acre.

Epilachna 28-punctata F.

Fig. 2.
Larva x 5.

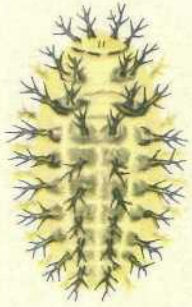


Fig. 1.
Eggs x 5.

Fig. 3.
Pupa x 5.

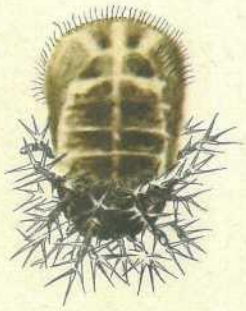


Fig. 6.
Parasite x 8.

Fig. 4.
Adult x 8.

Fig. 5.
Injury.

PLATE I.—THE LEAF-EATING LADYBIRD (*Epilachna 28-punctata F.*).

From a Watercolour Drawing by I. W. HELMSING.

THE LEAF-EATING LADYBIRD.

By MARGARET E. TEMPERLEY, B.Sc., Entomological Branch.

Every year the Department of Agriculture and Stock receives numerous reports concerning the depredations of the leaf-eating ladybird, *Epilachna 28-punctata* Fab., a small beetle belonging to the family Coccinellidæ. Last year was no exception, and in November and December the Chief Entomologist advised many inquirers concerning the control of this pest.

In late spring and early summer the beetle appears in large numbers, causing extensive damage to crops produced by the farmer and market gardener, both larvæ and adults feeding on the leaves of the host plant and in cases of gross infestation resulting in complete defoliation.

The various stages of this insect were described by Olliff[2] in 1890, but no detailed work appears to have been published regarding its life history. Accordingly, at the suggestion of Mr. Veitch, a brief study of this insect was commenced in December, 1927, and as a result some additional information has been obtained regarding the life cycle stages of this pest, the details of which are recorded in these notes.

Geographical Distribution.

Epilachna 28-punctata has been recorded as occurring in China, Japan, India, Ceylon, the Philippine Islands, the Malay Archipelago, New Guinea, Australia, and Fiji. In Australia it flourishes in the warmer parts, extending from New South Wales through Queensland to the Northern Territory.

Food Plants.

The widespread distribution and abundance of this beetle is due to its ability to change readily from one food plant to another. Among cultivated plants in Australia, potatoes, tomatoes, and pumpkins are more commonly attacked, while cucumbers, cotton, and rockmelons are also infested. *Solanum nigrum* or Nightshade and *Datura stramonium* or Trumpet Flower are the two most common weeds which serve as food plants for this pest, while it is also found feeding on many other solanaceous and cucurbitaceous plants. In other countries tobacco and egg-plant are recorded as hosts.

Nature of Injury.

As is well known the majority of the Coccinellidæ or ladybird beetles are beneficial insects, and are worthy of protection on account of the fact that in both the larval and adult stages they are predatory on aphids and scale insects. A few species belonging to the Epilachninæ, however, are plant feeders, and cause much damage to crops.

In the species under consideration both larvæ and adults are vigorous feeders, the larvæ exhibiting a marked preference for the under surface of the leaf, while the adults are found feeding on both

surfaces. Ragged patches are eaten out of the leaf, leaving a thin film of cuticle on the opposite side (Plate 1, Fig. 5). The adults frequently eat right through the leaf. A badly damaged leaf has a lace-like appearance, the tissue of the leaf being eaten away in patches, the patches being fairly close together with narrow intervening strips of undamaged tissue. A few of these insects feeding on the leaves merely retard the growth of the plant, but when present in large numbers defoliation may take place and the plant may die. Cases of severe infestation have been recorded where even the denuded stems were completely destroyed.

General Description and Life History.

In completing its life cycle this insect passes through the following different stages:—(1) The egg, (2) the larva, (3) the pupa, and (4) the adult.

The Egg.

The egg of this beetle is cigar-shaped, yellow in colour, and measures about one-sixteenth of an inch long (Plate 1, Fig. 1). The surface is hexagonally sculptured. Oviposition takes place during the day, the eggs, in the cases observed in this investigation, being laid in clusters on the under surface of the leaf. In clusters taken in the field, from 13 to 45 eggs were found in each, while in the laboratory the number of eggs per cluster ranged from a minimum of 9 to a maximum of 32. The details of the latter are shown in Table II.

The incubation period of the egg in the cases observed, remained remarkably constant at four days. The first signs of development are visible on the third day, when the ocelli or eyes of the larva can be seen at the apex of the egg with the aid of a lens. On the fourth day, the top of the egg becomes ruptured and the young larva emerges, clinging to the empty eggshell or remaining near the hatching site for several hours before wandering off in search of food.

The Larva.

The larva is yellow bodied and presents a rather formidable appearance, being clothed from the region of the head to the posterior extremity with stiff branched spines (Plate 1, Fig. 2). The spines are light coloured with dark-brown tips. The larva increases in size by a series of moults, whereby the old skin, which has become too small for the larva, is cast off and is replaced by a new and larger skin which formed underneath the old one. Four such moults occur in the larval stage. The duration of the larval stages is given in Table I. A somewhat technical description of the larval instars is given after the discussion of control measures.

The full-grown larva measures about three-eighths of an inch long and the rectangular areas surrounding the base of the spines are defined with dark-brown thickenings, which become more pronounced as the larva approaches pupation.

When disturbed the larva secretes drops of bright yellow fluid. The mature larvæ are gregarious and gather together on the stems and under surfaces of the leaves prior to pupation.

About two days before pupating the larva enters its prepupal stage, becoming attached to the stem or leaf at its anal extremity by means of a viscid secretion. It ceases feeding and the body becomes shorter and broader. The duration of the larval period averages nineteen days, the maximum and minimum periods being twenty-three days and seventeen days respectively in the cases under observation.

The Pupa.

The pupa (Plate 1, Fig. 3) is oval in shape and measures about one-fourth of an inch long and three-sixteenths of an inch wide. It is attached at its posterior extremity to the under surface of the leaf or stem. The body of the pupa is creamy coloured with dark-brown markings. The last larval skin with its stiff spines covers the posterior segments of the abdomen. The insect remains in the pupal stage four days, at the end of which the pupal skin splits and the adult emerges.

The total life cycle period from egg laying to the emergence of the adult averages twenty-seven days in summer. The full details are given in Table I.

Adult or Beetle.

The newly-emerged adult (Plate 1, Fig. 4) is bright yellow and is devoid of dark markings. The body is extremely soft, but on exposure to the sun and air soon hardens and after half an hour or so the spots can be seen very faintly. These become more pronounced until finally within a couple of hours after emergence they are densely black, while the ground colour has changed to a yellowish-brown.

The beetle is oval in shape, being broadest in the region behind the head and having the extremity of the abdomen more or less pointed. The under surface is flat, while the upper surface is strongly convex. In length the beetle is one-fourth of an inch and in breadth three-sixteenths of an inch at the widest part. The body varies in colour from light to dark yellowish-brown and is spotted with black. The head is somewhat retracted into the prothorax and bears a pair of black eyes. The antennæ are yellow with brown clubs, while the mandibles and palps are also tipped with brown. The ventral surface is light to dark brown in colour and the legs are yellow with brown tarsal claws. The prothorax bears from 2 to 7 black spots. These spots vary in size as well as arrangement, and adjacent spots frequently coalesce. The spots on the wing-covers are variable in both number and size. Gurney[1] states that there may be from 24 to 28 spots on the elytra. Mulsant has given specific names to some of these variable forms of *E. 28-punctata*, one of which was described by Tryon[3] in 1889 as having 26 spots on the elytra and which he refers to as *E. multipunctata* Muls.. The beetles examined were uniformly 26 spotted, each elytron bearing 13 black spots, the spots exhibiting variation in size in different specimens. From Tryon's description it is believed that the insect referred to is identical with the one studied in this laboratory.

The body is covered with a very fine pubescence. The female is slightly larger than the male, being distinguished from the latter by a median slit on the ventral surface of the last abdominal segment.

Habits of Adult.

The adults only fly short distances; when disturbed they fall off the plant and feign death, drawing the legs in flat against the abdomen. When handled they secrete a bright yellow fluid from the knee joints which is acrid smelling and is probably used as a defence against enemies.

In the laboratory and field, pairs were observed mating daily. Two females were confined in tubes with males and they commenced laying some sixteen to eighteen days after emergence, one laying 125 eggs, the other 252 eggs. Under natural conditions it is believed that the total number of eggs laid by a single female would exceed those laid under artificial conditions. The oviposition records are given in Table II.

Natural Control Factors.

A small brown ant, *Pheidole megacephala* Fab., is under suspicion as being an active agent in keeping the ladybird in check. It was found swarming over the host plants of *Epilachna* on which numbers of newly-laid egg clusters, distinguished by their bright-yellow colour, were observed on the leaves, but comparatively few egg clusters from which larvæ were emerging were found, indicating the destruction of large numbers of eggs.

Two hymenopterous parasites, which were identified as *Stomatoceras colliscutellum* Gir. (Plate 1, Fig. 6), were bred by Mr. I. W. Helmsing from pupæ collected on 12th November, 1927, at Maryborough.

Artificial Control.

Immediate action should be taken to check the increase of the pest as soon as the first signs of attack are noted. This insect has biting mouth parts, so a stomach poison must be used which can be spread in a thin layer over the surface on which the larvæ and adults are feeding and so be taken into the stomach.

Lead arsenate is found to be the most satisfactory poison and is procurable in both paste and powder form. When mixed with water it is applied to the plant in the form of a spray, care being taken to see that the under surface of the leaves are sprayed, for it is there that the larvæ feed.

Where powder is used the following proportions are advisable:—1½ lb. lead arsenate to 50 gallons of water. Before adding the bulk of the water to the powder it is necessary to mix it into a thin paste, using only a small quantity of the water.

If the paste is used it should be prepared as a spray in the proportions of 3 lb. of lead arsenate to 50 gallons of water.

Cultural Measures.

In cases of severe infestation the crops should be ploughed under so as to destroy thousands of eggs, larvæ, and pupæ. Weeds which serve as food plants should be destroyed even when no crops are planted.

Description of Larval Instars.

1st Instar.—Average length 1·5 mm., breadth ·52 mm. Body yellow bearing six longitudinal rows of fairly stiff branched spines, except on the prothorax where there are four and the last two abdominal segments where there are none. The spines are arranged in two dorsal, two latero-dorsal, and two latero-ventral rows. Spines dirty yellow with brown tips, base of spines dirty yellow. Head dirty yellow, ocelli brown, tips of mandibles reddish brown, legs yellow, tarsal claws brown. The abdomen tapers posteriorly, the last few segments being recurved and forming an attachment for the larva.

2nd Instar.—Average length 2·5 mm. Larva similar to previous instar except that spines are more branched.

3rd Instar.—Average length 3·4 mm. Similar to previous instar, spines more branched, faint brown markings partly surrounding base of prothoracic spines.

4th Instar.—Average length 6·8 mm. Body yellow, base of spines and spines dirty yellow, tips of spines dark-brown, spines much more branched than in any of the previous instars. Head dirty yellow, ocelli dark brown, mandibles reddish brown, legs yellow with brown tarsal claws. Rectangular base of spines becomes outlined with brown markings which surround or partially surround it, the thickenings becoming more pronounced as the larva approaches pupation. When fully grown the larva attains a length of 9 to 10 mm., the body becomes paler, the spines stiffen, the base of the spines becoming much darker and thicker.

TABLE I.

Series Number.	Incubation Period.	Period of larval instars in days.				Pupal Period in days.	Total Developmental Period.
		I.	II.	III.	IV.		
							Days.
7	4 days	4	3	5	7	4	27
8		3	4	4	8	4	27
9		4	3	5	7	4	27
10		3	3	5	8	4	27
11		4	4	4	7	4	27
12		3	4	4	7	4	26
13		3	3	6	8	4	28
14		5	5	4	7	4	29
15		4	7	5	7	4	31
17		4	4	4	7	4	27
20		6	3	3	6	4	26
21		4	3	4	6	4	25
22		4	3	4	7	4	26
Average ..	4	3·92	3·79	4·37	7·07	4	27·15

Period over which developmental studies were made extended from 29th December, 1927, to 3rd February, 1928. Average minimum temperature, 76 deg. Fahr.; average maximum temperature, 81 deg. Fahr.

TABLE II.

Series Number.	Date of Emergence of Beetle.	Date of Oviposition.	Number of Eggs Laid.	Period elapsing between emergence of beetle and oviposition.	Total Number of Eggs.
I.	27–12–27	14–1–28	23		
		15–1–28	19		
		19–1–28	10		
		22–1–28	17		
		23–1–28	19		
		24–1–28	23	18 days ..	252
		26–1–28	25		
		28–1–28	27		
		31–1–28	32		
		3–2–28	20		
		11–2–28	19		
		14–2–28	18		
II.	9–1–28	25–1–28	9		
		26–1–28	14		
		28–1–28	10		
		29–1–28	27	16 days ..	125
		31–1–28	13		
		2–2–28	24		
		3–2–28	28		

BIBLIOGRAPHY.

[1] Gurney, W. B., Agric. Gaz., N.S.W., Vol. 35, 1924, p. 53.

[2] Olliff, A. S., Agric. Gaz., N.S.W., Vol. 1, 1890, p. 281.

[3] Tryon, H., Annual Report of Deptartment of Agriculture and Stock, Queensland, 1889-90, Insect and Fungus Pests, p. 181.

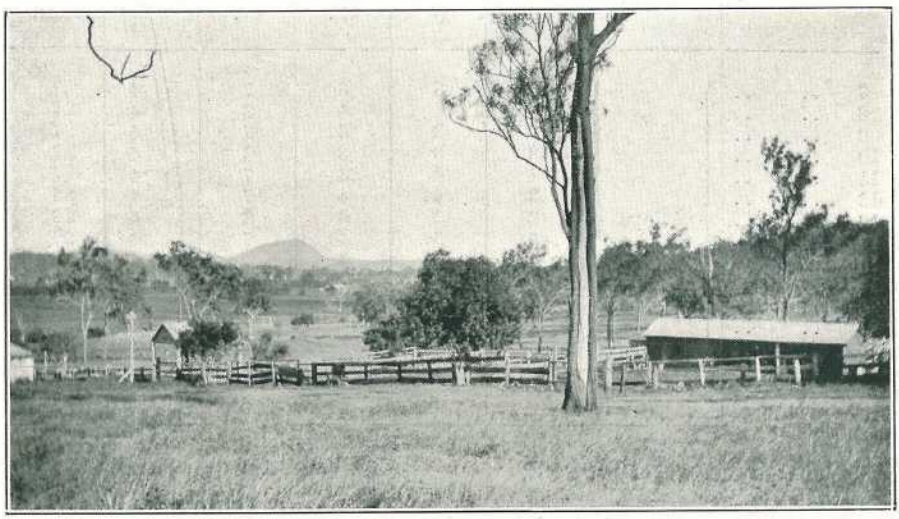


Photo.: Miss J. Easton.]

PLATE 2.—DOWN THE VALE—A SCENE ON COOCHIN COOCHIN.

AUSTRALIAN RURAL PROBLEMS.

BUREAU OF AGRICULTURAL ECONOMICS.

INTERSTATE MINISTERIAL CONFERERCE AT PERTH.

Perth was the venue this year for the Annual Interstate Conference of Ministers for Agriculture. Every State was represented, and the Western Australian Minister (Hon. H. Millington) presided. One of the most important subjects discussed was a Queensland proposal to establish a Commonwealth Bureau of Agricultural Economics. Subjoined are extracts from the report of the proceedings, which will be read with interest by Queensland farmers.

The Conference opened on Tuesday, 5th June, and continued until the following Thursday. The delegates to the Conference were:—

New South Wales.—Hon. H. V. C. Thorby, M.L.A. (Minister for Agriculture), Messrs. G. D. Ross (Under Secretary, Department of Agriculture), T. MacInnes (Dairy Expert), C. G. Savage (Horticultural Superintendent), and H. Luckman (Secretary).

Victoria.—Hon. J. Cain, M.L.A. (Minister for Agriculture), Dr. S. S. Cameron (Director of Agriculture), Messrs. R. Crowe (Export Superintendent), J. Thynne (Secretary to the Minister), and J. M. Ward (Director of Horticulture).

South Australia.—Hon. J. Cowan, M.L.A. (Minister for Agriculture), Professor Perkins (Director of Agriculture), and W. L. Summers (Secretary to the Minister).

Queensland.—Hon. W. Forgan Smith, M.L.A. (Minister for Agriculture), Mr. E. Graham (Under Secretary for Agriculture), Messrs. T. G. Hope (Secretary), and C. McGrath (Supervisor of Dairying).

Tasmania.—Mr. F. E. Ward (Director of Agriculture), Messrs. T. H. Atkinson (Senior Dairy Officer), and P. H. Thomas (Horticultural Officer).

Western Australia.—Hon. H. Millington, M.L.A. (Minister for Agriculture).

Mr. Millington was elected as Chairman.

OPENING ADDRESS.

The Chairman, in the course of his opening address, said that the Annual Conference of State Ministers was not merely a gathering for the exchange of formal courtesies, it was an assembly of major importance to all engaged, either actively or as administrators, in the general welfare and development of the great primary industries of Australia. They were not all satisfied with the progress being made, and no one realised more than Ministers and their officers the enormous amount of work ahead of them and the necessity for a periodical exchange of views through which a general policy in respect to interstate interests might be determined. They had also to consider their relationship with the Federal Government in respect to matters of mutual concern.

The Chairman went on to review the remarkable development of his own State from the gold mining days to the present period of vibrant agricultural prosperity. He then declared the Conference open for business.

CONFERENCE PROCEEDINGS.

A summary of action taken in respect to the decision at the Adelaide Conference in 1927 was discussed in detail.

Admission of the Press.

The question as to whether the Press should be present during the proceedings was raised.

Mr. FORGAN SMITH (*Queensland*) moved that the Press be admitted. They had everything to gain, he said, by the admission of the Press, and information on the matters they had met to discuss could not be disseminated too widely. The motion was carried.

The agenda was dissected, and several subcommittees were appointed to consider and report on the subjects submitted.

Bureau of Agricultural Economics.

Mr. FORGAN SMITH (*Queensland*) moved that the Conference give very serious consideration to the most important question of the establishment of a Bureau of Agricultural Economics. The text of his able address is published elsewhere in this issue.

Mr. H. V. C. THORBY (*New South Wales*) seconded the motion. The general principles enunciated by Mr. Forgan Smith, he said, were sound. The general trend of his remarks was that each State should establish its own Bureau and look to the Federal Authorities for Commonwealth co-ordination. He gave the proposal his whole-hearted support, but he was emphatic that the work should be carried out in detail by the respective States, leaving to the Commonwealth the co-ordination of results.

Messrs. J. COWAN (*South Australia*), J. CAIN (*Victoria*), *and* F. E. WARD (*Tasmania*) supported the motion.

After inviting further discussion on the principle involved, the CHAIRMAN stressed the need of the States carrying out their own investigational work. He was in accord with the motion provided means for complete co-operation were devised. The scheme outlined by Mr. Forgan Smith was, he said, undoubtedly an Australian one, and they must have machinery to work it in a way big enough for an Australian policy. He congratulated Mr. Forgan Smith, and added that the Conference was in accord with him.

The complete resolution, which was adopted, was submitted in the following terms:—

1. That it be a recommendation from this Conference that each State Department of Agriculture should establish an Economics Branch or Division.

2. That the State Parliaments provide such legislation (or amending legislation) as may be necessary to establish an facilitate the work of the Economic Divisions.

3. That the Commonwealth Government be asked to co-operate with the States in this matter by constituting an Agricultural Economics Committee under the Council of Scientific and Industrial Research. Each State Government, together with the Commonwealth Government, to nominate a representative to sit on such Agricultural Economics Committee.

Dingo Depredations.

The adoption by the State and Federal Governments of uniform methods for the protection of the live stock of the Commonwealth from the depredations of the dingo was affirmed on the motion of Mr. E. GRAHAM (*Queensland*).

Restriction on the Importation of Stud Sheep.

The restriction on the importation of stud sheep into Australia by fee and by insisting on the provision of the certificate of a recognised breeders' society was approved on the motion of the CHAIRMAN.

Uniform Grades and Standards.

On a question raised by Mr. FORGAN SMITH (*Queensland*) as to the desirability of grading produce on uniform standards, Mr. THORBY (*New South Wales*) moved—

"That Conference is strongly of opinion that it is undesirable to lower established standards of export products to meet temporary or seasonal conditions, and that the Commonwealth Government be informed accordingly."

The motion was carried.

Fertiliser Control.

The question as to the need of uniform legislation in respect to the control of the sale of fertilisers was affirmed.

Salt Licks for Stock.

The Conference affirmed the principle of compulsory registration and guarantee of salt licks for stock.

Buffalo Fly.

Mr. FORGAN SMITH (*Queensland*) moved—

"That Conference is of opinion that measures should be taken by the Commonwealth and States concerned for the control and eradication of the buffalo fly."

The motion was carried.

Educational Publications.

Mr. FORGAN SMITH (*Queensland*) moved—

"That the Commonwealth Government be requested to convey within the Commonwealth free of postal charges publications of an educational nature circulated by State Departments of Agriculture."

The motion was carried unanimously.

Much other important business was transacted at the Conference, and which must give additional impetus to the agricultural progression under able guidance now to be observed in every State in Australia. Queensland has adopted not only a progressive but an aggressive rural policy, and a recognition of this fact by the representatives of the other States is evident from a study of the lengthy record of the Conference proceedings.

After receiving the reports of the several subcommittees and adopting, in general, their recommendations, the Conference selected Melbourne as the venue for the 1929 assembly.

A Tribute to the Australian Press.

Before closing the proceedings, the Chairman (Mr. H. MILLINGTON, *Western Australia*) paid a graceful tribute to the daily Press of Australia. "I should like to express," he said, "our appreciation to the Press for the manner in which the Conference proceedings were reported. They have not tried to pick out merely the titbits or something sensational. I believe the Press in Australia realises it is part and parcel of their duty to assist in agricultural development, and we depend upon them for disseminating such information as should be available to the people throughout Australia."

The Conference then closed.

THE JOURNAL APPRECIATED.

A Sarina farmer writes—

"The amount of information is splendid, in fact every subject is treated in the most scientific manner possible."

BUREAU OF AGRICULTURAL ECONOMICS.

THE MINISTER'S SPEECH AT THE PERTH CONFERENCE.

"In Australia we have laid down certain definite standards of living, and it is desirable that those standards should be maintained and made secure."

"Any system of social organisation must have as its starting point a sound agricultural policy."

"Men who are prepared to go on the land and encounter the vicissitudes of country life, granted that they are industrious, must have the right to a decent standard of comfort as high at least as the community can afford."—*Hon. W. Forgan Smith, at Perth.*

ONE of the most notable utterances on current rural problems delivered at the Interstate Conference of Ministers for Agriculture at Perth last month was the speech by Mr. W. Forgan Smith, of Queensland, on the question of setting up a Bureau of Agricultural Economics in each of the States with a fully representative Economic Committee of the Council of Scientific and Industrial Research as a co-operative and co-ordinating authority.

Subjoined is the text (abridged) of the address taken from the official report of the Conference proceedings.

THE MINISTER'S ADDRESS.

Hon. W. FORGAN SMITH: I move that the Conference give very serious consideration to this most important question. Everyone must realise the importance of investigation into the agricultural economics of Australia. The problem becomes increasingly pressing as modern development in industry takes place. In Australia we have laid down certain definite standards of living, and it is desirable that those standards should be maintained and made secure on a sound basis as the years go by.

This is of extreme importance in regard to the primary producing industry. Any method of social organisation in the country must have as its starting point a sound agricultural policy. In order that this may be done, measures must be taken to ensure that those engaged in the production of the essentials of life shall be made as comfortable as possible and their conditions attractive. In other words, men who are prepared to go on the land and encounter the vicissitudes of that form of industry, granted they are industrious, must have the right to a decent standard of comfort of as high a character as the community can afford. The problem is as to how it is best to develop the country, and the resources of the country, in the interests of the people who are living in it.

Economic Waste.

Our methods of production indicate that there is much waste going on. No concerted effort is made to produce for the new needs of the country or the new needs of the markets we are endeavouring to supply. There is no co-ordination in the various activities in which we are engaged. Each of the States seeks to develop its industries in its own way, and often no information is available from the results of the activities in which they are engaged. Take, for instance, the development of the various forms of settlement immediately following upon the war. In connection with the soldiers' settlements schemes, all the States induced men to go on the land without having investigated the fields of production or the marketing of the product. All the States have experienced great loss in that way, but that is not the worst phase of it from the point of view of the State. There is the loss of energy and the discouragement that is brought about by the partial failure of settlers who have been placed on the land, without being able to establish themselves fairly and effectively.

Arresting Figures.

In addition, we find on a review of the Commonwealth statistics that we are importing very many products into Australia that could easily be produced here. Every effort should be made to make ourselves as self-supporting as possible, and a

review of the figures taken from the Quarterly Summary of Australian Statistics, December, 1927, indicate some of the things to which it is worth while giving attention. There is one very arresting table. We find that for the first six months of 1927-1928 foodstuffs of animal origin, excluding living animals, valued at £1,554,600, were introduced into the Commonwealth, and foodstuffs of vegetable origin, &c., valued at £3,457,988. That means that approximately £5,000,000 worth of produce was introduced into Australia in six months, a great proportion of which could have been produced in Australia.

Among those items are cocoa and chocolate, coffee and chicory, fruits, dried, including dates, nuts (edible), seeds (canary, hemp, and rape), and tea. These go to make up the commodities imported and that could be produced in Australia.

The Need of Effective National Organisation.

It is my desire to focus the attention of Ministers to the need of some organisation whose duty it would be to deal with all these matters and bring them to the attention of the proper authorities concerned. The Bureau of Scientific and Industrial Research has had under consideration the establishment of an Economics Department along the lines I am suggesting, and if we carry a resolution of this kind here to-day no doubt it will have a very beneficial effect. Such an institution would have a wide range of work in front of it.

Such an organisation is not new. In Great Britain an organisation of a similar character is in existence, and has done very valuable work. The same thing applies to the United States. It seems to me that the time is opportune for an organisation of this kind to be established in Australia, to carry out the work that has been undertaken so successfully in Great Britain and America by similar institutions there.

I have mentioned the fact of the States embarking on schemes of settlement and inducing settlers to take up land suitable to the growth of certain crops without investigation as to the demand for the products to be grown, or their marketing when produced. That indicates something lacking. It would be the function of such a bureau to deal with these matters, to co-ordinate the experience that has been gained in the several States and circulate the information.

Making Agriculture Attractive.

In addition, we have the problem of establishing agriculturists in a manner conducive to making their calling attractive. I believe that agricultural pursuits are the natural avocation of men. It is more conducive to the building up of a sturdy nation or race of people than any other occupation. Anyone can understand that men working under healthy conditions will produce a healthier type than those who are working in an environment less congenial.

The Costs of Production.

At present in Australia farming organisations are continuing to press Governments and endeavouring to educate public opinion as to their rights to secure what they call the costs of production. We receive deputations from these organisations where that question arises, but I have never yet been able to get them pinned down to what they mean by the costs of production, or as to how these costs of production are going to be assessed.

In the course of his opening remarks the Chairman referred to the dairying industry, and said that in Western Australia the average return per dairy cow probably does not exceed 100 lb., whereas the purebred herd of Guernseys at Denmark (Western Australia) are producing 450 lb. Yet you find men engaged in the dairying industry having herds of low production arguing in favour of increased concessions to enable them to enjoy a better standard of living. It is very apparent to anyone interested in the dairying industry that the line of activity should be in the direction of building up the herds as an economic unit in such a way as to secure the maximum return per unit in the herd.

Milk Yields Far Too Low.

In Australia generally the figures for the several States on investigation must show that the yield of commercial butter per dairy cow is far too low. In Queensland the average is 120 lb., and good herds produce considerably more than that. That indicates a line of activity that could be successfully followed to stabilise that

industry and give those engaged in it better returns. It is obvious we must devote our attention to the production of the class of herd that will keep the farmer rather than to the class that the farmer himself has to keep.

The Economic Unit in Dairying.

Then again, having disposed of the first problem, we have to consider what is the economic unit of the herd. By what means can we determine how many in a herd constitutes an economic unit—that is, the unit that a dairyman can look after economically? That is the line of investigation that must be taken up and has been taken up very successfully by the Bureaux to which I have alluded.

The Poultry Industry.

Take, for instance, the poultry industry. The production of eggs and poultry is the fifth most valuable in the United States of America, and the wealth is higher than the yield in many other products which would be considered among the highest produced there. They lay down that the economic flock of fowls is 1,000.

What is a Living Area?

Then we come to land settlement from the economic standpoint. We often use the term "The living area." We understand what is meant by that term, but in an economic sense it is obviously misleading. The living area varies according to climatic conditions, according to the condition of the soil, and for what it is proposed to utilise the land and the markets.

Hon. J. Cain: And very often to a large extent it is also the individual.

Hon. FORGAN SMITH: Yes. That shows the lines we should follow to establish not so much, perhaps, the living area but to establish the living herd, the living flock, and the living volume of produce. We have endeavoured to do that by a very exhaustive investigation into the pastoral industry. Apart from the immediate question of land settlement, this was one of the most valuable economic investigations into the pastoral industry that has been made for the last twenty years. Following on that report we have legislated to provide that in all future land settlement a sufficiency of land will be provided to maintain what is regarded as the economic unit of a flock or herd, or the volume of produce that it will be necessary to give a man a decent standard of living on the variations that take place from time to time.

It will be seen that an economic investigation of these matters I have mentioned would be conducive to greater clarity of thought, and much information would be made available to the various State Departments which would be of incalculable advantage in building up our primary industries.

Market Control.

Then again, there is the question of market control or organisations to prevent fluctuations of prices. These are established in almost every form of industrial activity outside of primary production. Very careful analyses are made as to the consuming capacity of a given commodity. An organisation producing carpenters' saws, for instance, can foretell with a fair degree of accuracy the number required in any one year by the world's markets. The same remark applies to motor-cars, machinery, and so on. It would be the duty of this organisation to investigate marketing conditions, the maximum consumption that is likely to take place, and organise the industry accordingly. In regard to our primary production little or nothing has been done in this direction. The farmer is about the only individual that produces without any foreknowledge of the marketing conditions attaching to his product. As a result you have violent fluctuations in prices in the various markets of the world, both in Australia and elsewhere. During the season when Nature is most bounteous you find a glut in the market, and the farmer gets little or nothing in return for his labour. Under other conditions the market is under-supplied, prices are high, and in many cases only a few people can supply that market. As a consequence the result is bad from the farmers' point of view and from the point of view of the consumer. You have a number of products from which a man can choose, and with orderly marketing you can build up a steady demand for that product, but that demand depends very largely on continuity of supplies. If there is a surplus at one period, and you are unable to supply at another period, the whole market is disorganised; there is no control of prices, and it is detrimental to the interests of all concerned.

Functions of the Bureau.

The work of an economic bureau would be in the direction of giving assistance in the building-up of marketing organisations which would be conducive to the best interests of all concerned. I suggest that the function of such a bureau would have regard to the following matters:—

> Climatic influences; land values; systems of farming practice, mixed farming in contradistinction to single commodity operations; costing of commodity production; finance for production; handling, grading, and packing methods and facilities; transportation; storage; processing; marketing credit; local markets as distinguished from world's markets; the influence of fiscal policies; the relation of the production of a given State to the world's production; problems dealing with the treatment of surpluses, the varying tastes and preferences of consumers; the relative influences of one commodity upon that of another; marketing conditions generally.

It is not my intention to speak at any greater length at this juncture on this matter, but I think I have said enough to indicate what is in my mind and what has caused me to move the resolution now before you.* Work along the lines I have indicated would tend towards the elimination of waste and towards building up a higher standard of production. Nothing could be more important than that. **High standards of living can only be maintained on the basis of high efficiency in industry, and these are points that can only be established by an investigation along the lines I have indicated. It would help in the building-up of the primary industries of Australia and increase the general wealth and happiness of the people of the Commonwealth.**

*The full text of Mr. Forgan Smith's motion appears in our abbreviated report of the Conference proceedings in this issue.—ED.

PLATE 3.—SOME MEMBERS OF THE FIELD STAFF OF THE FRUIT BRANCH, DEPARTMENT OF AGRICULTURE AND STOCK.

Left to Right—G. Williams (Director of Fruit Culture), J. Stockdale (Brisbane), H. Barnes (South Coast), E. Duffy (North Coast), A. M. Thorburn (Brisbane), H. J. Freeman (Gympie), F. L. Jardine (Nambour), E. Filer (Entomological Branch), S. C. Stephens (Innisfail).

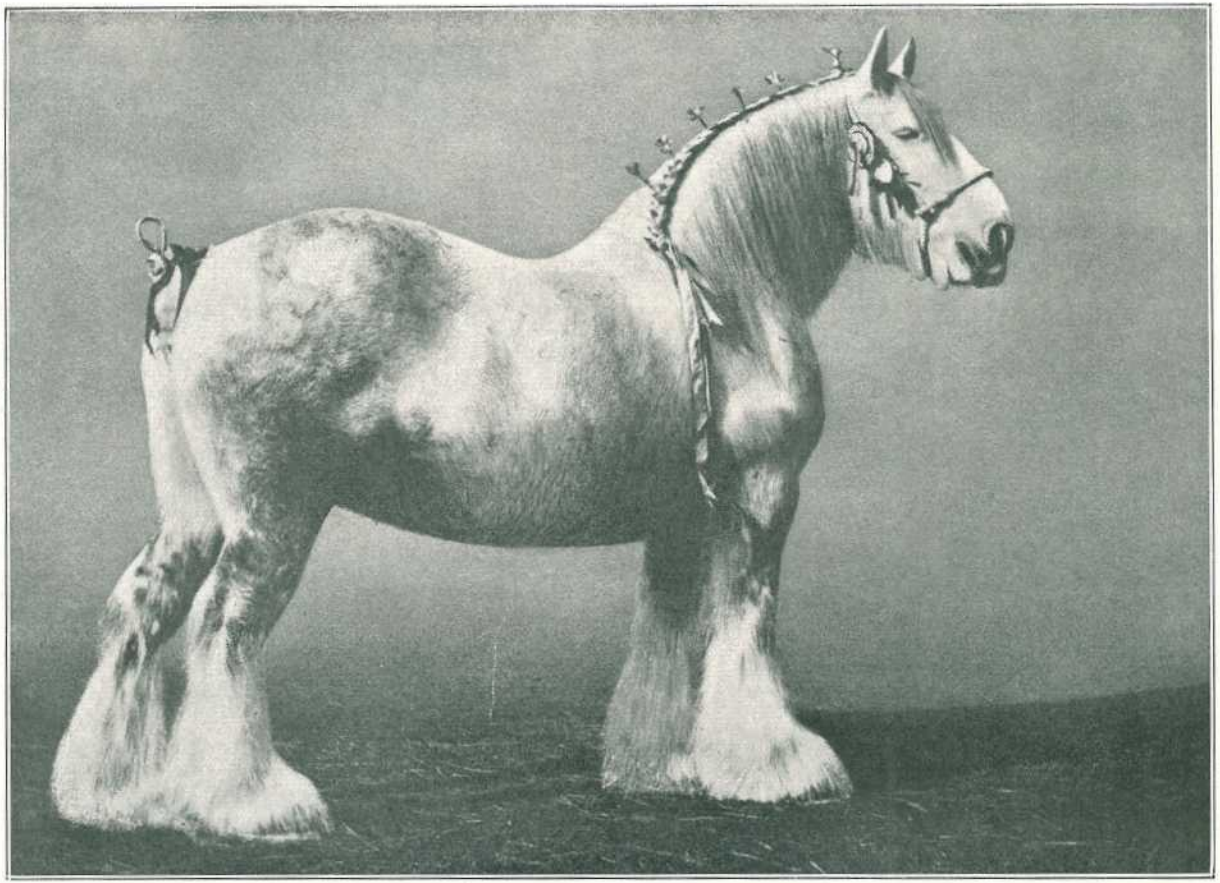


Photo.: G. H. Parsons.]

PLATE 4.—BRITISH BREEDS OF LIVE STOCK—SHIRE MARE.

A representation of the type aimed at by British breeders (reproduced from "Farming," an English publication).

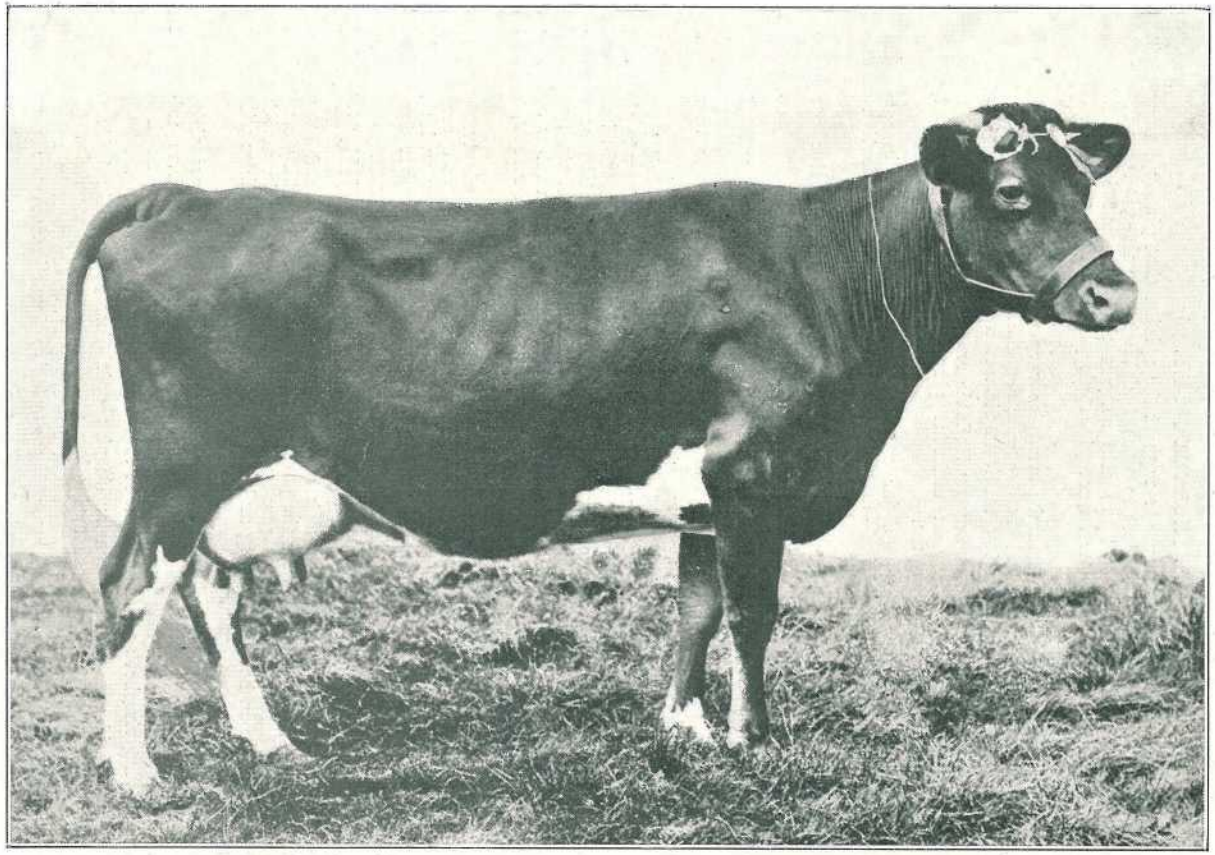


Photo.: "Sport and General."]

PLATE 5.—BRITISH BREEDS OF LIVE STOCK—GUERNSEY COW.

A representation of the type aimed at by British breeders (reproduced from "Farming," an English publication).

PINEAPPLE DISEASE INVESTIGATIONS.

INTERIM REPORT.

By HENRY TRYON, Plant Pathologist.

A. INTRODUCTORY.

1. The inquiry in progress serves to support the opinion that pineapples as grown in the open in Queensland are subject to several distinct "troubles," some of which have proved notably harmful and are still so, yet they are, notwithstanding, as vigorous and healthy on the whole as are pineapple plants grown as a field crop in other parts of the world.

2. However, yields of commercial pineapples vary within wide limits, but, as a rule, the differences to be observed are due more especially, not to disease occurrence, but to recognisable factors relating to circumstances and conditions of growth.

3. And among these are certainly controllable ones, constituted by horticultural methods adopted, and that vary in different plantations in every district, with respect, too, to almost all procedures.

4. Economic considerations—as, for example, where the use of pineapple soil fertilisers or drainage is in question—may be the explanation and justification of this variation.

5. More frequently it is want of knowledge regarding the better course to pursue, either arising through absence of authoritative teaching or of the lessons derived from experience.

6. In the subjoined summary of investigations of pathogenic agents that do, however, prove prejudicial to successful pineapple growing, a consideration of the extent to which these may operate in the several districts of the State where this occurs has been for the present postponed.

7. This has been due to the fact that visits to plantations in detail throughout the area have not been generally prosecuted, since the necessary adequate thorough personal inspection would have involved much time and labour that would have been incompatible with the often tedious and protracted minute examination of disease-affected pineapple material in the laboratory—so essential to our preliminary pioneer undertaking. Moreover, protracted drought succeeded by much rainfall would have operated to render a disease survey inconclusive in yielding material results, when it might in their absence have been otherwise.

8. To overcome this conflict of duties and reduce the effect of stressing the importance of one, our original scheme contemplated the active co-operation of another Bureau of the Department having several district field officers on its staff in order to discover the local occurrence of pineapple diseases of whatsoever description and their local range.

9. The foregoing explanation why an extended pineapple disease occurrence survey has not so far been undertaken throughout the Cooktown-Tweed River coastal area may be applied also to the lack of field experimentation devised by us, and carried out under our direction, for the purpose of advancing and checking conclusions the outcome of technical research prosecuted; but, too, as a guide in devising procedures at large in both preventing and controlling the pineapple troubles with which this research has been concerned.

10. But in the case of the several pineapple maladies of a non-parasitic nature primarily—physiological pineapple maladies—field experimentation from this point of view is very needful, even, moreover, to throw light on the nature of the circumstances giving rise both to their presence and destructive energy.

11. Most if not all of Queensland's pineapple diseases or virtual diseases are apparently common to the State and other pineapple-growing countries (the conclusion of both testimony and of personal observation). However, in reference to some of them elsewhere—notwithstanding successive investigators for years past have been inquiring into them from their several points of view—unanimity as to their causation has still to be reached, whilst as regards others our own findings (we may be excused in mentioning) have assisted in promoting this; a remark that applies to pineapple wilt on the one hand and to pineapple brown fruit rot on the other.

12. As an incident too frequently realised, bearing both in the wider occurrence and active perniciousness of pineapple maladies in the State, our inquiry (so far undertaken) has served to compel us to dwell upon the fact of the very prevalent

creation of new pineapple disease areas, by (1) the use of already infected stock in planting and by (2) devoting to pineapple cultivation land already tainted with a malady derived from another crop plant, and common to the pineapple. Nematode Root Gall of, say, the banana, &c., and a root disease of sugar-cane may both be mentioned in this latter connection. The interplanting of other economic plants with pineapples may, as we have noted, conduce to the same injurious results.

13. Pineapple diseases and pineapple injurious insects often constitute different aspects of a common trouble, and thus the latter have not escaped our attention.

14. A comprehensive pineapple memoir exclusively devoted to diseases and injurious insects is in process of preparation, but its completion must be deferred until our detail inquiry has been further prosecuted and certain outstanding questions have been settled.

A series of educational addresses in the several pineapple districts of the State are also projected when the progress of our inquiry will admit of it, and when a disease-occurrence survey has revealed those pineapple maladies that are present where such an undertaking is called for and in order to give point to whatever information it is sought to convey.

B.—NOTES ON THE NATURAL ENEMIES AND DISEASES OF PINEAPPLES.

1. AGENCIES—HARMFUL GENERALLY.

1. Top Rot—Root Disease.

This pineapple malady is characterised by the death of the central leaf-shoot of the plant (whence should arise the flower and fruit) in the early course of the trouble, the apical growth undergoing a form of wet decay. This, as we have discovered, is due to an injury of the extreme root ends also following damage in the first place to the absorbent root hairs occurring here. It arises from the development of an irritant in the soil itself, whilst the initial injury mentioned gives rise to and is augmented by a soil-frequentng fungus that, invading the root tissue, gradually also destroys it. Top Rot of the pineapple plant is very destructive where is occurs, but is neither necessarily hereditary in the plant nor necessarily infectious. Our observations have shown that it becomes manifest only in locations in plantations of a special character in which drainage is held back by retentive subsoil or by depressions therein at a low depth from the surface, or if of more profound occurrence connected therewith by a soil (fine sand for example) that admits of its upward movement by capillarity therefrom, whilst the chemical irritant itself is provided by the unaerated soil through which the drainage has percolated. This disease closely resembles that of a sugar-cane disease that we have described under the name of Top Rot also. In the Hawaiian Islands, a pineapple disease, referred to under the term Pineapple Wilt, and as being the most formidable trouble encountered in plantations there, has, in the light of our description of the malady under notice, been regarded by L. D. Larsen as identical with it; but the question involved is one that we are not ourselves prepared to decide. Top Rot, that may be very prevalent in certain places in Queensland but usually occurs quite locally and in circumscribed areas, can, as we have seen, be prevented occurring by cultural procedures, and the avoidance of uncongenial sites in pineapple growing.

2. Base Rot.

In this pineapple trouble, the individual leaves are successively involved from the base of the plant upwards, younger and still younger ones being gradually the scene of the morbid changes that characterise it. The affected leaf, or leaf-portion, firstly develops a *yellowish*-green colour that contrasts with those still unaffected that may exhibit a *vivid*-green colour. Then it dies from the tip towards its base until it is affected in its entirety. At first, the part destroyed becomes grayish-brown and flaccid, the demarcation between it and the still sound portion being marked. Usually, except in quite young plants (suckers), the death of the pineapple is only very slowly realised; but it soon ceases to thrive and remains without evidence of prospective fruit production. The malady is also now responsible for many of the "misses" met with in newly established pineapple plantations, or new areas devoted to the plant therein, and especially in replanted blocks. We have found Base Rot manifesting itself sporadically in plantations usually, although not seldom being responsible for noteworthy damage in the aggregate. Also, that it is due to a special form of decay that commences in the broken tissue occurring at the spot in the sucker that marks where it has been detached from its parent; or starts in the abortive pineapple at the base of a "gill sprout"; and, too, that a very small area involved in decay here may effect trouble.

It has been discovered that this Base Rot may be prevented by exposing suckers intended for use as plants for some days so as to admit of their ends drying out; and in the case of gill sprouts by first detaching the swollen basal portions or miniature pines from which they arise before doing this. Dipping, too, the broken or cut ends in a fungicide, will afford also a further safeguard. Again, planting in soil still saturated with moisture conduces to Base Rot, and should be avoided. Further, during moist muggy weather this trouble may develop in suckers that are left in heaps, or are being trucked, in both cases whilst in a damp sappy condition, and that in such circumstances the Base Rot may become manifest within a week or two of planting them.

The inquiries have suggested that our pineapple Base Rot is identical with the pineapple Blight of Florida.

3. Chlorosis ; or Leaf Pallor.

This, again, is a constitutional trouble that, as we have discovered, is in some situations fraught with serious damage to the plantations. In this there is until lately, and unlike what occurs in "Top Rot" and "Base Rot," no decay of the stock internally taking place. The entire plant presents a sickly appearance, being of a general palish hue of colour. The first leaves to be affected are the outer—the older ones. Thus, whilst the inner leaves of the central shoot may be merely clouded with creamy yellow, the outer ones external to it may be almost white instead of green, with the central broad purple band changed to red and often almost lost. These changes, however, may occur in pineapple plants that previously have shown normal growth, but with their manifestations this is brought to a standstill. Following these symptoms of sickness, a wet form of decay may set in, involving the older leaves—now horizontal on the ground—where they are attached to the stem, the stem itself in this situation, if not earlier, and so in turn the roots. This decayed tissue supports a white filmy growth of fungus. The trouble, however, is not due to the attacks of any such organism acting as a parasite. On the other hand it is an indication of the effect on the plant of soil that has become saturated with surface drainage, and which may persist when this soil only holds sufficient moisture to ball when compressed in one's hand.

The lay of the land, with regard to a plantation or any part of it, will indicate where this pineapple chlorosis is likely to take place, and where the preventive measure of proper drainage should be undertaken.

All authorities on pineapple growing emphasise the necessity of "proper provision for suitable drainage," and disregard of this requirement has even been mentioned as one of the causes responsible for continuously diminishing yields in fruit production.

4. Root Tangle.

This, although not a disease proper, has been observed to considerably affect returns from all crops, subsequent to the plant crop, and even so its prejudicial effects have been noticeable, especially in the late dry season. It arises through the inability of the roots that start from the root granules, occurring on the plant at the base of each sucker, and beneath the leaf-sheaths here, to reach the soil, owing to these leaf sheaths failing to decay and break down, and so admit of their emission, whereupon they become confined to the narrow spaces between leaf bases and stem, and so as they grow pursue an irregular winding course often side by side but with more or less interlocking.

This condition is commonly realised when suckers have not had their basal leaves removed in sufficient numbers prior to planting, or when they have been planted in the flat, so that when rain falls the surface soil surrounding these suckers is too dry to admit of the leaf-sheaths naturally decaying under the influence of saprophytic organisms, as they continuously do when it is moist. It is to be observed also that the use of butts, in so much as they result in the suckers arising from them, being higher (set) in the ground than if independently planted, is again very conducive to root tangle. In crops again beyond the plant crop, the suckers that yield this are succeeded by others that spring laterally from the stem as it branches monopodially, each becoming a stem in turn giving rise to a sucker since it ends its growth in fruit production. Thus successive suckers start higher and higher from the ground, and thus even the first produced is often unable to send roots to the earth by decay of its lower leaf, unless special means are taken to ensure this. This tangle in fact militates against the functioning of any roots except those originally entering the soil shortly after planting.

This circumstance may be overcome by forcing the branches of the plant towards the ground, or bringing the earth upwards towards them, as by turning the land towards the plants in ploughing rather than away.

5. Wilt.

Two apparently distinct pineapple affections have been brought under notice with the title "Pineapple Wilt" assigned to them. Both may be exhibited by younger or older plants.

(*a*) In one the pineapple plant (sucker) after growing perfectly erect for a time gradually curves over, the older leaves being directed in this movement more or less regularly to the side to which this takes place. This foliage presents also an unusual vivid green, except outwardly where it may be more or less clouded with yellow. Each leaf, again, is shortened coming more suddenly to a point and has its margin curving upwards and inwards (involute), so that it appears widened at its base; it is, moreover, unusually turgid and brittle. The entire plant, moreover, has a stunted habit and commonly yields no fruit. Nematode Galls or Mealy Bugs have been found on the roots of affected plants, but the general symptoms evinced are not characteristic of their presence; in fact, both may be absent. Such plants may occur sporadically in good more or less level land.

(*b*) In this form the stem also gradually inclines over until eventually it may be almost parallel with the soil surface. There is, too, a general pallor of the foliage, and both it and the stem lose their turgidity. Meanwhile the individual leaves become light-coloured, sometimes indeed of a cream-like hue. Then first the lower leaves and then the stem where they originate will both rot and decay. (This may in part be due to sun scald experienced by the plant when horizontally inclined.) This form of "wilt" also affects pineapple plants varying in age, and usually when occurring neither fruit nor flower is produced. In those plants having "wilt" examined, the roots were intact and apparently healthy. This latter form of the trouble usually is met with in poorer soil than the former, and may locally occasion much injury and loss to a plantation.

At present we are unable to state definitely with respect to either form what agency may occasion it, but, although in some respects it corresponds to the pineapple "wilt" of the Hawaiian Islands, that during 1910-19 had no less than five distinct causes assigned to it by as many investigators, it is evidently distinct.

6. Club Root or Root Rot—*Heterodera radicola* (Nematodes).

This, in brief, causes first swellings and then decay of the root-ends, the nutritive absorptive portion, and so gradually determining arrested growth, then virtual starvation of the plant. A most serious pineapple malady is Root Knot, yet one whose nature and cause are both usually overlooked. This we have discovered is widely prevalent, extending gradually its range of occurrence, doing much damage, and, as far as is at present known, almost impracticable to deal with here from the point of view of farm economics in ordinary plantation routine. Its injuries to the plant being usually of an indirect nature, it is commonly spoken of under one term or another that is descriptive of some plant malady distinct from it. It has been found that it is being introduced on to "clean land" through the use of pineapple plant stock, "butts" especially, that are already nematode infected; and thus also with other plants harbouring the disease—tomato seedlings especially grown as inter-crops. But pineapples are commonly infected through growing them in succession on land on which other plant crops have manifested the trouble—e.g., bananas, sugar-cane, potatoes, &c. This is due to the commonly unrecognised fact that the parasite of Root Knot—the nematode worm, *Heterodera radicola*—leaves its temporary host-plant habitually to pass into the soil and thence enters into the roots of other plants susceptible to its attacks. The coping with this form of Root Knot is one of the problems of horticulture and agriculture generally throughout the world, and is being assailed here and elsewhere only by an empirical method of attack; better procedures have yet to be discovered than the costly ones already in vogue.

7. White Soil—Fungus.

The pineapple plant, under the influence apparently of this organism, ceases to thrive, and presents a starved appearance (as does a plant when, say, hanging for some time on a fence) being now of a sickly yellow instead of a vivid green colour. Small patches of plants or individual ones in a plantation may be noticed thus affected. This plant, again, when removed from the ground exhibits

a more or less conspicuous development of white fungus mycelium beneath and between the leaf sheaths covering the base of the stem, and in later stages a rotten condition of the corm develops, the affected tissue eventually becoming dry and powdery. Again, the roots may have white threads coursing over their surfaces; but in some instances the latter (now very slender indeed) may be observed throughout the soil in which the dead or dying roots occur and to a slight extent adherent also to the latter.

This trouble is still under observation, and the final or reproductive form of the fungus apparently implicated has yet to be discovered. Apparently, two different fungi may produce the effects noticed. It reminds one of a well-known sugar-cane disease, in which a small agaric (a species of *Armillaria*) is concerned.

Its presence is evidently favoured by the use of "butts" in planting, rather than suckers, nibs, or crowns, those portions of the stem supporting a growth of fungus is very similar to that associated with the sick plants. Further investigation is projected.

8. Soil.

Abundance of evidence is forthcoming to indicate that pineapple plants or even entire pineapple plantations in Southern Queensland are in some cases being prejudicially affected, from the point of view of fruit production especially, by defects in the soil constituency commonly but not always to be overcome by the addition to it of manurial agents suggested by the plant's chemical composition. The pineapple, as has been shown by others, makes special demands not yet perfectly ascertained in the way of essential nutrients for crop production—ones not always met by even apparently "good ground," or by the addition of what "poor land" obviously lacks to make it so.

In many places the soils devoted to pineapple plants—as is suggested by the appearance of the latter—would doubtless be benefited by incorporation of vegetable matter to supply the necessary humus; but at the same time, their roots being intolerant of acidity in the soil, this would have to be supplied in a manner to avoid the presence of an excess of acid that vegetable matter might yield.

Already the lower soils of one area have been found to be slightly acid, and appearances of pineapple plants grown therein suggest that in some few instances this fact is reflected in the state of health of the plants.

Although the physiological trouble named "Chlorosis" has been commonly remarked, this is not the form of it manifested by pineapples elsewhere, due on the one hand to excess of manganese (Ohau) and the other to the presence of lime in undue amount (W. Indies).

9. Bottle Neck.

The name Bottle Neck is that of a pineapple fruit malformation suggested by the shape assuming the form of a bottle, being narrowed suddenly towards the apex or top that remains small and neck-like and widens basally to represent the body. Usually, too, if the fruit reaches maturity it is of relative small size. Growers associate "Bottle Neck" also with special features, evinced by the prospective fruit, even prior to flowering having taken place—a persistently diminutive flowering head (pine) with scarcely any top, and it of somewhat scale-like bracts, and surrounding this the leaves ill-developed and with their margins turned in on the upper surface (involute), and therefore appearing though narrowed, noticeably so. And, further combined with this, an undue amount of yellow spotting and mottling of the older or lower foliage.

Subjected to these unusual conditions, that may be quite prevalent on certain plantations, the yield in fruit to which this applies may be greatly reduced, and insomuch also as growth may be brought to a standstill or nearly so, it is often that affected pineapple plants have to be eradicated.

The latter constitutional symptoms are not uncommonly met with in pineapple plants whose roots are rendered functionless and partly destroyed by either gall-forming nematodes or by Mealy Bugs, also plants growing in land where Bottle Neck in the fruit occurs; so also, with respect to land that is prone to dry out whenever a drought is being experienced. Still there appears to be another causal agency that may determine in some unascertained quality of the soil, apart from that which may conduce to desiccation in dry times, also acting through the root system. (The local distribution of occurrence of Bottle Neck suggests this.)

This, and the association of other diseases with pineapple plants that are alleged to be subjects of Bottle Neck of the fruit, is in harmony with the fact that this malformation is evidently the expression of some factor operating continuously for a period, at a particular time during the development of the fruit, so as to check and even restrain its growth. This critical time is when its apical development—the last to take place in the fruit—is being undergone, so also, when parts other than fruit participate at other times in the pineapple plant's history of growth.

[The occurrence and prejudicial effect of Nematode worms as well as of Mealy Bugs is one for separate consideration.]

The question of the influence of the soil—the occurrence of a special soil type—from a physical and chemical standpoint, needs the co-operation of the chemist and the controlling influence of field experiment.

As may be inferred from the foregoing findings, Bottle Neck—as is evident from facts brought to light—is not a permanent endowment of the pineapple plant. However, it is injudicious to utilise stock from affected areas for planting unless the certainty that it harbours neither Mealy Bug or Nematode Gall is assured.

II.—AGENCIES INJURING THE FRUIT.

1. Fruitlet Core Rot (Tryon), Brown Rot (Larsen), Black Spot, &c.

The fruit disease known under the above names is, as we have found, very prevalent in South Queensland, during the winter season affecting the "winter crop." It is said, indeed, when pronounced then to involve locally at least 25 per cent. of the fruit, both smooth and rough leaf pineapple varieties being alike subject to it.

It has been termed "Fruitlet Core Rot" by us its discoverer, since it is at first confined to single "pits" of the fruit, and the dark spots just within the outer surface, so evident on cutting the pine across, and so symptomatic of its presence have originated its more popular local name, "Brown Rot," above mentioned, in the Hawaiian Islands where also it is met with, so also we have the term "Black Spot," although the tissue first involved is dark-brown rather than this colour. From single pits it may extend to others, especially when the more succulent fruits of the smooth-leaf pine, for example, are attacked. At its commencement it may occur without external symptoms being noticeable. It has been shown by the writer to originate in a very minute injury at the base of the closed calyx cavity or cup (air-chamber of some) and near in it where the pistil is planted. This injury, in the rough-leaf pine at least, is caused by the punctures of a tiny mite of invisible smallness—except when a magnifier is used—an acarid that we have assigned to the genus "Tarsonymus." At times, however, and more commonly in smooth-leaf pines, the injury consists of a few more or less gaping fissures in the same position as these punctures, caused by the inability of the thin hard tissue here to resist weather changes—from high to low temperature and vice versa—having a disruptive action when as in winter surface extension cannot as here at the same time ensue to withstand it. In each case fungus infection is rendered practicable and takes place at these sites, and is especially operative in causing tissue changes in colouration and decay, through excessive realisation, since the relatively cold winter temperatures in reducing vigour deter the plant in resisting and overcoming the attack of the fungus and the changes that it can effect.

This explanation has been virtually accepted by Larsen as an explanation of Brown Rot in pineapples in the Hawaiian Islands and by Matz as far as relates to Porto Rico (W.I.) with this difference, that whereas the writer regards the fungus implicated as derived from the dead and decayed stamens constantly present within the closed calyx cup, these writers regard the micro-organism as being a Fusarium of undetermined species and origin. The fact that this trouble both originates and develops always in a closer space—the calyx-cup in the individual fruitlet or pit—renders direct treatment apparently wholly impracticable. Dusting the flowers with very finely-ground sulphur has not been attended with certain benefit either in the case of the Ripley Queen, or with the common rough-leaf pine. Inquiry is being prosecuted with a view to ascertain to what extent, if any, this fruit disease is virtually hereditary, since the mite mentioned is indigenous to the plant. The circumstance that the trouble is locally prevalent in certain plantations is suggestive, indeed, of locally-grown plants constantly carrying with them the prime agent of this Fruitlet Core Rot.

2. Sun Scald.

The symptoms of sun scald of the pineapple fruit are as follows:—At first one face of it is of a lighter green than is the surface generally and then assumes a pale-yellow hue. A softening and collapse in patches now develops in this area, whilst meanwhile there is slight exudation of sap and later on fissuring—these appearances being suggestive of premature ripening restricted in position and extent to the part in question. These may supervene a change from yellow to dark-brown and following this a drying out shrinkage inwards of the affected tissues—the alteration of colour, significant of decay proceeding deeper and deeper, the conspicuous altered tissue being very noticeable on cutting the pine across. (*Note.*—These progressive changes are detailed since they are usually regarded as symptomatic of a specific disease.)

At first there is no occurrence present of micro-fungi to suggest parasitism as the underlying cause of this trouble, but the presence of morbid moist plant-tissue soon determines the presence of the Brown Rot organism whose destructive activities are promoted by Fermentation Flies (*Drosophila*) that are early attracted by it. Pineapple Fruit Scald with corresponding features is met with also in other countries; and it may be prevented when threatening here as in them by sheltering each individual pine when its attitude acquired during growth suggests it by the use of some light plant debris or cotton, or by raising them under shelter as in Florida, treating the pinery as a whole (a procedure not admissible, possibly, on economic grounds in Queensland, except under special circumstances).

Pines that have been rendered unduly succulent by generous rainfall, or by free use of growth-conducing fertilisers, and thus whilst producing large fruit have not the rigidity so essential for maintaining them in an erect position, are liable to this injury, since leaning over they expose to the sun's rays one face rather than the surface generally. This especially applies to the first or plant crop, but the fruit of succeeding ones are also liable to become oblique since, arising laterally on the plant, the inclination under the circumstances mentioned will be emphasised with age—the bias once produced naturally augmenting.

Fruit affected by sun scald even in a slight degree on being gathered is very liable to travel badly, since the damage once initiated is liable to develop with the ripening process.

3. Cripples.

In this further fruit malformation the symmetry of the fruit is impaired, one side through being invested in growth being flattened or even concave, the pits included in the affected area being relatively small. This in the past especially affected pineapples in the localities longest devoted to pineapple growing (Old Nudgee Gardens), and the pineapple variety earliest cultivated, the so-called "rough leaf"—the smooth-leaf pine (Cayenne) manifesting Fruit Cripple much less frequently. It has been pronounced to be an hereditary trouble transmitted by vegetative growth from affected plants. Also, that it is linked with the presence of a "mesial streak in the leaves." We are not in a position to support either of these conclusions unless on *a priori* grounds. At present the occurrence of these fruit cripples is not a serious matter with regard to pineapple growing, but it is one that may claim attention at our hands in view of this being not so in the future.

4. Fruit Storage Rots.

These are an important consideration since not only do they impair the value of shipments especially overseas, being responsible for a large measure of destruction at times, but they may also affect the value of the pack when ripe fruit is used by canners. Any fruit that is bruised is especially liable to the destructive action of the agents that cause them.

We have not so far been able to prosecute the inquiry necessary for the elucidation of this matter, beyond having discovered that a special species of *Penicillium* (one of the mould-fungi) may be implicated in this work following up the damage arising from mechanical injuries, bruising, &c. It is in this work, that of storage Pineapple Rot, that the organism of "Soft Rot" (*Thielaviopsis paradoxa*) plays such an important part elsewhere.

5. Soft Rot (*Thielaviopsis paradoxa*) (de Seynes), von Hohnel).

The occurrence here of Soft Rot has not definitely been established, but owing to its prevalence in other countries where pineapples are grown as a field crop (e.g., Hawaiian Islands, the West Indies, and Florida) may be expected to already be present in Queensland also. When the fruit disease, originally termed by us "Fruitlet

Core Rot,'' and subsequently by others Brown Rot, freely affects the smooth-leaf pine it may readily be confounded with it owing to the development of so much dark-brown tissue adjacent to the external surface. It is essentially a disease affecting the ripe fruitlet, generally on its being stored and especially when shipped. In the field should ripe fruit occur, the organism causing it finds entrance through insect punctures or mechanical injuries; in the fruit-store through the cut-end or stem (Base Rot); and on ship board—when the atmosphere is humid—through the general surface (shipping rot). When the fruit is affected, ''the tissue takes on a water-soaked appearance, becomes a shade darker yellow than the normal tissue, and has a characteristic odour'' (L. D. Larsen)—that of acetic-ether. When exposed to the air, such affected tissue after the lapse of twenty-four hours has become black owing to the formation of innumerable black spores on the surface by the *Thielaviopsis paradoxa* parasite. This may also happen within the core of the fruit when the Soft Rot has proceeded from the base upwards through its centre.

(This Note is inserted for convenient reference.)

6. Watery Core.

Some years since (1918) an anomalous pineapple fruit disease was brought under notice as affecting a locally slowly-growing winter crop on land that had been neglected. The features noticed were as follows:—The core becomes watery and soft; and thereupon this change extends outwards to the surface. The fruits when attacked are partially ripe, but still green on one side. In other respects they are well developed and sound.

This if still now discoverable awaits investigation.

III.—INJURIOUS INSECTS.

1. Root-destroying Beetle Larvæ (*Scarabaeidae*).

These principally prove injurious in pineapple plantations in the southern parts of the State, and especially in special positions (e.g., higher grounds) and special soils (''heavier'' ones) within these. The insects are the larvæ of an undescribed species (a large-size one) of *Lepidiota*—a member of the Scarabæid group Melonthidæ, the genus that embraces more than one sugar-cane destroying beetle also. The injury they occasion is the destruction of the entire root system by gnawing off usually short one root after another, but they also gouge out cavities in the root stock itself, single grubs passing through the soil from one plant to another in the row. These destructive grubs have at least two years in the soil, and as they meanwhile persist, generally speaking, in one spot, the continuous damage they perpetrate is considerable. Moreover, since they may pass downwards with the moisture level as the soil surface dries out during drought, their presence may be overlooked and so same individual grubs may destroy successive pineapple plantings. They have been found to yield to the methods applied in subduing sugar-cane destroying *Lepidiota* grubs, although these are not all available, since the pineapple destroying beetle (the parent of the root-destroying grub) does not apparently feed on the foliage of trees or of other plants, and remain on them during the day as do so many of the ''cane beetles,'' and thus they can neither be captured or poisoned as could be done were this habit displayed. On the other hand, they pass the hours of the day beneath the soil to which they repair, only issuing from it as at first—at and just after sunset (during September-October) to swarm and mate when temporarily settled. It has, however, been practicable to capture a proportion of these beetles on emergence since they will remain temporarily settled on any small bushes that may be stuck in the soil whence they are issuing and so may be hand-captured. The destruction of the large grubs in the soil by paradichlorbenzol has been found practicable. The necessary inquiry centering on this destructive insect and its habits is in progress.

Note.—A second, a larger species, of *Lepidiota* of unknown feeding habits occurs in a portion of the district in which this pineapple damaging one is met with. In Southern Queensland a third scarabæid larva also gnaws pineapple roots, but not shortly off—possibly *Isodon puncticolle.*

2. "Mealy Bug" or "White Louse" (*Coccida-Pseudoccus* spp.).

What are apparently two different kinds of ''Mealy Bugs'' have been found associated with pineapple plants. One, occurring especially upon and injuring the root system—and in feeding amongst other places—by suction at the root-ends causing an obscure form of plant failure through preventing their proper functioning—damaging the nutrient-absorbing tissue occurring there, and very harmful when

dry conditions prevail and fresh root-formation is no longer taking place. The other Mealy Bug concentrating its attention principally on the apical growths above ground on either the developing pine or tender leaf-shoot, but infesting the base of older and more developed fruits also. This latter, as we find, is especially harmful in the more northern areas of this State, where its work is facilitated by a special ant, that in return for sweet aliment that it derives from the pineapple-loving insect, protects it from its would-be enemies with a canopy of debris or some other vegetable matter.

The species of *Pseudococcus* concerned have not yet been definitely specifically determined, but two different species of Mealy Bugs are known to attack the pine-apple in other countries.

These harmful insects, whose obscure habits lead generally to the damage they perpetrate being overlooked, are, it has been discovered, largely disseminated and so established in clean areas by means of plants used in propagation that already harbour them. This remark, whilst it may refer to both suckers and "nibs," has special reference to "stumps" that are often grossly infested. Any plants that show the nmerest trace of Mealy Bug presence should be disinfected prior to being sent out or planted. Fumigation for scale insects will constitute an effective method in securing this end if carefully pursued. Experiments involving the use of hot water are projected.

3. The Pineapple Scale Insect (*Coccidae-Diaspis Bromeliaceae*).

This formerly was to be met with in the Brisbane area infesting plants of the pineapple family (*Bromeliaceæ*). Fortunately, it apparently has spontaneously disappeared. In the West Indies and Florida it is one of the plant's worst insect enemies.

THE LARGE FRUITED GRANADILLA.

G. WILLIAMS, Director of Fruit Culture.

The Passiflora family is of wide distribution, several being included in our native flora, but to the introduced varieties we are indebted for their delicious fruits. The passion fruits, of which two are of purple and one yellow, are widely distributed. A recent introduction, *P. ligularis*, has not been sufficiently established to warrant general comment. The fruit is comparatively small—though the foliage more resembles the granadilla—and is of plum colour. *P. laurifolia* is an old identity, but extremely rare. The fruit is very sparsely produced, but the quantity may be increased by hand pollination. It is twice the size of the large purple variety, which it excels in flavour. Recently a fair supply of granadillas, *P. quadrangularis*, has been available on the local markets, but distant transport obviously necessitates their being forwarded in a rather green stage, consequently the flavour is not in many instances fully developed. It is extremely rare that the large-fruited granadilla, *P. macrocarpa*, is seen on the market, though vines are occasionally noted in private gardens. The more fertile soils in some of the higher parts of the metropolitan area are adapted for the production of this highly esteemed fruit. The illustration is of a fruiting vine in Mr. J. C. Brünnich's garden at Taringa, near Brisbane.

The vine may be induced to climb over a trellis but in this way is unsatisfactory, the best results being obtained when grown over a pergola, as shown, covered with open (5-inch) wire netting, or any substantial structure with widely spaced battens. It is found without hand pollination the early flowers fail to set fruit, but later in the season a good crop is carried. In addition to its use as a dessert the granadilla of both types, when properly matured, is prized for culinary purposes, when its succulent pulp protected by a very thin skin is incorporated. The fermented juice of the fruit may be converted into a most palatable wine.

Plants are propagated from seeds or cuttings—planted in early spring. Germination of seeds is accelerated by soaking in hot water for three or four hours before planting. Seedlings will transplant readily, provided the foliage and soft terminals are removed; usually they are pot grown when removal of any portion at the time of transference to open ground is unnecessary.

PLATE 6.—THE LARGE-FRUITED GRANADILLA.

Carrying specimens 9 in. x 17 in. circumference, grown by Mr. J. C. Brünnich, in his garden at Stanley Terrace, Taringa, near Brisbane.

THE LATE MAJOR A. J. BOYD.

Many expressions of regret at the passing hence of Major A. J. Boyd, F.R.G.S., who was editor of this Journal from 1897 until his retirement in 1921, have been received, together with many evidences of widespread appreciation of his worth and work. Included among them were the following Press references:—

From the Sydney "Bulletin," 23rd May, 1928:—

Major A. J. Boyd, man of many parts and fine personality, passed over in Sydney last week at eighty-six. Born in Paris, he came to Australia, after a spell at sea, in 1860, and became one of the early sugar-planters of the Northern State. From that he passed into the Education Department, and later conducted a school of his own which turned out many first-class men. A ripe scholar and an exceptional linguist, he also broke into journalism; he edited the "Queensland Agricultural Journal" from 1897 till he retired in 1921. He was a keen volunteer soldier in pre-Federation days, and held his majority in the old Queensland Garrison Artillery.

From "The Brisbane Courier," 16th June, 1928:—

I was most interested (writes a correspondent) in the article entitled, "The Late A. J. Boyd, Soldier, Sailor, Schoolmaster, and Journalist," written by "Nut Quad." In it the writer remarked that the late Major Boyd was a Frenchman born—and it reminded me that sometimes people had jokingly accused him of being half a Frenchman, because his parents happened to be stationed in France at the time of his birth. His reply was, "If I had happened to be born in a stable would I have been a horse, or, if I had been born in China, would I have been half a Chinaman?" It would have been very hard to find a man who was prouder than he of being British.

In mentioning that the Darling Downs Mounted Infantry was largely the fruit of the late major's recruiting zeal, "Nut Quad" reminded me, too, of the Eton Cadets at his Nundah School, a corps of which he was very proud. All his friends will remember his enthusiasm for soldiering, and those in close contact with him were apt to catch his enthusiasms. Mr. Orlando Daly, a tutor at Eton, Nundah, passed on from that school to the Permanent Force in Brisbane, and so did Mr. J. J. Byron (another tutor at Eton, Nundah), now Major-General Byron (of South Africa). The late Major was very proud of the fact that three of his lieutenants in the Brisbane Garrison Battery when he was in command all became distinguished soldiers, namely, the late Major-General Sellheim, General Foott (our Queensland Commandant), and also General Coxen. General Sir Brudenell White—[a Queenslander and one of the greatest general staff officers the war produced—Ed. "Q.A.J."]—was a pupil at Nundah, and later on received some coaching from the late Major Boyd for his military career. Others of his pupils included Mr. Justice Lukin, the late Mr. Charles Bright (Postmaster-General), Mr. A. D. Walsh, the late Mr. Gordon Graham (Under Secretary for Lands), Mr. Horace MacPherson, Sir Samuel Pethebridge, K.C.M.G., and others too numerous to mention.

When "Nut Quad" gave a list of the late Major's writings, he forgot to mention the author's book, "The Shellback," in which he gave an account of his life at sea in the 'sixties—and it was to those far-off days that his mind mostly went back in the last few years of his life. These few reminiscences are written by one who knew him very well as soldier, sailor, schoolmaster, journalist, and also a very dear old man. [Major Boyd's literary activities covered a very wide field. In addition to the works already listed, he was the author of "The Colonel's Sons" and other stirring boys' stories. "Geology in Verse," a clever text-book in rhyme, and numerous pamphlets and brochures on agricultural subjects were also the products of his vigorous pen. His general outlook on world affairs was that of a broad-minded, keen-brained, cultured Australian.—Ed. "Q.A.J."]

MANURING OF BANANAS.

In the May issue of the "Journal" the usual formulæ for fertilising of bananas were given, and recommending the use of sulphate of potash as a source of the necessary potash, which is of such importance for successful banana culture. Bananas are one of the plants which like a certain amount of chlorine, and the use of salt is therefore frequently beneficial. By substituting the cheaper muriate of potash for the sulphate the banana crop will be greatly benifited, and muriate of potash can therefore be strongly recommended as a base for all fertiliser mixtures for bananas.

OBSERVATIONS ON EYE WORMS OF BIRDS.

By J. W. FIELDING, Australian Institute of Tropical Medicine, Townsville, North Queensland.

THE presence of worms in the eyes of birds was apparently first noted about 1819, when Rudolphi described a number of species. From 1825 onwards a noted collector named Natterer appears to have concentrated his attention on the parasites of birds, paying special attention to the parasites of the eyes. He appears to be responsible for quite half the species recorded to date, which were collected principally in Brazil. They were described by Molin (1860), since when various authors have found and described new species from other parts of the world.

Krefft (1871) first recorded the presence of worms from the eyes of wild birds from the Australian region. These worms were placed in the genus *Ascaris* (Ascaris sp.), and were recovered from the Red-wattle bird or Gill bird, *Acanthochæra carunculata* Lath. Johnston (1912) redescribed it as *Ceratospira acanthochæræ*, later placing it in the genus *Oxyspirura;* Railliet, Stiles, and Hassall give the specific name as *Anthochæræ*. Von Linstow (1897) found worms in the eyes of Brenchley's Fruit Pigeon, *Zonoenas brenchleyi*, from Bismarck Archipelago, describing it as *Ancyracanthus ophthalmica;* Ransom (1904) brought it into the genus *Ceratospira*.

From 1913 onward special attention has been paid to the presence of worm parasites in the eyes of wild birds in North Queensland. Nicoll (1914) recorded parasites from the eyes of the Wedge-tail eagle, *Uroætus* (*Aquila*) *audax*, and the Brown hawk, *Hieracidea berigora*, which were placed provisionally in the genus *Oxyspirura*. Breinl (1913) recorded *Filaria dacelonis* from the Laughing Jackass; *Dacelo leachi*, which was placed by Johnston (1916) in *Ceratospira;* and latterly this species has been placed in the genus *Thelazia* by York and Maplestone (1926). The presence of an *Oxyspirura* sp. from the Sea Eagle, *Haliætus leucogaster* is here recorded. These records form the positive findings of a systematic examination of 250 wild birds for ecto and endo parasites, special attention being paid to the eyes. The list of birds examined includes 109 domestic birds; of the wild birds examined 5 were found to be infected, or 2 per cent. of the total; of the 109 domestic birds 51 were positive, or 46.88 per cent. In the following list of birds examined, the common and ornithological names are given to avoid confusion:—

—	—	Number Exmd.	Negative.	Infected.
Bee eater (sacred kingfisher)	*Halcyon sanctus*	1	1	..
Bower bird	*Chlamydodera orientalis*	2	2	..
Butcher bird	*Cracticus destructor*	3	3	..
Canary, native	*Ptilotis fusca*	4	4	..
Cockatoo, black ..	*Calyptorhynchus funereus*	1	1	..
Cockatoo, white ..	*Cacatua galerita*	6	6	..
Cormorant	*Plotus* (*Anhinga*) *novæ hollandiæ*	2	2	..
Coot, bald	*Porphyrio melanonotus*	19	19	..
Crane, white	*Herodias timoriensis*	2	2	..
Crane, blue-grey ..	*Notaphoyx novæ hollandiæ* ..	2	2	..
Cuckoo	*Eudynamis cyanocephala*	4	4	..
Cuckoo, chestnut breasted	*Cacomantis castaneiventris* ..	1	1	..
Cuckoo, shrike, black-faced	*Graucalus melanops*	2	2	..
Curlew	*Numenius cyanopus*	1	1	..
Dove, large (wood-pigeon)	*Geopelia humeralis*	1	1	..
Drongo, fish tail ..	*Chibia bracteata*	6	6	..
Duck, black	*Anas superciliosa*	12	12	..
Duck, Indian Runner (penguin duck)	?	13	13	..
Duck, muscovy ..	*Cairina moschata*	3	..	3
Duck, whistling ..	*Dendrocycna arcuata*	12	12	..
Eagle, sea	*Haliætus leucogaster*	1	..	1
Eagle, wedge tailed ..	*Uroætus* (*Aquila*) *audax*	2	1	1
Fig bird	*Sphecotheres maxillaris*	11	11	..
Fowl, domestic ..	*Gallus domesticus*	82	34	48
Friar bird (leather head)	*Tropidorhynchus corniculatus* ..	10	10	..
Frog mouth	*Podargus phalænoides*	4	4	..

—	—	Number Exmd.	Negative.	Infected.
Goose, domestic ..	*Anser cinereus*	2	2	..
Goose, pied	*Anseranas semipalmata*	1	1	..
Grebe, hoary headed ..	*Podicepes poliocephalus*	1	1	..
Hawk, brown	*Hieracidea berigora*	10	9	1
Hawk, sparrow	*Accipiter cirrhocephalus*	1	1	..
Hen, water	*Gallinula tenebrosa*	1	1	..
Heron, Nankeen ..	*Nycticorax caledonicus*	2	2	..
Honeyeater, blue faced..	*Entomyza cyanotus*	1	1	..
Ibis, glossy	*Plegadis falcinellus*	3	3	..
Ibis, straw necked ..	*Carphibis spinicollis*	2	2	..
Jay, blue	*Coracina robusta*	4	4	..
Kingfisher, Leach's ..	*Dacelo leachi*	10	8	2
Lark, magpie	*Grallina picata*	7	7	..
Lorikeet, blue-bellied ..	*Trichoglossus novæ hollandiæ* ..	10	10	..
Magpie	*Gymnorhina tibicens*	2	2	..
Mocking bird	*Anellobia chrysoptera*	3	3	..
Mynah bird	*Acridotheres tristis*	11	11	..
Native companion ..	*Antigone australiana*	11	11	..
Oriole, northern ..	*Oriolus affinis*	2	2	..
Owl, brown	*Ninox boobook*	1	1	..
Owl, masked	*Strix novæ hollandiæ*	1	1	..
Parakeet, red shouldered	*Neophema pulchella*	2	2	..
Pelican	*Pelicanus conspicellatus*	1	1	..
Pigeon, barred wing ..	*Phaps chalcoptera*	2	2	..
Pigeon, domestic ..	*Columbia livia domestica*	9	7	2
Pigeon, pheasant ..	*Macropygia phasianella*	4	4	..
Pigeon, purple-crowned fruit	*Ptilopus superbus*	1	1	..
Plover, spur wing ..	*Lobivanellus lobatus*	11	11	..
Rail, land	*Eulabeornis philippinensis* ..	2	2	..
Sandpiper	*Tringoides hypoleucus*	18	18	..
Shag	*Phalacrocorax carbo*	3	3	..
Sheldrake, white headed	*Tadorna radjah*	2	2	..
Snipe	*Rostratula australis*	1	1	..
Spoonbill	*Platalea regia*	2	2	..
Sun bird	*Cinnyris frenata*	1	1	..
Swan, black	*Cheonopsis atrata*	4	4	..
Thrush (babbler) ..	*Pomaterhinus rubeculus*	1	1	..
Turkey, scrub	*Catheturus lathami*	2	2	..
		359	303	56

Examination of Young Chickens.

Attention is drawn to an examination of one poultry yard, taking only young chickens into consideration. The results are not included in the general list of birds examined. The total number examined was forty-five chicks, ranging from three days to twenty-four days old. The table shows the age and the results obtained, giving positive findings in 32 per cent.

—	Number Examined.	Negative.	Infected.
3-day old chicks	8	8	0
7-day old chicks	12	12	0
10-day old chicks	14	12	2
14-day old chicks	3	0	3
18-day old chicks	2	0	2
24-day old chicks	8	1	7
10-21-day old muscovy ducks	3	1	2
Total	50	34	16

Worm parasites from the eyes of domestic birds were first found by Dr. Manson at Amoy, China; these were described by Cobbold (1879) as *Filaria mansoni*. Since that time this parasite has been recorded in other parts of the world, and appear to be closely associated with the two tropical lines of Cancer and Capricorn. The following are the places from which the parasite has been recorded:— Florida (Niles 1904), Ransom; Jamaica (Clark 1904), Ransom; Mauritius (Emmerez 1901); Isle of Reunion (Ozoux 1910); Brazil (Megalhæs 1888); Guam Ladrome Islands (Barber 1916); Hawaii (Norgaard 1918); Java (Penning 1894) (Smit 1918); Annam Indo-China (Carougeau 1902); Rabaul Mandated Territory of New Guinea (Heydon 1926), Fielding; New South Wales (Johnston 1909-10); North and Central Queensland (Tryon 1907-8), (Dodd 1909), (Sweet 1910), (Breinl 1913), (Nicoll 1914), and (Fielding 1926); the latter author records finding it in the muscovy duck, *Cairina moschata*.

In a recent paper on the subject, the present writer draws attention to having obtained specimens from inland centres, thereby dispelling the idea that it only occurs on the sea-coast. Ozoux (1910) drew attention to its occurrence in mountainous districts on Reunion. Smit (1918) states that Neveu-Lemaire says that the parasite does not occur on the sea-coast

As pointed out by Fielding (1926), various experiments have been carried out on the question of the elucidation of the life history, and has himself been working on the question for the past twelve to thirteen years, during which time some thousand or so experiments and dissections, which were the fore-runners of the findings tabulated by him, were carried out. He shows that the cockroach *Pycnocelus* (*Leucophæa*) *surinamensis L.* is responsible for the transmission of the parasite, and succeeded in infecting young and old ducks and young chicks experimentally by feeding the cockroach to the birds, and that the time taken for worms to appear in the eyes of birds, after having swallowed the roaches, is very short.

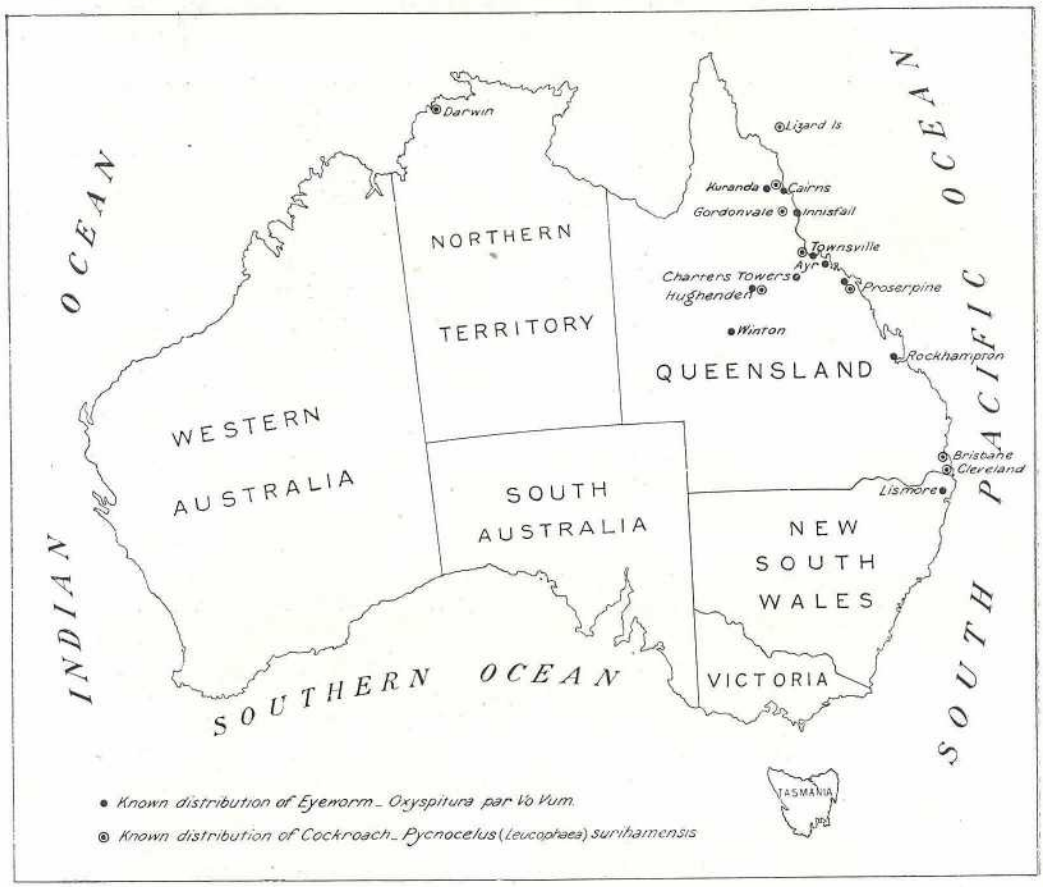
That there is an association between the eye-worm of poultry *Oxyspirura parvovum* and the cockroach *Pycnocelus* (*Leucophæa*) *surinamensis* in Australia is evident on consulting the map showing the distribution so far as is known at present. This is further accentuated on taking the known distribution of *O. mansoni* and the cockroach into consideration throughout the world, which shows that of the places where the worm parasite is known six have also the cockroach. So far we have no records of the occurrence of the roach in Indo-China, Guam, or Rabaul, Mauritius, Reunion, New South Wales, Florida, Jamaica, but owing to the fact that it has been recorded from adjacent places, it is hardly conceivable that it does not occur in the places mentioned. As regards Florida and Jamaica we would draw attention to Doucette and Smith's statement that it occurs on the eastern portion of the United States, and has also been recorded from Mexico.

General Sanitary and Hygienic Considerations.

It is undoubtedly of first importance that the general sanitary and hygienic condition of the poultry yard should be attended to. Even under the ordinary rules of poultry keeping the first essentials are—open air, light, cleanliness, and careful feeding. Infinitely more necessary is it that these conditions should be given with a disease of such importance as the one under review. It is considered that in an endemic area the poultry yard should have a minimum of shade so that the penetrating and sterilising effect of nature's own disinfectant can be made of more use—viz., the sun. This minimum of shade is not only meant in the ordinary sense but also as regards shade for insect pests in the fowl-house and yard generally. The yard should be thoroughly cleaned, and the droppings cleaned up at regular intervals and spread out in the sun to dry and eventually burned. All bags, boxes, boards, and other material which might serve as hiding-places for cockroaches, crickets, and other insect pests should be burned. Disinfectants should be sprayed at frequent intervals around the fowl-house and shady spots, or powdered lime, borax, or sodium fluoride mixed with flour should be sprinkled wherever cockroaches are prevalent. Recently in the United States, Doucette and Smith (1926) have recommended the use of a solution of sodium cyanide sprayed on the soil for the destruction of the cockroach which is now known to be responsible for the transmission of eye-worms of poultry. As they were working under conditions totally different from those obtainable in a poultry yard, and as this solution is a deadly poison, it should be clearly understood that the birds would have to be segregated during operations, and all refuse and detritus cleaned up afterwards. Even then there would appear to be a certain amount of risk attached to its use, owing to the fact that the fowls scratching around in the soil for tit-bits may pick up some particles impregnated with the compound. On general grounds the feeding should be carried out on the hopper principle, and the drinking water supplied on the fountain system.

Treatment.

Various methods of treatment, aiming at the destruction of the worm parasites of the eyes have been put forward, but to appreciate fully the effects of any treatment, it would appear necessary to point out that there is a wide space all around the eyes communicating with the beak and mouth called the infraocular sinus, through which the tears drop into the buccal cavity, and that the worm can and does pass out from the eyes through this sinus into the mouth, or from one eye to the other, thereby evading for a time the effects of the treatment of the eyes. Obviously, whatever method of treatment is given, it is necessary, to get the best results to carry the treatment to the only means of escape for the worms from the eyes, viz., the opening into the mouth of the sinus. This end is accomplished by painting the opening with the solution by means of a camel-hair brush.



The following solutions have been suggested:—(*a*) Dropping a solution of sodium bicarbonate into the eyes. (*b*) A similar proceeding with chloroform. (*c*) First anaesthetise the eyes with a 5 per cent. solution of cocaine, by drawing apart the eyelids and pouring a few drops of the cocaine into the eyes, allowing this to act for some time, and afterwards drawing up the nictitating membrane and placing a few drops of 5 per cent. creolene underneath. (*d*) By forcibly extracting the worms by means of a small pair of forceps (this is a dangerous practice and is better left alone). An improvement is here suggested, viz.—a small camel-hair brush. This method has been used for some years and has been found to answer quite well, but requires plenty of time and patience; even this is objectionable

owing to the creation of inflammation of the eyes. (*e*) Placing a small quantity of turpentine and allowing it to act for half an hour, followed by irrigation of the eyes with lukewarm water. (*f*) A weak solution of potassium permanganate (Condy's crystals); this is somewhat slow in action, and should be continued daily for a week or so. Further treatment directed at the alleviation and cure of the inflammatory and catarrhal conditions by irrigation of the eyes with a mild antiseptic as 4 per cent. boric acid. Ransom suggests the use of a mixture of nine parts of lard and one part of iodoform or carbolised vaseline.

TURKEY REARING.

P. RUMBALL, Poultry Expert.

There has been a serious falling off in the number of turkeys kept in Queensland during recent years, of which ample evidence is supplied by the Registrar-General in his annual reports.

This decline in numbers cannot be attributed to the lowered value of turkey flesh, as excellent prices are generally realised for good birds in the local markets, and in seeking the cause, one is forced to the conclusion that faulty methods of breeding and disease are the principal factors, although seasons and the ravages of foxes have probably played their part.

Suitable Localities.

The farm, by reason of offering turkeys ample range, thereby enabling them to indulge in some of their wild traits, is its natural home. Free range also enables turkeys to gather considerable quantities of their own food in the form of grass, insect life, and when stubbles are available, grains. Districts in which the soil is of a light nature and undulating is more suited to turkey raising than low-lying wet country. Scrub country offers ideal conditions, especially where there is a good supply of green feed and water.

Housing.

It is natural for turkeys to roost in the open, but, when there is no suitable belt of timber to afford protection, certain housing methods should be adopted to obtain the best results. These houses need not be very elaborate, but should be so constructed as to permit of a free circulation of air. Old open-fronted lofty barns are well suited for this purpose, but in districts in which turkeys have to be protected from the fox it may be advisable to adopt the following system:—Enclose an area of land, about ½ an acre, with a 6-foot netting fence, and build a shed in the middle. This shed should face north, and be open in front with a 6-inch space between the back of the top wall and roof. The dimensions would vary according to the number of birds to be housed, but each bird should have a floor space of 15 square feet. The house should be 9 feet high in front and 7 feet at back. Perches should be about 3 feet high, all on the same level and 3 inches wide. Suitable nests could be placed around the enclosure and made to look as natural as possible with the help of bushes. The turkeys could be confined to these quarters at night, and allowed range during the day.

Breeding Stock.

There are several varieties of turkeys, but the American Bronze holds pride of place. This is a large and hardy breed, which has supplanted most other breeds, and appears to be well suited to our climate as well as our markets. Mature stock should only be used for breeders, two years and over being more suited than stock only a year old. One vigorous Tom can be mated with as many as ten hens, but probably six to eight females on the average would give better results.

In selecting, strength and vigour, coupled with the knowledge that your stock are from healthy parents, is of primary importance. The head should have a clean and healthy appearance, body compact and long. Sturdy shanks and strong toes with fair-sized bone indicating stamina.

Extra heavy show specimens do not make the best breeders. What is required, is stock in good hard condition and not fat; on the other hand, stock that are thin should never be used, as the lack of condition may be due to some inherited weakness. Hens weighing 16 to 18 lb. and Toms 25 to 30 lb. in fair condition will be found to give satisfactory results.

Avoid in-breeding and endeavour to obtain occasionally new Toms from reliable stock, but before buying make sure that he comes from healthy parents, and take further precautions by isolating him for some two or three weeks. The best hens raised on the farm should be reserved for breeding purposes, and not sold because there is a good market.

Hatching by Natural Methods.

Vermin must be carefully guarded against and when nesting in enclosed quarters, both the hen and the nest should have a good dusting with insect powder for a start, and again a few days previous to hatching. By taking these precautions you assure the young poults of a start in life free from vermin, which is a great aid to successful rearing. A turkey will only cover properly fifteen to eighteen eggs, and it is a good plan to set a few eggs under broody hens at the same time as the turkey is set, and when hatched to give all the chicks to the turkey, as she can comfortably mother about twenty-five. Food, water, and grit should always be handy to the sitting hen, and if the Tom is at all savage it is advisable to protect the nest and young.

Rearing.

It is found best to let turkey hens mother the chicks. When hatched, the young poults should be left undisturbed until thoroughly dry, they then may be temporarily removed to induce the turkey to remain on the nest, if it is found that the eggs are hatching irregularly. After the hatch is complete a coop which affords protection from wind, rain, and dampness should be provided. This coop should permit of a free supply of air and be moved on to new ground daily. The hen and poults should be confined to the coop for ten days to a fortnight, but if the weather is fine the poults may be allowed a little liberty when the dew is off the grass; after this period it is generally safe to allow range, providing the grass is not too long and wet. When they have reached the age of five weeks, entire liberty can be given, allowing them to roost in barns, houses, or trees, according to the policy adopted.

Feeding.

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to imitate them as far as possible by only feeding the young chicks a little at a time and fairly frequently. This prevents them from over-loading their digestive organs and helps to retain that keenness of appetite which is essential to successful raising of poultry of all kinds.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm and also gives excellent results. This can be fed five times a day for a few days, and variety can be made by the replacement of some of the meals with chick grains, mashes of brand and pollard mixed with milk, to which can be added a small amount of minced meat and tender green feed. This mash should be made crumbly and not sticky. When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night and so induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

Diseases in Turkeys.

Turkeys are subject to practically the same diseases as other classes of poultry, but mention is made here of the most common and devastating diseases affecting the problem of turkey raising.

Black-head, Hepatitis, White Diarrhœa, &c.

This disease was given the popular name of black-head owing to the darkened appearance of the head of affected birds. The general adoption of the name is unfortunately misleading, as the darkening of the head is not noticed in all cases.

Old and young stock are affected, but heavy mortality is principally met with in young stock a few weeks old. The external symptoms are drowsiness, lack of vigour, and loss of appetite. Diarrhœa is nearly always present and of a yellowish colour, though sometimes white, due to the abnormal percentage of urates. The disease usually appears in the intestinal tract, the ceaca being the most seriously affected. The liver quickly becomes affected.

Cause.—Bacteriologists do not agree as to the particular organism which causes this disease, but they do, however, assert that it can be transmitted from mother to progeny by means of the infection of the egg, hence the necessity of obtaining stock free from the trouble. It is also readily transmitted from one bird to another through food coming in contact with the droppings from diseased stock.

Medicinal treatment has not proved successful, but where stock has been recently infected the following remedies may be adopted as a means of arresting the disease:—Thorough cleanliness of quarters and disinfection with a 5 per cent. carbolic acid solution. A teaspoonful of hydrochloric acid to a quart of drinking water often gives good results. Sour milk, by its action in keeping the intestinal tract in an acid condition, is also of value.

MAIZE AND LUCERNE.

Maize is one of the most valuable cereals grown in the State, and is used extensively as a fodder in the drought periods, saving thousands of merino sheep that are now grazing on the Western downs.

It is difficult to over-estimate the value of such fodder crops as maize and lucerne and the service they render to the live stock industry in the trying periods of drought. The value of the activities of our agriculturists throughout the State cannot be solely estimated on the basis of the market value of the maize and lucerne produced. To such values must be added that of live stock saved by feeding drought rations of maize and lucerne and so preserving an industry that contributes largely to our national wealth.

Favourable seasonal conditions have yielded heavy crops of these fodders, but market values have fallen below the cost of production. A surplus over the immediate market requirements depresses values, and the producer suffers in consequence. With our varying climatic conditions surpluses and scarcity of fodder often follow at intervals that are altogether too brief.

Conservation of fodder is of really vital importance to us all. Lucerne and maize are especially suitable for conservation purposes. Our pastoralists where practicable might insure the lives of their stock by purchasing and storing maize and lucerne hay in silos or lofts. At the market prices ruling in times of plenty for such products the premium is most reasonable. By taking steps in time to make their position more secure, they will also render a great service to primary producers engaged in the production of fodder crops by stablising the market for them.

The menace of a prolonged dry spell has been lifted from most of the pastoral and agricultural areas of the State, and the future of both will be brighter and more secure if those controlling the pastoral industry will, where possible, make a special effort to purchase maize and lucerne for the purpose of storing for a lean period. Seasonal conditions will repeat themselves, and a period of high production is frequently followed by a subnormal season.—From Field Notes—by C. McGrath, Supervisor of Dairying.

A FARMER'S APPRECIATION.

Renewing his subscription, a Nambour farmer writes—

"I would like to add my congratulations to the Department for making available, at a small cost, such valuable information to the man on the land."

CLASSING SMALL CLIPS.

From a radio address by Mr. J. CAREW, Acting Instructor in Sheep and Wool, and continued from the June issue.

Marketing Wool.

The system of placing wool on the market must be taken into consideration. Five bales of wool, each 200 lb. or over, of a given class are placed in the general catalogue by the wool brokers, and therefore meet with keener competition at the auction sales than if in lines of less than five bales each. The latter are placed in the star lots, where speculators usually buy them up to repack into longer lines to be again put on the market in the general catalogue. In the classing of small clips the fleece wool should be worked into bulk lines. The main idea being to class into lines as even as possible, but at the same time make as few sorts as possible. There are three chief factors that are taken into account by the buyers when coming to a conclusion on the value per lb. of greasy wool—namely, spinning qualities, length of fibre, and yield. In the lastmentioned is meant the actual weight of clean dry fibre, after all yolk, vegetable, and other extraneous matter are removed. Length of fibre is considered in respect to the process to which the different lengths of fibre are suited in preparation for yarn and subsequent manufacture. Spinning quality means the actual length of yarn that can be spun per lb. of top or sliver.

Woollen yarns differ from worsteds in that they contain all the fibres that are in the particular class of wool from which the yarn is spun. Worsted yarns on the other hand have all short, weak, knotty, and cross fibres combed out before they reach the process of spinning. All fibres are lying parallel to each other, thus enabling them to be drawn out and spun into a more symmetrical and even yarn. To suit this combing process the wool must be of a given length, at least 2 in. for English and Australian manufacture for worsted top making, while on the Continent shorter wools can be used; they must, however, be sufficiently strong to withstand the strain of the combing machines.

In merino combing wool we have what are known as the warp and the weft classes, which indicate the requirements for the weaving of worsteds. In this respect the threads that form the foundation of the cloth are known as warp yarns, and are placed lengthways in the loom. These warp yarns are spun from a sound wool of a greater length than the weft yarns which can be much weaker, just sufficiently strong to stand the weaving as they form the cross yarn to be woven into the fabric.

It can readily be observed that the grower's main object should be to have the wool classed to meet the demands of those purchasing the wool for manufacture, thus enabling them to secure the desired class for their special purpose. These top makers use combing wools only, and if any wools are included that are too short or too weak for top making purposes they must get rid of it again.

The Departmental Wool Scheme.

If the flock is so small that the fleece wool cannot be got into the bulk lines, and is still kept fairly even in length, spinning qualities, and condition, the grower is going to sell his best wools at a disadvantage, for the value is likely to be based more on the low wools contained in the parcel. It is because of this disadvantage under which the farmer with a small flock is suffering that the Department of Agriculture and Stock receives and classes any farmer's clip from flocks of 1,500 sheep and under. No lot is too small for consideration, and all wool received is classed according to its grade. When these wools are received they are weighed and an average value placed against them. If required, an advance of 60 per cent. on the Departmental value is remitted to the owner without delay. The balance due is forwarded, less expenses, on realisation in the market.

In grading these wools, the main features considered are length, colour, condition, and soundness, and the several qualities found in merinos and other different breeds and grades. Each separate class is a distinct and even line, showing the particular type to which it belongs. A line may contain any number of farmers' wools, each of which has been weighed as it is sorted into the respective classes and placed in the bin. The only preparation necessary on the part of the grower is the rolling of the fleece having the tip sides inward, after the dags and stains are removed, before being placed in the bale or other package. When the wool is baled, a distinct brand should be placed on the cap of the bale. Under this scheme handling and all other charges have been reduced to a minimum, in order to encourage farmers to keep sheep even if only in a very small flock.

DROUGHT FEEDING OF STOCK.

By RALPH V. HOLE, Manager of Warrana and Bimble Stations, Coonamble, New South Wales.

Some time ago the "Pastoral Review" offered three substantial prizes for the best contribution by subscribers or their managers or overseers on actual and practical experiences in the drought feeding and management of stock. Following is the first prize essay which is reprinted from the "Pastoral Review" for last April, and to which we are indebted.

THIS essay covers experience of hand-feeding over a period of almost seven months. Commencing on 6th May with 10,000 sheep, the numbers were increased until a maximum of 88,000, including 13,000 April-May lambs, were being fed, and finally ceased 3rd December, when sufficient natural feed was available.

Following a prolific growth of herbage in the winter and spring of 1926, the early summer was dry, and although large quantities of dry herbage remained, sheep did not thrive on it, and toward the end of the year rapidly lost condition. The low nutritive value of the dry herbage was very unusual; this was attributed to fouling by aphis and a species of caterpillar, also to the sudden advent of summer heat while the growth was still sappy and overgrown, which prevented it from coming to maturity and seeding. It was noticed that a great deal of trefoil did not seed, and where the seed did form that it contained no kernel.

Three hundred and twenty-three points of rain in January, 1927, gave temporary relief, but was not followed up, and during the succeeding eight months only 3.36 inches were recorded, and that in small falls of no value. By the end of April most of the country was getting bare and stock commencing to lose condition, so hand-feeding was resorted to in May. The extremely cold winter—the severest for many years—made conditions very hard for stock. Heavy frosts, followed by bleak winds during the day, prevailed for weeks, and stock on the open country got no relief, day or night, and with drought thrown in made it the hardest time in my experience. These introductory remarks may convey to the reader the general conditions prevailing prior to and during the drought.

When to Commence Feeding.

In all cases hand-feeding was resorted to while the stock were in really good condition, and a little natural feed remained, and to this undoubtedly the ultimate success of the operation was due. Commencing with a small ration, the sheep were used to and thoroughly broken in by the time they were altogether dependent on the artificial feed. They retained their condition for many weeks, whereas had they been left until their condition was gone, it would have been almost impossible and prohibitive in cost to build them up again. A good reserve of strength and stamina is necessary, otherwise a heavy loss may occur when rain does come, either from bogging in heavy country or if full-woolled from inability to carry the wet fleece, and this when relief is actually in sight.

Again, in wet weather, except on very favourable country, it may be impossible to feed, owing mainly to difficulty of transport and waste. I cannot emphasise too strongly the vital importance of commencing early while sheep are in good condition. This particularly applies to ewes in lamb, and will be the means of minimising loss in both ewes and lambs.

Selection of Feeding Grounds.

These were chosen close to water, on hard, level ground, free from holes and cracks. The sites were selected with sufficient area to permit of moving to either side as the ground became dusty, and after a spell the wind cleaned the original ground ready for use again.

Method of Distribution.

Motor vehicles were chiefly used to distribute the feed from depots, made at convenient places to serve several paddocks, and which were kept supplied by the heavier lorries carting from the railway. The sheep were quietly mustered to the feeding ground, and the feed trailed in a thin stream from the corner of the bag in a complete circle around them. They were then moved on to the trail, and held for a couple of hours. In some cases a little lucerne hay was used to coax them to take grain—maize being spread about, and on the hay. This procedure was only adhered to until they took to the feed, and then broadcasting was adopted.

The feed was tipped loose in the lorry and mixed, and on arrival at the ground where the sheep were mustered ready, the driver quickly circled round the mob, and then backwards and forwards through the centre, the second man broadcasting with a wide shovel, one throw to the right, the next to the left, giving the shovel a swish to distribute the grain over the greatest possible area, to avoid crowding. Where lucerne hay was used, it was left in the bundle with the bands removed for the sheep to pull at themselves. Opening it up proved too wasteful.

Sheep soon learn to draw to the ground of their own accord, but always the paddocks were ridden, to make certain none were away. Lambing ewes were successfully fed in this way, the only difference being any ewes with green lambs were left alone until they came in themselves. Being broken in beforehand, they were very little trouble, and loss in lambs was very little above normal. A horseman was always at the feeding ground to hold the sheep and prevent them rushing to meet the lorry and from following it away.

It was found necessary to have the sheep at the ground to rest awhile before being fed, otherwise weak sheep were tired and not inclined to fed. To avoid mustering to a central ground, we tried running round the paddocks and feeding wherever they happened to be. This method was an absolute failure and speedily abandoned for the reasons that the sheep knocked themselves about racing after the lorry, and it was impossible to feed them properly and ensure an equal ration.

In some lots the "tail" sheep were drafted off and fed with a heavier ration, which proved successful in levelling them up again. Between 10 a.m. and 2 p.m. proved the best time to feed. Earlier, the sheep, instead of drawing in themselves, had to be driven, and later got restless and inclined to walk off the camp. Flock sheep were fed in lots of from 500 to 2,000, and although one lot of 3,400 was successfully handled, the smaller lots were easier to feed.

Ration per Head.

The daily ration was 2 oz. per head for the first month while they had a little dry feed. It was then increased to 4 oz., at which it remained for from two to three months, sheep doing well on it. As the weather became colder and the country devoid of feed of any sort, it was again increased to 6 oz. Towards the end of the drought a further increase to 8 oz. was made in some lots, but it was noticed that no improvement came with the last increase.

This confirmed a previous experience that there is a limit to the time sheep will thrive on a concentrated ration alone, and must have bulk with it. With paddock roughage or scrub, they will do well, and always provided feeding is commenced in time, will carry on for from eight to ten weeks on the concentrated ration alone, but after this period will cease to thrive. To combat this, in October and November, some lots were given ½ lb. lucerne hay daily, the maize, &c., being cut down to 4 oz., when the improvement was immediate and most marked. The best results were obtained with 4 oz. for the first period, and then 6 oz., and when they ceased to thrive on this, 4 oz. grain and ½ lb. lucerne hay. The feed consisted of half maize and half either Thorpe's Kubettes or Meggitt's Nuts. The commencing ration of 2 oz. is only of benefit with a fair amount of natural feed, but serves to break them in.

Ewes rearing lambs were allowed the same ration, with an addition for the estimated number of lambs in each lot. With ewes in lamb, it is necessary to give hay or bulk as soon as paddock roughage becomes scarce. Stud sheep and flock rams were fed 6 to 8 oz. maize and Thorpe's Kubettes, and ½ lb. to 1 lb. lucerne hay, and did very well, finishing in fine condition.

Value of Fodders Used.

Maize, Thorpe's Kubettes, Meggitt's Nuts, and lucerne hay were used, and with one lot of lambs and some cattle, several stacks of old coarse wheaten hay. Scrub was only available in a few paddocks—box, wilga, and belar were used in these. Maize was used as the foundation feed, and it is undoubtedly the best. It is both sustaining and heating, is easily handled, there is no waste, and when broadcasted, sheep have to search for it, thereby giving the weak sheep and slow feeders a chance to get their ration. The big flat-grained maize, either white or yellow, was found to be fully 33 per cent. of more value than the small, hard, red variety. At one period we had to use several trucks of the latter variety, and the result was immediately noticeable, the sheep cutting up badly.

Thorpe's Kubettes, containing as they do a variety of grain, all of good feed value and a high percentage of proteins, are an excellent fodder, especially when

fed with maize, and were used largely with success. This particularly applied to weaners and young sheep. They take readily to them and do not go "stale" as on maize, and will hang on for a long period. The same applies to Meggitt's Nuts, the oil contents of which are valuable and which perhaps are superior for lambing ewes and during period of gestation. It is a good milk producer and is laxative, the latter quality being noticeable in the moist and soft droppings of the sheep.

The three varieties of scrub were used with maize, &c., but were found to be of low value and hardly warranted the expense of cutting. They certainly were of some help with young sheep, but with aged ewes and ewes in lamb caused mortality, and were discontinued.

Coarse, dry wheaten hay, containing no grain, was fed to one lot of 2,000 lambs. They were taken from their mothers at three months and put in a 10-acre paddock. The hay was fed at first moistened with molasses water, and later they were given access to the stacks. In addition they had the ration of 1 oz. maize and 3 oz. Kubettes. They held their condition for over two months, and until sent away on feed in November. An outbreak of eye blight, commonly known as "Pinkeye," caused a small mortality among them. Seventy cows suckling calves were also fed with this hay well moistened with molasses, being allowed 10 lb. daily, it kept them for three months. The dry cattle eked out a living on belar, which they themselves could reach, and although they lost condition, managed to survive until both lots were sent away in November. Lucerne hay proved excellent fodder for both sheep and cattle, but its value is largely discounted by the high cost of handling, the large percentage of waste, and the impossibility of ensuring an equal ration for each individual.

Water.

Bore water of excellent quality was available in most paddocks. The drains are small and were frequently delved and kept in order so that sheep got a drink of fresh, clean running water without congestion or crowding, and without bogging. With any of the ground tanks in use that commenced to bog, the batters were cleaned with a "Nelyambo" scoop, leaving a clean, hard surface; one cleaning sufficed for from six to eight weeks. Some of the tank water, when low, was inclined to become stale; an improvement was noticed among sheep moved from this to bore water.

Lambing.

Owing to 68 per cent. marking in December, 1926, the autumn drop was light, being 31 per cent., except with 6,000 ewes, not previously joined, which marked 84 per cent. Most of the ewes were fed while lambing, and reared their lambs for about ten weeks and then weaned them. No loss was incurred from marking, but a mortality estimated at 15 per cent. occurred from malnutrition, when the lambs first took to the feed, and for which maize was responsible. When they first take to feed they are inclined to swallow the maize whole. Had we been able to confine their ration to Kubettes this loss would not have occurred, as this feed is readily digested even by very young lambs.

The balance eked out a living on the feed until relief came, and are now growing and doing well. In all, 13,223 lambs were marked in June, and shearing count in October was 9,829, a shortage of 25.66 per cent. Rams were joined in June, and we are now (January) marking a 65 per cent. drop.

Shearing.

This work commenced at Warrana, 1st July, and at Bimble, 25th July, and both sheds cut out 19th August. We were anxious to complete this work early and get the wool off, but, as the season turned out, it was too early, and the exceptional cold caused losses. Feeding was continued at both places during operations, with the only difference that sheep being handled were fed twice daily, and for convenience feed depots were made along the routes to the sheds.

Sheep were yarded in small lots, just sufficient for half-day's shearing, and only ewes and lambs were drafted. Immediately prior to entering the shed they were fed, and straightaway after each run of shorn sheep was counted they were let out and fed and removed to the most sheltered paddock available. On many occasions the sheep shorn during the last run at night were fed and put back under cover for the night, and to gain time for this the clock was put forward thirty minutes. These precautions were successful in avoiding heavy losses which occurred elsewhere off-shears. Only one lot of lambs was shorn at this time, the balance being shorn at the end of October.

Licks.

Salt and molasses were freely used and proved beneficial, molasses being both nutritive and laxative. Vita Lick (drought formula) was also used with good results, although a little difficulty was experienced in getting sheep to take to it. In my opinion, a lot more use could be made of scientifically prepared licks in both good seasons and bad. By this I do not mean any haphazard mixture, but a corrective lick, prepared after an exhaustive analysis of soil, water, and natural fodder in various localities, and this would be welcomed by pastoralists generally.

Losses.

In the drop of autumn lambs, losses already have been dealt with. The extreme cold during August and September was responsible for the greater part of the loss incurred, and sheep even in fat condition cut up badly for some time after being shorn, and continued to do so until the advent of the warmer weather.

The loss "in the wool" was negligible, and all sheep went to the shed in good condition. The heaviest losses occurred in one lot of 20,000 December 1926 drop weaners, and three small lots of aged ewes. The weaners had a check, when dropped, from which they barely recovered, when drought conditions again prevailed. They proved an extremely hard lot to handle, being shy feeders, generally very touchy, and at an awkward and delicate age. The loss in these was 11.22 per cent.

The aged ewes died after being shorn, and again a heavy mortality occurred in November, just before they were due to lamb. Had the value of these ewes justified it, a ration of hay would, I am sure, have saved most of them. The paddocks were absolutely devoid of feed of any sort, and all they got was the concentrated ration, which carried them along until about a month before they were due to lamb, when they ceased to do on it. Their age and value did not warrant any further expense in trying to save them. The loss, finally, in these was 50.55 per cent. In the balance of almost 50,000 sheep, comprising ewes one to 4 years old, and rams, the loss was 5.10 per cent.

Costs.

These are computed at per 1,000 for the calendar month, and include all expenses mentioned:—Cost of fodders used, with rail and road freight; cost of distribution, including running costs of motors, and wages of men looking after paddocks. Deduction of rail rebate on fodder is also taken into account.

The daily ration of 2 oz. maize and 2 oz. Kubettes, £47 4s. 8d., or 2 oz. maize and 2 oz. Meggitt's, £53 18s. 2d. per 1,000.

The later ration of 3 oz. maize and 3 oz. Kubettes, £68 5s. 11d., or 3 oz. maize and 3 oz. Meggitt's, £78 6s. 2d. per 1,000.

The last ration used of 2 oz. maize, 2 oz. Kubettes, and ½ lb. lucerne hay cost £90 15s. 8d. per 1,000.

These figures are taken from the actual cost of handling and feeding one lot of 14,000 sheep, and are as nearly accurate as possible.

Conclusion.

From 15th July to 8th August, 3,770 killable aged ewes were sent to Flemington, in the wool; 6,400 ewes were sold and delivered off shears in August. Following relief rains in other districts, from 10th October to 14th November, 31,770 sheep were trucked to various destinations on agistment. These comprised 14,000 ewes forward in lamb, the balance being young dry sheep. They were given an extra ration of grain and ½ lb. hay before being trucked, and not one death occurred in the trucks, but a small mortality was met with after they reached the feed. The balance remaining was fed until relief came in December.

The experience contained in the foregoing proves it is only possible to feed sheep with success on a highly concentrated feed that is easily and economically transported and handled, and convenient rail facilities must be available. A whole ration of any bulk fodder is prohibitive in cost and wasteful, and owing to the difficulty of quick distribution it will be found impossible to ensure an even ration.

The most important factors toward success are to commence early and conserve the condition on the stock, regular feeding, also measuring all quantities, and constant personal supervision to direct the frequent small changes necessary, and which will, at once, be apparent to the eye of the practical sheep man.

SOME ASPECTS OF STOCK-FEEDING IN AUSTRALIA.

By E. H. GURNEY, A.A.C.I., Senior Analyst, Department of Agriculture and Stock.

Paper read at the Hobart Meeting of the Australasian Association for the Advancement of Science, January, 1928.

THE great areas of grazing land in Australia with their varying soil types, climatic conditions, and plant growth, in conjunction with financial, labour, and market conditions, have influenced the existing methods of stock feeding of this country.

A review of the stock-feeding methods in Australia then would demand that all the foregoing factors be taken into consideration, but this paper only touches upon a few aspects of the matter which, though recording data already known, it is thought, if such were appreciated more generally by the stock feeder, the result would be beneficial, both to the individual and the Commonwealth.

The Importance of Mineral Salts in Stock Food.

It is interesting to mention some statements that have been made in literature concerning the importance of mineral salts in the food of stock.

The following extracts are from "Farm Foods," Emil Wolff (English Edition, 1895):—

"Lack of potash is not a probable contingency, as it always occurs largely in vegetable foods. The addition of lime and phosphoric acid to the diet of milch cows is always worth consideration, but is not often necessary."

Again—

"In feeding young animals the greatest care is necessary with regard to the phosphoric acid and lime in the food supplied. The other mineral constituents, such as potash, magnesia, and iron are always supplied in plenty and need no especial provision."

Wolff, in illustrating rations deficient in lime and phosphoric acid, states—

"The addition of a little chalk to the food in the form of powder or of 'lick-stones' is evidently desirable under such conditions of feeding as the above. Phosphoric acid can be provided artifically in the form of phosphate of lime. Experiment has shown that this latter substance is capable of assimilation by calves and lambs, and it has been found of great benefit to foals.

"The food of young animals reared artificially should always contain two to three times as much lime and phosphoric acid as that actually required by the animals."

In "The Feeding of Animals," W. H. Jordan, 1901, the following occurs:—

"The ash or mineral part of plants or animals occupies a minor place in the discussions which pertain to the principles and problems of animal nutrition. Much is said and written about the carbon compounds of living organisms, but the compounds of the mineral world, in their relation to foods and to the processes of growth, are generally passed with brief comment, much less than would be profitable. It is certainly desirable to gain a clear understanding of the combination, distribution, and functions of these bodies. Their importance as necessary constituents of foods and animals is no less than pertains to the carbon compounds, although their scientific and commercial prominence as related to animal nutrition is much less."

J. Alan Murray, in "The Chemistry of Cattle-feeding and Dairying, 1913," after mentioning the function and value of ash ingredients, states—

"To sum up, it may be said that of the ingredients of the ash some are of vital importance in the economy of both plants and animals. Others, though normally present, are probably not indispensable, but may be of use indirectly. From the point of view of the practical feeder, they are all unimportant inasmuch as they are always present in the natural food of the animals. If the food be sufficient in quantity and suitable in other respects, it will certainly contain enough 'mineral salts' for all ordinary purposes. It is unnecessary, therefore, to add any ash ingredients, except common salt, to the ordinary rations of animals."

The following extracts are from "Feeds and Feeding Abridged," Henry and Morrison, 1926:—

"The common feeding stuff contain all the necessary mineral salts, at least in small amounts. As a rule, the roughages, except some of the straws, are much

richer than the grains in mineral matter. Moreover, the body is probably able to use many of the mineral compounds over and over again, taking them back again into the circulation after having been used. Therefore, for most animals which have finished their growth, the usual rations containing good quality roughage furnish sufficient mineral matter, except common salt. As shown later, it is advisable to supply farm animals common salt in addition to that in their feed. Since large amounts of lime and phosphorus are needed to build the skeleton, these elements may fall short in rations for young animals. Also, as is pointed out later, high-producing dairy cows may sometimes be benefited by a mineral supplement furnishing calcium (lime) and phosphorus, for milk is very rich is these mineral nutrients. Over 90 per cent. of the mineral matter in the skeleton consists of calcium and phosphorus. When the supply of either of these is low in the feed, the skeleton acts as a storehouse, doling out these mineral elements so that the life processes of the body may continue normally for a time. But such withdrawal of mineral matter from the bones makes them porous and brittle. Indeed, in certain localities where the hay and other roughages are unusually low in calcium and phosphorus, due to the poverty of the soil in these elements, the bones of farm animals may become so brittle that they break with surprising ease, &c. Fortunately, roughage from the legumes, such as clover, alfalfa, and cowpea hay, is rich in phosphorus and especially in calcium, &c. When there is danger of a deficiency of either calcium or phosphorus, it is wise to add a supply to the ration. Calcium may be furnished cheaply in ground limestone or wood ashes, and both calcium and phosphorus in ground rock phosphate, ground bone, or bone ash.''

The foregoing extracts denote that the fact that mineral salts in stock foods was essential was recognised, but that in later years the possibility of a shortage of these ingredients in stock foods emphasised, and within the last few years a large amount of investigational work has been conducted in different countries of the world in connection with pastures, and the mineral content of their herbage. Mention of a few only of these researches will be made here.

Experience in Other Countries.

Theiler, Green, and du Toit (1) reported that, owing to the low phosphorus content in soils of a large area of the Union of South Africa, a relationship between phosphorus deficiency of the pastures of these areas and aphosphorosis in cattle was found. Davis (2) points out a connection between low milk supply and low percentage of phosphorus in crops and soils in the Bihar district of India. Armstrong (3) concludes that the best grazing land is always associated with soils rich in available phosphates and that inferior herbage of pasture is generally due either to the soils being deficient in available phosphates or in bad mechanical condition.

In a paper of this length it is impossible to give even a brief summary of the comprehensive work, ''Investigation on the Mineral Contents of Pasture Grass and its Effect on Herbivora,'' by Elliott, Orr, Wood, and collaborators (4), of which five reports are already published, but one or two extracts of these reports are given below.

Elliott and Crichton (5)—''Pasture analyses show that these grave mineral deficiencies do actually occur in large pastoral areas, and that these areas are correlated with high stock death rates. The mineral elements of the ration are therefore no less important to the pastoral farmer than to any other stock feeder.''

Godden (6)—''The percentage of silica-free ash in the 'not eaten' grass from the hill pastures is only approximately 50 per cent. of that in the 'eaten' grass. This deficiency is fairly uniformly distributed over the ash constitutents with the possible exception of sodium.''

Godden (7)—''Analytical data are recorded which indicate that the application of artificial fertilisers to grass land may result in considerable modifications in the mineral content of the herbage of these pastures. The constitutents which appear to show the biggest variations are calcium and potassium and, to a lesser extent, phosphorus. Coupled with any marked increase in the calcium content of the herbage, there is generally to be found an increase in the percentage of nitrogen.''

Australian Pastures.

In connection with stock feeding in Australia it has to be recognised that there are areas of land, both on the coast and inland, that are deficient in phosphates, and also that, by a method of continuous cropping or of grazing without some means

being taken to at least maintain the phosphate content of the soil, these areas are continually being increased. It is not contended that phosphate deficiency is the sole factor in causing the breaking down of what was once good grazing land, but it is thought that such deficiency is a big factor, and at times the determining factor.

In feeding dairy cattle, the system of allowing the stock to graze upon cultivated fodder crops for a certain time and then turning the stock into grazing paddocks is becoming a somewhat usual practice in Queensland, and it is thought in other States also.

The actual determination of the amount of nutrient and mineral obtained by stock feeding in the above-mentioned way becomes a difficult problem, for, the different rates of feeding by the individual animal, and the growth of the grazing areas of both fodder and grass, whether regular or irregular, will have to be taken into consideration. If the stock are herded on a restricted area and the fodder grazed practically to the ground, a fair estimation of the food consumed will be possible. As in the case of feeding weighed rations, the financial aspect has to be considered, so also when the above methed is followed the experience of the stock feeder will be called upon to decide how long to graze his stock upon any particular fodder crop to obtain the most profitable returns.

Variation of Feeding Values—Queensland Experience.

The variation in feeding value of pasturage at different periods of growth has always had some recognition, but within the last few years more detailed determinations have been made of the nutrients existing in pasturage in different stages of growth.

Referring to the protein content of grass at different stages of growth, the following figures are extracted from Annual Report (1914), J. C. Brünnich, Agricultural Chemist, Department of Agriculture, Queensland. The percentage of crude protein is calculated on water-free material, and this figure is extracted from analyses of grass samples collected as representing different stages of growth:—

Paspalum dilatatum (Esk District).

	Crude Protein.
Young, thinly grassed, March, 1914	15.64
Midgrowth, May, 1914 ..	10.80
Mature, March, 1914 ..	6.35
Midgrowth, May, 1914 ..	9.93

Flinders Grass (Cunnamulla District).

	Crude Protein.
Winter, matured, August, 1913	4.52
ditto	3.83
Midgrowth, March, 1914 ..	7.96

Mitchell Grass (Cunnamulla District).

	Crude Protein.
Winter, mature, August, 1913	4.02
Midgrowth, March, 1914	8.76
Winter, mature, August, 1913	3.79
Midgrowth, March, 1914	7.90
Approaching maturity, May, 1914 ..	5.45

Wood, Blunt, and Stewart (8) have made a very comprehensive investigation concerning the nutritive value of pasture under a system of frequent cutting resembling the conditions of close grazing. This investigation shows that when grass is kept short by grazing a high protein percentage is maintained throughout the whole season, and that, compared with grass allowed to grow until suitable for haymaking, although the hay crop yielded much more dry matter per acre, it only yielded about two thirds of the amount of digestible protein obtained in the herbage from the pasture plot. Still further, the fibre of the pasture grass was found to be much more digestible than the fibre of the hay crop, being digestible almost to the same extent as the carbohydrates. The pasture as treated favoured increased clover growth. It should also be mentioned that the soil in which the pasture was grown contained very satisfactory amounts of available phosphate and potash.

In this report it is mentioned that cutting the grass with motor mower and grazing, in certain respects, is not strictly comparable, as the mower is non-selective and animals show tendency to graze certain herbage and leave the rest to grow coarse.

The grass frequently cut as in this investigation was found to have a narrow nutritive ratio, and it is mentioned that if any supplementing is required when grass is fed in this manner, a carbohydrate and not protein concentrate should be used.

It is stated "that the results of the investigations are only applicable to such pastures as are kept short by being grazed to their fullest capacity."

The foregoing illustrations are sufficient to emphasize the fact that the protein content is higher in the younger stages of grass growth.

The Importance of Protein Content of Pastures.

In Australia the fact that young pasturage has higher protein content than that of matured growth has been to some extent recognised. It has been related that a dairy farmer has fenced off his grazing area in order that the herd might graze over one paddock one day per week. The animals under such practice should, according to the illustrations mentioned, obtain more protein than if grazed on more matured grass.

The importance and necessity of a sufficiency of mineral matter in the pastures and crops eaten by animals for their healthy growth has been mentioned, but the protein content of the feed is also of the very greatest importance. The animal requires adequate quantities of the various nutrients and accessories of a feed, but this paper is dealing only with the mineral and protein content of pasturage, and a close connection exists between these substances. Clovers and cultivated legumes are characterised by having a high protein and mineral content, the last containing a high percentage of both phosphorus and calcium, especially of calcium.

Phosphatic and Lime Deficiency in Soils.

As before mentioned, the soils of a large portion of our grazing areas are deficient in phosphates, and also it may be stated in some cases a deficiency in lime occurs. Therefore it naturally follows pastures growing in above-mentioned soils are deficient in legume growth, but where climatic conditions are favourable upon application of phosphatic fertilisers a good growth of clover has resulted.

It is known that by means of bacteria existing in nodules upon their roots the leguminous crops obtain their nitrogen from the air, and it is stated that leguminous growth in pasturage increases the nitrogen content of the other grasses of the pasturage.

Bear (9) writes—"As to whether any associated non-legumes are benefited by nitrogen fixed by the nodule organisms is uncertain. While the content of the nitrogen of the associated non-legume has been shown to be increased, this may be by reason of the favourable effect of the legume on nitrification."

Legumes in Pastures.

In connection with this matter Murray (10), in a paper, "Meadow and Pasture," gives a very interesting explanation of the beneficial results of legume growth in pasturage. In this article it is pointed that in the early stages of growth there is little difference in the nutritive value of the several varieties of grass, but towards maturity the digestibility of the organic matter is modified. Again, it is stated that heavy dressing of soluble nitrogenous fertilisers accelerate the formation of fibre and that phosphatic manures have a contrary effect; and experiments are quoted showing that the nutritive value of hay was depressed by the application of ammonium sulphate and that in other cases by the application of basic slag or superphosphate much more mutton was obtained from the land than where such applications were not made.

Mention is made of the acceptance of the idea that, owing to the accumulation of nitrogen in the soil by growth of clover, pastures were improved; then why should this clover-accumulated nitrogen, which it is believed must be transformed into nitrates before being utilised by other plants, be regarded as more beneficial or less harmful than nitrogen in the form of sulphate of ammonia—which in the above-mentioned experiment was not beneficial?

Murray explains this, writing as follows:—

"The key to the mystery appears to be that in pastures the clovers not only collect nitrogen, but they also regulate the supply. In a previous article (11) the author pointed out that both the quantitative and qualitative results depend not only upon the amounts, but also, to a very large extent, upon the relative proportions in which the various fertilising ingredients are present in the soil. At present only the nitrogen and phosphoric acid need be considered. Now, clovers require more phosphates than the grasses—about twice as much per acre—and any deficiency in this respect tells much more heavily against the former than against the latter, and the growth of clover is restricted. The supply of nitrogen does not

therefore increase beyond the amount of phosphates for which it is suitable. When the amount of available phosphoric acid in the soil is increased by application of phosphatic fertilisers, a marked increase in the amount of clover in the herbage almost invariably follows. The supply of nitrogen, which is necessary for the growth of grasses, is thus increased, but the quality of the fodder is not deteriorated, because the quantity of nitrogen accumulated in this way is never in excess of the amount of phosphate for which it is suitable.''

Queensland Grasses.

From a review of a large number of analyses of Queensland grasses which have been published in the annual reports 1909, 1912, and 1914 of J. C. Brunnich, Agricultural Chemist, the great variation of the crude protein content of these grasses cut at different stages of their growth will be very noticeable. And when stock, through one cause or another, have nothing practically to eat but the matured low protein-content grass, which at this stage will also have a very low digestion coefficient, it will follow that through protein deficiency the growth and constitution of the stock will be seriously affected.

Brunnich (12) reports protein starvation as being one of the causes of death of sheep feeding upon Mitchell grass hay containing 2.01 per cent. crude protein.

Factors Requiring Urgent Consideration.

Judging then from what has been already stated in this paper and referring to stock feeding in Queensland, it would appear that mineral (phosphorus and calcium) and protein deficiency are two factors that require urgent consideration..

In the case of those stock feeders whose grazing areas are climatically suitable for a more or less continuous clover growth, the application of phosphatic fertilisers to the pasture would remedy both deficiencies.

Even when late and irregular rainfall causes a spasmodic clover growth, the nitrogen accumulated by this growth would, according to reference (10), be utilised by the non-leguminous growth. And where top dressing with phosphatic fertilisers of only restricted grazing area is considered profitable, any further requirement of mineral matter or protein must be supplied by phosphatic licks and feed stuffs with high protein content.

The unique position of clovers in the leguminous growth of pasturage is recognised, and so far they only have been mentioned, but in the greater porportion of the grazing areas of Queensland the climatic conditions are unsuitable for clover growth. It is thought therefore that there is a very large amount of investigational work to be done in connection with discovering, if possible, leguminous herbage, indigenous or imported, most suitable for the pasturage of each particular district. As before stated, the ash analyses of the legumes show that these plants require a plentiful supply of phosphorus and calcium for their growth, and it is not inferred that any legume is likely to be discovered that is exceptional in regard to the above-mentioned requirements.

As with other plants, the different legumes have root systems ranging from shallow to deep-rooted, and with the deep-rooted varieties, the roots having contact with a larger soil area, the possibility occurs of their being able to obtain more plant food than shallow-rooted varieties, and also of being more suitable to droughty conditions.

Central and Western Queensland Grazing Areas—Soil Analysis.

From analyses made in the Queensland Agricultural Chemical Laboratory of soils from the Central and Western grazing areas, it is seen that there is very marked deficiency in phosphorus combined with, as a general rule, good calcium and potash content. It is thought then one important factor causing the very high mortality in lambing, which has become more apparent in latter years, in certain grazing areas is the gradual depletion of available phosphates in the soils of these areas; the constitution of the ewes being weakened by an insufficient amount of mineral matter and protein in their feed.

The principal grass of the pasturage, owing to insufficient phosphorus, grows to maturity rapidly, and is therefore liable to contain a relatively low amount of digestible nutrients, as illustrated in (10).

Also, owing to the want of any soil plant food there is the probability of change in the botanical composition of the edible herbs and shrubs of a pasturage occurring, resulting in a less nutritive growth becoming established.

The Value of Suitable Stock Licks.

With stock grazing on such country the use of phosphatic licks, together with top dressing with phosphatic fertilisers (effecting an increased legume growth), at least some paddocks to be used for sick and stud stock, will undoubtedly improve the constitution of the stock, and lower the high mortality.

The gradual exhaustion of the soil phosphates may have caused the lowering of the legume content of the herbage, and when consideration is given to the fact that stock show instinctive preference in grazing legume growth, it is possible for such growth to have been entirely depleted, and in such cases, even with top dressing, it is thought quicker and more profitable results would be obtained by planting suitable legumes in the herbage.

In Queensland some stockowners have followed the recommendation of the Agricultural Chemist, J. C. Brunnich, and have supplied their stock with a lick composed mainly of Nauru phosphate with salt, and reports have been received stating the very beneficial results obtained by using such licks.

That recognition of the value of phosphatic licks is taking place is evidenced by the statement of one Brisbane firm that within the last fifteen months 460 tons of Nauru phosphate have been sold to stockowners for purposes of stock lick; also, prepared phosphatic licks are now upon the market.

It is to be hoped the demand for Nauru phosphate rock, both for fertiliser and lick purposes, will ultimately be large enough to allow the landing and grinding of this rock to be a commercial undertaking in Queensland, thus allowing the ground rock to be sold at a lower price.

Conclusion.

This paper has been concerned with only phosphate and protein deficiency in stock feed; that deficiency in other constituents of feed may cause serious trouble is recognised.

The very comprehensive programme of investigational work upon the subject of Animal Nutrition in the Commonwealth, as outlined by Professor T. Brailsford Robertson in "The Journal for Scientific and Industrial Research," vol. I., No. I., will yield, in its accomplishment, information of the greatest importance both to the investigator in animal nutrition and the stock feeder.

(1) Theiler, Green, and du Toit, J. Dep. Agric., S. Africa, May, 1924.
(2) Davis, Agric. J. of India, 22-77.
(3) Armstrong, J. Agric. Sci., 7-283.
(4) J. Agri. Sci., 16, Part 1.
(5) Elliot and Crichton, J. Agric. Sci., 16-65.
(6) Godden, J. Agric. Sci., 16-78.
(7) Godden, J. Agric. Sci., 16-98.
(8) Woodman, Blunt, and Stewart, J. Agric. Sci., 16-205 and 17-209.
(9) Bear, Soil Management, 1924.
(10) Murray, "Fertilisers and Feeding Stuffs Journal," vol. xi., 1926, p. 85.
(11) Murray. "Fertilisers and Feeding Stuffs Journal, vol. ix., No. 21.
(12) Brunnich, "Queensland Agric. Journal," March, 1926.

"A MOST USEFUL JOURNAL."

A Gympie farmer writes—

"It gives me great pleasure to renew my subscription to a most useful Journal. No farmer should be without it. During the year I have recommended it to some of my neighbours, who did not even know such Journal was in existence. In one instance I was given a subscription to send at once for it. This farmer is very pleased with it, the only thing he is sorry about is that he had not heard of it before. Wishing the Journal that success which it deserves."

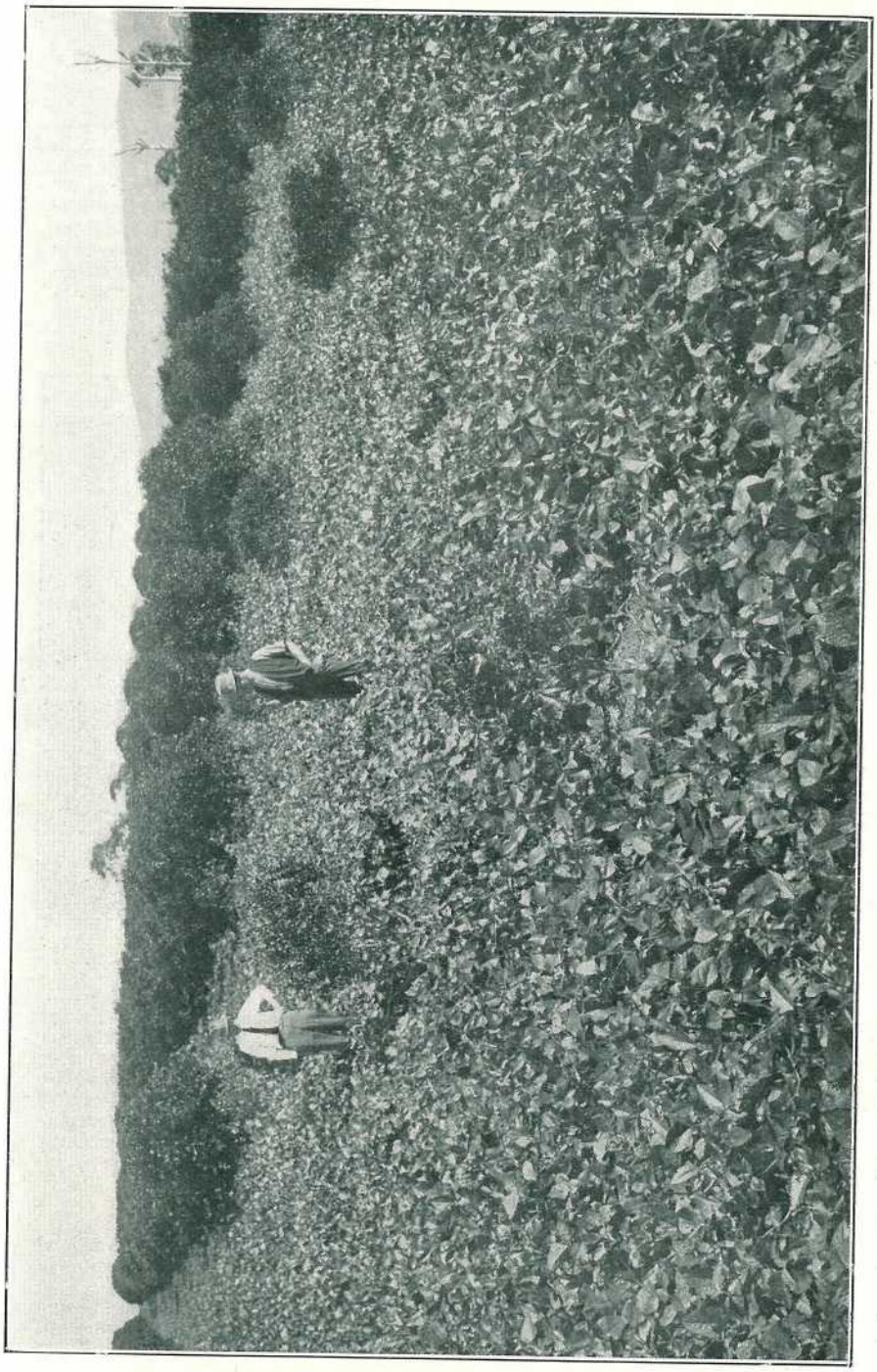


PLATE 7.—A GREEN MANURING CROP (COWPEA) AT PALMWOODS.

THE PRINCIPLES OF BEE-KEEPING.

FEEDING AND BREEDING FOR SPECIAL PURPOSES.

By RUPERT HOLMES, Poultry and Bee Instructor, Queensland Agricultural College, Gatton.

It is important that the beginner should clearly understand the principles underlying successful bee-keeping. A colony of bees consists of fertile queen, a large number of worker bees, and during summer a certain proportion of drones (males), together with their combs and brood. The strength of a healthy colony depends on the vigour and laying power of the queen, who is at her best in her second season. A queen hatched in October 1924, will be at her best in September 1925. She should be replaced by a young one in 1926 by requeening. Queens may either be purchased, or be raised by different methods, which will be described later. The economy of a hive depends on (1) the generation of sufficient warmth in the brood nest (by means of the heat from the bodies of the clustering bees) to such a point as will stimulate the production of eggs and enable the young

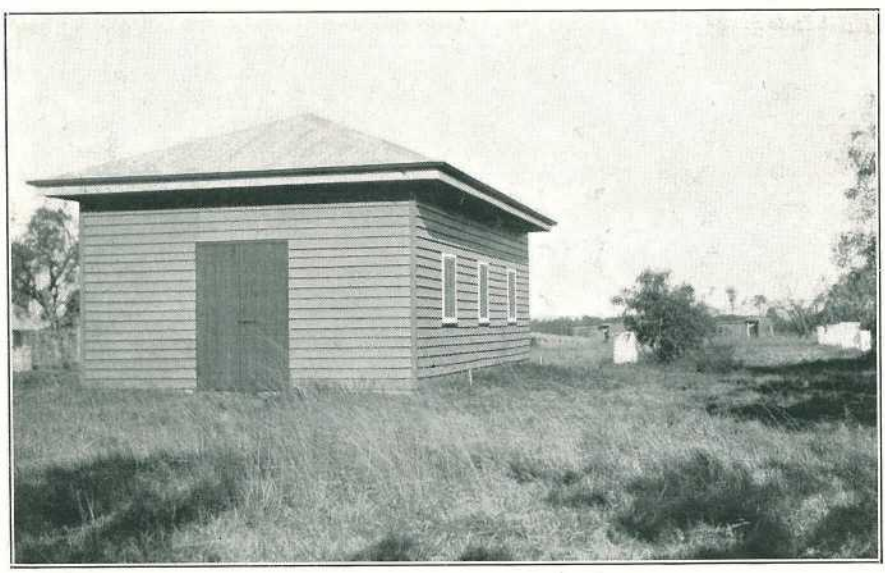


PLATE 8.—HONEY HOUSE, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

bees to be reared; (2) the nursing of the larvæ and the cleansing of the cells for the queen to lay in; (3) the collection of the pollen, water, and nectar for food; (4) the building of storage comb; and the collection of nectar for future supplies of honey. The first three of these conditions must be fulfilled before the last can begin; it is, therefore, only by means of a large and vigorous surplus population that a colony can gather enough stores for its future use, and provide surplus honey for the bee-keeper. The aim of the bee-keeper is to keep his colonies strong; weak colonies are always unprofitable.

Colonies for Wintering.

Many bee-keepers make the mistake of attempting to winter colonies by artificial increase. Colonies that for various reasons have become reduced in numbers are in such a weak condition that they often do not survive the cold weather, or the long confinement in the hive during the winter. In order to avoid failure increase should be made early in the season so that by the end of February at least four combs are filled with brood and well covered by bees. The colonies must then be built up during March and April until they are sufficiently strong to winter successfully. Colonies covering less than four combs at the end of February should be united to form stronger ones. After selecting two or more weak colonies for union move

them gradually together. Allow them to remain two days in this position and then in the evening of the second day unite them in one hive.

This is carried out as follows:—First remove all combs in each colony which are not covered with bees. Then, after selecting and caging the better queen in the permanent hive remove the other queen or queens. The bee-covered combs are placed in this permanent hive. The empty hive or hives are then removed. The operation is completed by releasing the caged queen forty-eight hours after the colonies have been united. The process of building up is carried out by gradual addition of frames fitted with full sheets of foundation and in this way the strength of the colonies increases.

Feeding to Increase Brood Rearing.

In most districts few nectar yielding flowers are in bloom after March onward, and only a small quantity of natural food can, therefore, be collected by the bees. It is most necessary, therefore, in such districts, to supplement the natural food supply by feeding with syrup. This syrup must always be fed at this time of the year through a slow feeder, giving just sufficient for the purpose, otherwise, if a rapid feeder is used, the bees will store the surplus syrup in the cells. Syrup for feeding can be made from ordinary white cane sugar by dissolving each pound of sugar in half a pint of water by heating over the fire, in order to prevent robbing the entrance to the hives must not be wider than ¼ in. during the whole of the time feeding is taking place, and the syrup, which should be warmed, must be given late in the evening.

Feeding Candy.

If it is doubtful whether the supply of food contained in the combs is sufficient to carry the bees through to the following spring then feed candy. A cake of candy should be placed over the brood nest, and the candy supply should be renewed from time to time if required. Candy can be prepared as follows:—In a clean pan there should be placed three pounds of white sugar, half a pint of water, and as much cream of tartar as can be heaped on a sixpenny piece. The pan should be stood beside the fire, stirred occasionally until the sugar is dissolved, and then placed on the fire and stirred continually. When it has been boiling two minutes the pan should be removed and placed in cold water, until the sugar begins to cloud. The mixture should then be stirred well, and poured into saucers lined with paper and allowed to cool.

Pollen Substitutes.

This naturally brings us to a consideration of pollen shortages. Honey is the heat and energy forming portion of the bee's diet, and if in the protein foodstuff pollen is missing or deficient, the young larvæ must suffer. Pollen under analysis contains ingredients similar to pea-flour. Bees, when pushed, will accept a number of substances such as flour (wheaten or rye) or oatmeal. A good plan is to place a number of flat trays containing flour about the apiary. The bees carry the flour to the hive. I have had success by mixing pea-meal with a pinch of salt, and working it into a thick paste with honey. The paste is plastered on to an empty comb, giving it directly to the brood nest. Most hives in winter have no brood or eggs, and this is to be preferred when no natural pollen is available in the late autumn.

Taking a normal season on early spring about the end of August, all colonies should be overhauled to see they are not short of food. Food in this case means honey and pollen. If there is a shortage I would suggest the pea-meal mixture with honey and salt worked into a stiff batter with 5 per cent. white of egg. Take a table knife and press the batter into an empty comb, which should then be given to the bees, on the outside of the brood nest.

A CREDITABLE PUBLICATION.

Thus a Kilcoy farmer—

"I enclose herewith a postal note for 3s., being subscription for another three years to your fine Journal. As a publication it is a credit to the Editor and staff, the Department of Agriculture, and the State of Queensland. Wishing the Agricultural Journal the continued success it deserves."

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, 1928 IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY 1928 AND 1927 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1928.	May, 1927.		May.	No. of Years' Records.	May, 1928.	May, 1927.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	1·98	26	1·03	0·84	Nambour	5·02	31	2·97	0·06
Cairns	4·49	45	2·38	1·10	Nanango	1·55	45	0·94	0
Cardwell	3·57	55	1·74	0·26	Rockhampton ...	1·50	40	0·11	0·09
Cooktown	2·98	51	0·62	0·45	Woodford ...	2·95	40	2·57	0
Herberton	1·64	40	0·54	0·58					
Ingham	3·42	34	1·17	1·58	*Darling Downs.*				
Innisfail	12·34	46	9·07	9·82					
Mossman	3·69	14	1·37	1·12	Dalby	1·34	57	0·88	0
Townsville	1·33	56	0	0·03	Emu Vale ...	1·17	31	0·64	0
					Jimbour	1·23	39	1·43	0
Central Coast.					Miles	1·55	42	0·74	0
					Stanthorpe ...	1·91	54	1·38	0·14
Ayr	1·13	40	0	0·03	Toowoomba ...	2·22	55	1·79	0·08
Bowen	1·30	56	0·06	0·11	Warwick	1·57	62	0·95	0
Charters Towers ...	0·78	45	0	0					
Mackay	3·81	56	2·43	0·59					
Proserpine	4·63	24	1·23	0·48					
St. Lawrence ...	1·80	56	0·19	0·08	*Maranoa.*				
					Roma	1·48	53	0·40	0·06
South Coast.									
Biggenden	1·82	28	1·71	0·13					
Bundaberg	2·76	44	0·86	0·18	*State Farms, &c.*				
Brisbane	2·80	77	1·82	0·02					
Caboolture	2·92	40	1·67	0	Bungeworgorai ...	0·59	12	0·42	0·04
Childers	2·25	32	0·98	0·10	Gatton College ...	1·70	27	1·36	0·03
Crohamhurst ...	4·92	35	4·12	0·12	Gindie	0·99	27	0	0
Esk	2·03	40	2·19	0·02	Hermitage ...	1·26	20	0·65	0
Gayndah	1·57	56	0·09	0	Kairi	1·99	12	1·52	...
Gympie	2·96	57	2·14	0·16	Sugar Experiment Station, Mackay	3·44	29	2·03	1·13
Kilkivan	1·89	48	0·82	0·11					
Maryborough ...	3·18	55	1·16	0·12	Warren	0·95	12	...	0

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

SHEEP IN THE WHEATGROWING PROGRAMME.

The value of fallowing is now recognised by all capable farmers. Fallowing, however, can only give the best returns when combined with sheep, and it actually provides the opportunity for keeping sheep. Where fallowing is not practised the straw is burnt off, and the land is ploughed for the succeeding crop; but under a fallowing system it is not necessary to burn the straw, for the stubble can be grazed with sheep six or seven months after harvest. A great deal of the straw is eaten and the balance is broken and trampled into the ground, and is generally put into such a state that it can be ploughed under easily without the texture of the land being interfered with.

In the old world great value is attached to farmyard manure, the basis of which is straw. It is not yet possible, in this country of high labour costs, to adopt reaping and threshing and the production of farmyard manure for the maintenance of soil fertility. The grazing of sheep on the straw and the ploughing under of the residues, however, is a very fair substitute, and has the advantage, which appeals to all of us, of being applicable at no outlay for labour. If, however, the crop is infected with disease such as flag smut, foot rot, or take-all, then the wisest plan is to burn the stubble early, cultivate the land, and sow an early crop of oats to provide feed.

A very undesirable feature of farming in our wheat districts is its one-crop nature. Such a system tends to deplete the fertility of the land and to encourage weeds and diseases. Some of these—wild oats among the weeds and take-all among the diseases—levy heavy toll upon our crops, and the only practicable method of dealing with them is by rotation. In practically all the wheat districts wheat is the only saleable crop which can be raised; but oats, barley, Sudan grass, and others can be grown as fodder crops and can be turned to account by means of sheep. By the use, therefore, of sheep, we can apply one of the great principles of good farming—rotation of crops.—"A. & P." Notes, N.S.W., Dept. Ag.

PLATE 9.—CUTTING AND CARTING GREENSTUFF TO PIGS

This may be even a better proposition than grazing during very moist seasons when the ground is soft. There are occasions, too, when it pays better to cut and cart lucerne than to allow pigs to graze on the crop. This farmer is gathering the daily supply for his brood sows and young stock.

PIG FARMERS' SCHOOL AT GATTON.

A Comprehensive Programme.

Queensland's first pig farmers' school was held at the Queensland Agricultural High School and College at Gatton during the middle weeks of June. The school revealed a new phase of usefulness of the College and its excellent service to the rural industries of the State. It was the outcome of a suggestion by Mr. E. J. Shelton, Instructor in Pig Raising of the Department of Agriculture and Stock, and is the first school which has resulted from a full co-ordination between that branch of the service and the Department of Public Instruction. Professor J. K. Murray, Principal of the College, who also holds the Chair of Agriculture at the Queensland University, and Mr. Shelton organised the course on lines similar to the successful annual tractor and dairy schools conducted at the College. Lectures and practical demonstrations were given daily by members of the College staff and instructors of the Agricultural Department.

Farmers and farmers' sons from the South Coast, Darling Downs, and from the North beyond Mackay made up the personnel of the school. The enrolment was not quite as large as expected, but in the circumstances this was rather an advantage, for while the College is in ordinary session accommodation is limited. As it was class-rooms had to be turned into temporary dormitories.

A Practical Programme.

Each forenoon was devoted to lectures for which there were three daily sessions, commencing at 8 a.m. The afternoons were taken up with practical demonstrations in the piggeries. Prior to the regular evening session a question period, from 7 p.m. to 7.45 p.m., was fixed. Inquiries into all phases of farm work were invited, and these were answered by the instructors. For the night gatherings a course of special lectures on general subjects was provided. During the currency of the school special visits to the bacon factories at Oxley (Foggitt, Jones, Limited) and Murarrie (Queensland Co-operative Bacon Company) were arranged, and this proved one of the most important and instructive features of the school. Every assistance and sympathy was forthcoming from the managements of the several bacon factories, from which samples of excellent foodstuffs were supplied to the school without charge. The benefit of bringing the farmers into closer contact with the factories and impressing them with their requirements, so that the work of developing the industry might be co-ordinated and continuous from breeding to ultimate market disposal of the product, was appreciated by all.

Visits to some of the larger piggeries near Brisbane were also arranged.

The Lecture Syllabus.

Lectures listed as follow were delivered in the course of the school:—

Breeding, Feeding, and the Characteristics of the several families of Pigs: Mr. E. J. Shelton.

Principles of Feeding and Microbiology: Professor J. K. Murray.

Animal Husbandry: Mr. A. J. McKenzie.

Fodder Crops for Pigs: Professor J. K. Murray and Messrs. A. J. McKenzie and T. Graham.

Marketing Methods and Problems: Mr. J. A. Heading, Chairman of Directors, Queensland Co-operative Bacon Factory.

Pig Hygiene: Mr. H. G. Cheeseman, Department of Agriculture and Stock.

Pure Breeders' Societies: Mr. J. H. Whittaker, President of the Pure Breeders' Society.

Pig Club Organisation: Mr. A. G. Aitchison, Department of Public Instruction.

The Pig Industry: Mr. R. S. Maynard, Editor "Live Stock Bulletin."

Biology: Professor E. J. Goddard, Dean of Faculty of Agriculture, Queensland University.

Agricultural Education: Professor J. K. Murray.

The Value of Publicity to the Pig Industry: Mr. J. F. F. Reid, Editor of Publications, Department of Agriculture and Stock.

Overseas Experiences in the Bacon Trade: Mr. G. Setch.

Bacteriology: Mr. C. Pound, Government Bacteriologist.

Commercial Pig Farming: Messrs. R. G. Watson and C. H. Jamieson, and Staff Captain Alexander, of the Salvation Army Boys' Home, Riverview.

Show Preparation of Pigs: Mr. Howies, Royal National Agricultural Society.

Lectures on General Subjects: Mr. E. J. Dunlop, Department of Public Instruction.

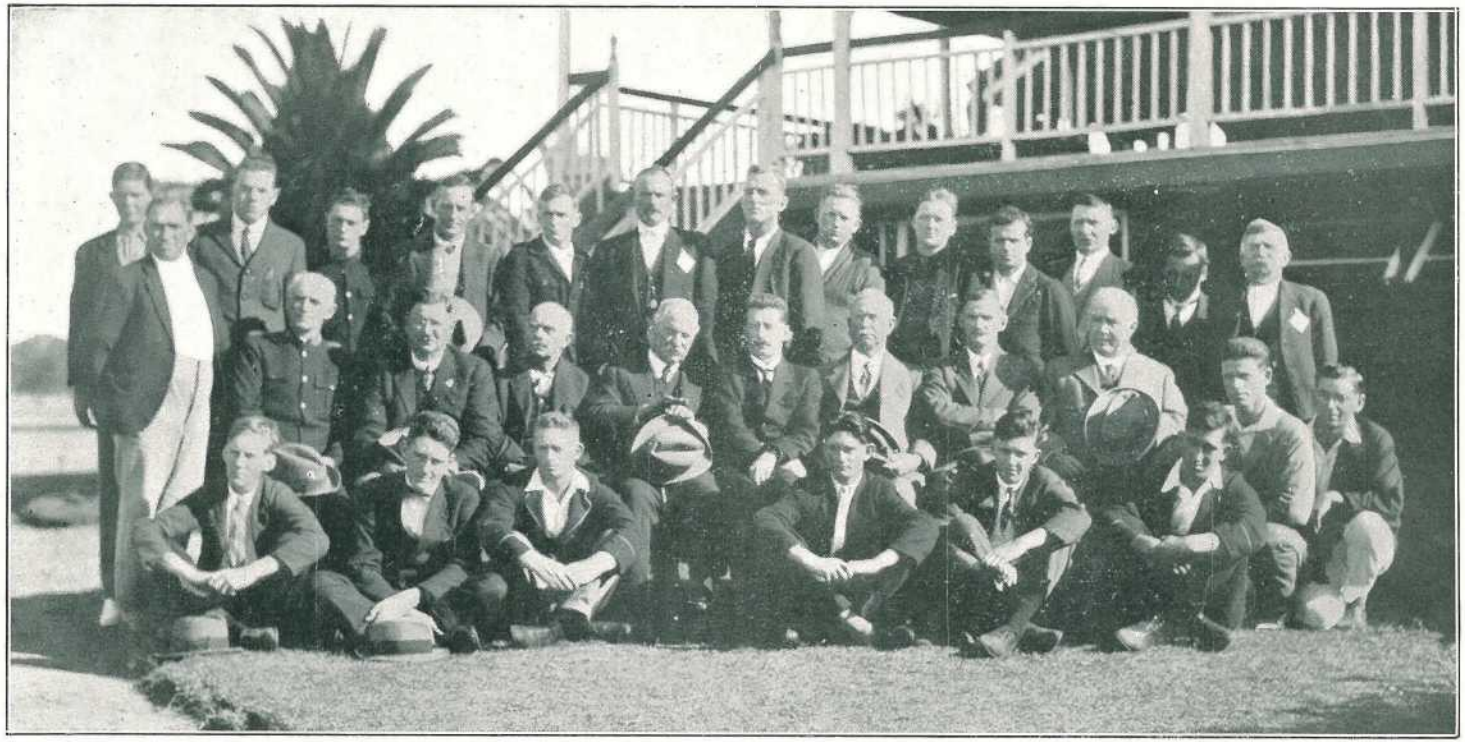


PLATE 10.—FARMERS' PIG SCHOOL AT THE QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, GATTON, JUNE, 1928.

FRONT ROW—*Left to Right*—Geo. Handley (Murphy's Creek), A "Riverview" Student, R. Johnston (Kingaroy), L. Skerman (Brisbane), Douglas Wells (Kureelpa), Noel Harding (Flaxton), Duncan Stevens (College), W. P. Hamon (College).

SECOND ROW—H. West (North Tambourine), Staff Captain Alexander ("Riverview"), H. J. McKenzie (College), Instructor Animal Husbandry, W. E. Muspratt (Littlemore, Boyne Valley), Ernest Baynes (Royal National), Professor J. K. Murray, J. P. Bottomley (Treasurer, Royal National), E. J. Shelton, J. Bain (Secretary, Royal National).

BACK ROW—C. Dunstan (Mount Sampson), L. A. Downey (Assistant Instructor), Captain Hunter ("Riverview"), P. N. Campbell (Lamington), H. Curtis (North Tambourine), Alf. Hanson (Jinghi Gully, Jandowae), M. Brosnan (Clifton), J. Stephens (Withcott, Toowoomba), T. Stephens (Withcott, Toowoomba), G. Hudson (Mackay), J. Schneider (Boonah), S. Whittaker (Casino, N.S.W.), W. Puschmann (Jandowae).

Field Demonstrations.

Practical field demonstrations in every phase of animal husbandry relating to pig raising were an important daily activity of the school, and in these the Principal, Professor Murray, Messrs. Shelton and McKenzie were assisted by Messrs. A. Severns and H. Noble of the College staff. The senior students of the College also attended all lectures and demonstrations.

The farmers attending the school elected a committee to assist in its management, consisting of Messrs. W. E. Muspratt, Boyne Valley (Chairman); M. J. Brosnan, Clifton; and A. A. Hanson, Jandowae. The spirit and camaraderie of the school was excellent, and speaking in appreciation of the course Mr. Muspratt said: "Most farmers are like us—they have pigs because they have cows, and they are working in the dark as far as the pigs are concerned. We want to know how to get something which will give us the quickest return and give what the bacon factories want, to get in the £ s. d. for our pigs. We consider ourselves very lucky to be able to get the chance this school gives us to learn what we need to know."

The school was run very inexpensively for the students. The total cost of board and tuition for the two weeks, exclusive of fares and the cost of the factory trips, was £2 13s. 6d.

CARE AND HANDLING OF PIGS.

A special notice, as set out hereunder, has been issued to pig farmers, carriers, loading agents, and officials:—

Queensland bacon-curers affirm that the pig farmers of this State suffer loss to the extent of thousands of pounds sterling annually through careless handling of live pigs in transit to market. This is the result of excessive bruising and damage, deaths in transit, &c.

Your attention is specially drawn to the following general recommendations:—

Remember that the great demand now is for prime light to medium weight fleshy bacon pigs.

See that your pigs are properly fed and "topped up" on grain food for several weeks before marketing.

Give your pigs ample exercise during the growing and "topping up" stages. Do not keep your pigs closely confined in small sties, as this is conducive to overfatness and to soft, flabby fat.

Allow your pigs clean drinking water at all times, and provide shade and protection from the effects of the weather.

Be careful to market at correct weight; you should weigh your pigs regularly and accustom them to being handled and driven. Ask your factory for their current schedule of weights and prices.

Avoid beating the pigs with whips, rods, or sticks; every time you strike them you inflict a bruise which reduces the animals' value.

Do not feed your pigs on the morning of despatch (they travel better on an empty stomach), but provide plenty of clean water.

Co-operate with your neighbours in arranging assistance at sale and trucking time.

Firebrand your pigs with your registered firebrand. Ear marks and ear tags have not proved satisfactory; the factories prefer firebranding.

Be certain that the factory receives early advice *re* your consignment, the numbers, grade, brand, mark, and time and date loaded. Hand a written statement to the buyer or official loading agent.

Co-operate with the Railway Department and the factories in their endeavours to deliver your pigs at destination in the best condition possible.

Use purebred boars only and sows of the best breeding you can obtain in producing your pigs, and buy store pigs only from reliable sources.

Help us to help you succeed in the industry.

Write to the Department of Agriculture and Stock, Brisbane, for all available information on the subject of pig-raising.

Issued under the authority of the Department of Agriculture and Stock, Brisbane, Queensland, 1928.

PIG HYGIENE.

By H. G. CHEESEMAN, Senior Slaughtering Inspector.

From a paper read before the Pig Raisers' School at the Queensland Agricultural College, Gatton, on 15th June, 1928.

I might state that when my esteemed and enthusiastic friend, Mr. Shelton, invited me to assist in filling part of this programme by reading a paper before you, I really accepted the invitation reluctantly, realising that I had nothing very new or valuable to impart. Therefore, permit me to say if I can cause someone to reflect and put into practice the things which we already know, my effort will not be in vain.

Close association with meat inspection and piggeries for the past thirty years enables me to speak with some knowledge of the life and habit of the short-lived pig from its birth to its appearance on the table in various food forms. As we have all been taught, the pig belongs to the order mammalia, species pachydermata, or otherwise thick-skinned animal. Briefly, the generic characters of the domesticated animal are small head, ears short, thin, and sharp, neck full and broad, cheek full, flexible and short snout flattened in front, small and quick eyes, mouth small, strongly built body, uniform in line carrying a wealth of condition, short twisted tail well set, four toed, short legged, and full ham.

The wild pig has different characteristics, namely, long legs, long neck and snout, long narrow roach back, thin hams, carcass generally spare of flesh, eats ravenously, and develops big belly and lives on carrion offal.

According to design and nature the dentition of the pig varies considerably; at nine months he shows 40 teeth, and at eighteen months a full mouth of 44. In order, the teeth are divided into incisors or nippers, canine or eye-teeth, molars or grinders. Therefore, from the number and position of the teeth, physiologists are enabled to define their nature and functions, as they are always intimately related to the food and habit of the animal. They form, for the same reason, important guides to the naturalist in classification of animals. Thus the domestic pig can be classed as much a grinder as a biter, for he can as well live on vegetable as animal food, although a mixture of both is economically sound, which has been decided as the most natural.

From this description the pig may be regarded as a link between the herbivorous and carnivorous tribe, and is consequently known as an omnivorous quadruped; or, in other words, an animal capable of converting any kind of foodstuff into nutriment.

Characteristics of the Pig.

Physiologists and naturalists are all agreed that the functional characteristics of the pig are the same in whatever part of the world he may be found—he is known for his gluttony and indifference to the character and quality of his food. Occasionally he shows an epicure's relish for a succulent root, pumpkin, or other vegetable. He will the next moment turn with equal gusto to some unsavory offal, sour swill, or even liquid and stagnant filth from wallow holes in and about his lair, or in other words, will endeavour to convert any kind of aliment, good or bad, into supposed nutriment. Hence, from his coarse and repulsive mode of feeding, slothful habits, laziness and indulgence in sleep, he has gained for himself the unenviable name of being an unclean animal. The question arises "why?" Well, the answer is simply because the unfortunate animal is the victim of circumstances, brought about by the indifference of his keeper. Consequently, it is only reasonable to suppose that under such influence he is particularly susceptible to disease, saying nothing of other ailments of a dietetic nature, and which set up derangement of the alimentary canal.

Now, as filth defiles physically the characteristics of the flesh or meat, it behoves those whose livelihood it is to depend upon pig-raising to consider the seriousness of violating the law of nature, for it rests with man to counteract the evil consequences of some of his habits which the animal is unable to teach himself.

It is a remarkable fact that, though everyone who keeps a pig knows how prone he is to disease or other ailment which injures the quality and wholesomeness of the meat or flesh, yet very few have judgment to act on what they see and provide against it by strict attention to his diet, housing, and general welfare.

By strict attention to diet particularly is meant the thorough cooking or sterilising of all flesh food such as offals from slaughter-houses, skimmed and separated milk from dairies, butter and cheese factories, scraps of cooked animal substances, and boiled vegetables, bread and other aliment cast from banquets and possibly plates of sick and ailing individuals. The lastmentioned is most necessary and the old adage "Prevention is better than cure" always stands good, for it is known, for instance, that the pig is most susceptible to tuberculosis. We also know that there are many individuals in our midst suffering from that dread disease, and experimentalists have shown the possibility of infection from human beings. In nearly every case the pig is infected by ingestion, thus it will be seen how easily he might become infected if care is not exercised in the systematic selection and proper boiling of all foodstuff.

Tuberculosis in Pigs.

It is quite common knowledge that tuberculosis in the pig develops rapidly without showing any external symptoms. The disease can only be definitely detected upon slaughter. Anyway the disease is always the same from whatever cause. Though subject to disease, no domestic animal is more easily kept in health, cleanliness, and comfort. By comfort is meant that his sleeping quarters should be perfectly dry and well sheltered from all changes of the weather. He should have a nice cosy bed to burrow in; moreover, under cover in his sty, there should always be a trough full of clean drinking water. The trough should be so arranged as to prevent the animal from immersing his body or standing in it, or otherwise fouling it. Clean water is most essential to a pig, saying nothing of a shovelful or two of charcoal, some lime, brimstone, Epsom salts or other medicinal agent, which are necessary to correct physical disorders caused by his artificial existence.

The Pig's Economic Value.

As you all must know, habit blunts the sensibilities of most of us; and men are not naturally cruel. Still, I am a believer that there are some among us who never realise the fact that the brute beast can be made to suffer quite unnecessarily. What would happen if a pig had a voice to tell its sufferings and needs? I am afraid that many of us could not listen without feeling a twinge of conscience.

There is no domestic animal so profitable or so useful to mankind as the pig. Its value per pound exceeds that of all other flesh-giving animals.

Meat Inspection.

Meat inspection is of great national importance to a meat-eating community such as we are in Australia, especially as our daily bill-of-fare is made up largely from the flesh of the ox, sheep, or pig. Therefore, it is only reasonable to expect that the great mass of consumers—the general public, for they are the most interested in the matter—should have some sort of guarantee that the flesh they do eat is perfectly free from disease.

Meat eating people throughout the whole world recognise the necessity and importance of inspection of their meat and other food products.

Diseases of the Pig.

Tuberculosis is commonly spoken of as "T.B.," technically it means "Tubercle Bacilli." We are told that tuberculosis is a specific bacterial disease, and above all the most widely distributed of all contagious diseases, saying nothing of its being the most universally dangerous and deadly to man and animal. Of the latter, swine, according to statistics, are first among its victims.

Speaking generally, I have endeavoured to show how easily a pig might become tuberculous when fed on material rich in tubercle bacilli. Apart from such mechanism of infection, a tuberculous sow may infect all its young when its teats are contaminated or otherwise infiltrated by tuberculous deposits. We are also told that infection by the respiratory tract is certainly possible, but rare owing to the

fact that affected animals are usually slaughtered before the softening of the pulmonary lesions have time to disseminate the virulent matter.

The disease can only be definitely detected upon slaughter, that being so, the inspector has no difficulty in locating the presence of the disease, that is, as far as the naked eye is concerned.

More often the glands of the head are affected than the body, which accounts for the greater number condemned. Times out of number the question is raised, "Why condemn the head and not the body?" It may be explained this way. The pig mainly breathes through his mouth where straying germs of disease gain an entrance which are absorbed by the delicate membranes of the mouth, tongue, and tonsils, resulting in the fact that the glands draining the part act as fortresses against further invasion of the body. It then only remains a matter of time when they may be overcome by the enemy, thus the barrier being broken down the germ has a clear passage along the ducts into the next lymphatic vessels. It therefore will be understood that if only a speck of disease is found elsewhere in the carcass, it involves seizure of the whole body.

Often a recommendation of the Royal Commission on Tuberculosis in 1898 is cited, which reads: "In view of the greater tendency to generalisation of tuberculosis in the pig, we consider that the presence of tubercular deposits in any degree should involve seizure of the whole carcass and of organs."

This rule, of course, is not carried out in the case where the head is only affected.

Another feature of the disease, from an inspection point of view, lies in the fact that it is seldom met with in the flesh or bones of the pig, mainly confining itself to the lymphatics and delicate linings of the chest and abdominal cavity and organs. The glands, or kernels as they are commonly called, play an important part in meat inspection. It is from them the inspector gets the first indication of the presence of disease. The normal condition and colour of a gland is moderately small, somewhat firm, and on cutting exudes moisture (lymph) the colour of—in fact it resembles—common yellow soap.

The most accessible glands are the sub-maxillary and cervicals of the head and neck, dorsal (back), renal (loin), inguinal or mammeny, and the iliac. Of the visceral glandular organs lungs, liver, and mesentery, &c., are all more or less subject to disease.

With regard to condemnation for parasitical infestations, very rarely is a pig totally condemned. The only parasite of any consequence is the kidney worm known as the "Stephanurus dentatus." Very little is known about it other than it is very destructive and will sooner or later cause economic losses if the pig farmer does not attend strictly to the laws of sanitation.

The worm itself varies in size, being a thick, round, and mottled specimen and is found abundantly in the kidney region and in other portions of the body. The presence of the worm gives rise to cysts and abscess formation containing pus-producing organisms and eggs of the parasite. They are also found in the ureter; from whence they pass out with the urine. Old sows and boars are very subject to the parasite, and no doubt are the cause of all the trouble in younger pigs. Pigs during life show no evidence of the infestation, unless they are old sows. From my experience the complaint is more pronounced in cold weather than hot.

The conditions which are most favourable for the infestation of the kidney worm are filthy wallows, insanitary feeding and watering places, especially where large numbers of pigs are kept year after year on a small area. Veterinarians tell us there is no reliable method of dealing with the trouble other than thorough sanitation. That being so, the pig farmer must then seriously consider the matter of changing his sties and yards every year or so to fresh ground, and planting a crop before using the piggery again for pigs. In any case, pig yards should be selected with a view to securing proper drainage, cleanliness, and sanitation. They must also be as free as possible from the common type of mud wallow, which soon becomes a reservoir of concentrated filth and bacteria.

In conclusion, I would plead for the pig's welfare and comfort, and again stress the fact that much disease and other disorders are due to insanitary feeding and unclean drinking troughs in which the pigs are able to place their feet which carry filth direct from the floor of the sty.

Answers to Correspondents.

Seaweed as Fertiliser.

A.G.B. (Townsville)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

Seaweeds contain from three-tenths to 1 per cent. of nitrogen, one-tenth to ½ per cent. of phosphoric acid, and ½ to 2 per cent. of potash. When burnt the nitrogen is lost.

Charcoal has practically no manurial value, but will sweeten the soil.

Coral sand is practically pure lime carbonate and contains only a small trace of phosphoric acid.

Sawdust contains from ½ to 1 per cent. of nitrogen, practically no phosphoric acid, and one-tenth per cent. of potash and a little lime.

Fish manure contains from 3 to 5 per cent. of nitrogen, and from 3 to 8 per cent. of phosphoric acid, and is a valuable fertiliser.

FRUIT CULTURE.

Selected from the outgoing mail of the Director of Fruit Culture, Mr. Geo. Williams:—

Papaw—Sex Determination.

C.P. (Eel Creek)—

There is no reasonably certain method of distinguishing the male from the female papaw. It is found, however, that the most vigorous seedling plants are generally males, and should be discarded in favour of those of weaker growth.

BOTANY.

Selected from the outward correspondence of the Government Botanist, Mr. C. T. White, F.L.S.

Phasemy Bean.

J.G. (Boonah)—

The specimen is *Phaseolus semierectus*—the Phasemy Bean, a native of tropical America now widely distributed over the warmer regions of the globe. It was introduced into Queensland many years ago as a fodder, but never took on and is now only to be seen as a stray along railway lines, &c.

Kapoc.

J.C.H. (Port Glasgow, Papua)—

We have little experience with Kapoc here as it is only grown as an ornamental tree or as a specimen tree in public gardens. Some few years ago, in response to several inquiries, we compiled and published some information on it. A copy of the "Journal" containing that matter has been forwarded.

A Native Fig (*Ficus fasciculata*).

W.H.C. (Malanda, N.Q.)—

The fig is *Ficus fasciculata*, a native fig nowhere abundant, but found here and there on the Atherton Tableland, Eungella Range, and on one or two other places in North Queensland. There is a large number of figs in the scrubs of Queensland—about sixty different sorts—and this seems the best of the lot as an edible fig, in fact, the only really palatable one. We have never heard a common name for it, but if you wanted to give it one you might call it the "Brown Fig," from its character of turning brown when ripe. It should strike quite well from cuttings or could be grown from seeds, but its value would only be, we think, as a "private garden" tree; the fruits bruise very easily and quickly rot.

"Wild Onion."

Enquirer (Toowoomba)—

The specimen is *Bulbine bulbosa*, commonly known as Wild Onion. It occurs in all the States except Western Australia, and is generally regarded as poisonous, though no definite feeding tests have been carried out with it. The symptoms of poisoning by it are given as severe scouring, with great pain and a mucous discharge of a green and yellowish colour from the nose.

Carbide Residue.

K.G.C. (Westwood)—

Your inquiry regarding the use of carbide from gas plants was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—"Carbide residue is pure slaked lime, and can be used in place of agricultural lime. It is best to allow the residue to dry and break up to coarse powder before applying to land."

Plants from the Central District.

G.W.K. (Sapphire)—

1. *Solanum ellipticum.*—A "Potato Bush."
2. *Pterocaulon cylindrostachyum.*—A common weed: the only local name I have heard is "Rog Weed," a name applied in Queensland to several plants.
3. *Chenopodium carinatum.*—A common plant in Queensland, especially in light soils along watercourses, &c. I have never heard a common name.
4. *Trianthema crystallina.*—A common plant, but I have not heard a common name for it.
5. *Abutilon* sp.—Belongs to a genus that contains several garden shrubs known as "Chinese Lantern" flowers.
6. *Sida subspicata.*—Belongs to the same genus as the common *Sida retusa* or "Paddy's Lucerne."
7. *Epaltes australis.*
8. *Rhagodia.*—This and an allied plant are known in Queensland as "Fish Weeds." They are valuable fodders, but are said to give a fishy flavour to the milk of cows feeding on them.
9. *Polanisia viscosa.*—Sometimes called "Wild Mustard." The plant has a wide distribution through Queensland to India.
10. *Amarantus viridis.*—Green Amaranth. The young tops can be used as a substitute for spinach.
11. *Nyssanthes erecta.*—"Needle Bush."
12. *Achyranthes aspera.*—"Needle Burr."
13. *Sida corrugata.*—See note under No. 6.
14. *Abutilon oxycarpum.*—See note under No. 5.
15. *Sida corrugata.*, var. *ovata.*—See note under No. 6.
16. Too framentary for determination.
17. *Alternanthera nana.*—A weed of the Amaranth family; useful forage.
18. *Justicia procumbens.*—Small herb eaten by stock.
19. *Hibiscus Sturtii.*
20. *Ruellia australis.*—A small herb, eaten by stock.
21. *Euphorbia pilulifera.*—Asthma Plant. The dried leaves taken as tea afford some relief in asthma for a time, but the effects are said to wear off after repeatedly taking the infusion.

Swamp Paspalum.

W.D.D. (Innisfail, N.Q.)—

The grass is *Paspalum scrobiculatum*, the Ditch Millet or Swamp Paspalum. It is a fairly common grass in Coastal Queensland and grows mostly in wet, swampy places and in such places has some value as growing where other grasses do not do much good. Apart from this, it has no particular value.

"Giant Couch" or Para Grass.

M.K. (Dalby)—

The grass commonly known in Queensland as Giant Couch is *Panicum muticum*, a tropical grass known outside of Australia mostly as "Para Grass." It is unquestionably a valuable forage, particularly for places along the coast from Rockhampton northwards, and is one of the principal grasses of the Atherton Tableland. We would say, however, it was quite unsuitable for the Dalby district.

"Love Grass" (*Eragrostis curvula*).

L.M. (Ballandean)—

Your specimen has proved to be one of the American species of Eragrostis or Love Grasses naturalised in New South Wales. Mr. Whittet informs us it is *Eragrostis curvula*. He says:—"We are growing this grass in our 18-inches rainfall district; it is somewhat harsh but very drought-resistant." E. Breakwell, in his work "The Grasses and Fodder Plants of New South Wales," says:—

"This grass was introduced from America some years ago, and grown at the different experiment farms. It soon asserted itself as a very rapid grower, a free seeder, extremely drought-resistant, but with leaves of a rather harsh character. The leaves are extremely long, tapering very gradually to a fine point. During a dry spell the ends of the leaf wilt and curl up, leaving the rest quite green. The inflorescence is always of a distinct leaden colour, with the spikelets crowded and rather pointed.

"*Eragrostis curvula* does extremely well under cultivation, and has produced yields at Hawkesbury Agricultural College as high as 6 tons of green feed per acre. Owing to its drought resistance it was taken up by different farmers, and although it has been reported on favourably, both for drought resistance and for palatability, it does not seem to have taken on to any extent. Farmers at Taylor's Arm, Nambucca River, have found it an extremely useful grass for spreading over hillsides of poor country, and testify that cattle eat it very rapidly when it is young.

"Although *Eragrostis curvula* is looked on as a permanent grass, it seems to die out after a few years if subjected to hard conditions. New seedlings, however, are constantly appearing, and it could undoubtedly be maintained in a permanent pasture by allowing it to seed. Generally speaking, this grass may be recommended for scattering over burnt ashes in scrub country of poor formation, when it will act as a good stand-by in times of drought."

In general appearance it reminds one of the common Tussock Grass of New Zealand, but the structure of the seed head is quite different.

"Cherry Penda."

J.L.T. (Atherton)—

We do not know the species by its common name. It is evidently a species of Eugenia, but which one we cannot say from the fruit alone. We have handed the seeds to Mr. Bick, Curator of the Botanic Gardens, for propagation. He is in charge of the Sherwood Arboretum, which is under control of the Brisbane City Council as part of its park system.

A Northern Species of Zamia.

E.H.H. (Kureen, *via* Cairns)—

The specimen is *Bowenia spectabilis*, a species of "Zamia" or "Cycad," common in North Queensland. Like the rest of the family, it has been accused of causing "rickets" in stock. No feeding experiments have been carried out with it, but the general symptoms as observed in "Zamia" poisoning are very different from those you describe. The poison is a cumulative one, and the progress of the disease gradual. Attention is first directed to the presence of the disease by a peculiar arching of the back and weakness in the hindquarters. When approached, affected animals become excited and endeavour to get away, but as soon as they get into a fast walk the hindquarters sway from side to side, though in the worst cases an animal cannot go a few yards without falling down and is unable to rise without assistance.

Needle Burr.

J.T. (Kaban)—

The specimen is the Needle Burr (*Amarantus spinosus*), a common weed on the Atherton Tableland. It is rather a bad weed pest, but is not poisonous in any way. Apart from its spines it is quite edible, and the young shoots of it and allied species are used in India and other Eastern countries as greens.

A Poisonous Lily (*Dianella laevis*).

F.W.N. (Birkdale)—

The specimen is *Dianella lævis*, a plant of the Lily family, fairly common in Queensland, but for which I have not heard a local name. It has been recorded as poisonous both here and in New South Wales. No definite feeding experiments have been carried out with it, but as other members of the genus abroad are recorded as poisonous, the plant should be cut out from paddocks to which stock have access.

A Poisonous Plant (*Datura stramonium*).

"QUERIST" (Townsville)—

The cases of stock poisoning by *Datura stramonium* that have come under our notice have been confined to cases where the plant has been found as an impurity in chaff. It is fairly common in cultivations, and disastrous losses have occurred through stock eating chaff containing Datura. All parts of the plant are poisonous, but the growing plant is rarely touched by stock as it has a nauseous taste and odour. One case is, however, recorded by Bailey and Gordon ("Plants Poisonous and Injurious to Stock," page 55). The commonest Datura on the Central-West and Northern Downs is *D. Leichhardtii*, a native species which is very abundant on the black soil plains. This has been suspected of poisoning stock at times, though it must be only very rarely eaten. No work has been done on it, but as all the genus are poisonous, it is not likely to prove an exception. An article on the genus was published in this "Journal" for July, 1917.

"Tick Trefoil"—Carpet Couch.

W.E.P. (Maroochydore)—

The "clover" or "trefoil" is *Desmodium triflorum*, a species of "Tick Trefoil." The local name is given to it on account of the pods breaking up into small one-seeded pieces which stick to clothing, and around the feet of horses and cattle. It is quite a useful fodder. The grass is *Paspalum platycaule*—Carpet Grass or Carpet Couch. A useful grass for growing where the better-known grasses, such as ordinary *Paspalum dilatatum* and Rhodes, do not succeed.

It is very hard to get grass established in Wallum and Honeysuckle country. You might try transplanting roots of the species—small rooting pieces like that you sent put in and lightly buried in showery weather or when the soil is damp should thrive readily enough. A mixture of ordinary Couch and *Paspalum compressum* (or *Axonopus compressus*) might be tried. Rhodes might do in the better patches.

Some annual trefoils, such as the Medick Burr (*Medicago denticulata*), might do, but seed is unfortunately not generally stocked by seedsmen.

Castor Oil Plant.

G.C.B. (Wallumbilla)—

The specimen is a variety of the common Castor Oil (*Ricinus communis*). It was very mouldy when it reached us, but seems the form with large red seed pods that is naturalised in some parts of Queensland. The seeds are poisonous, due to the presence of "ricin," a very poisonous toxin. It is to this and not to the oil, which is a safe purgative, that the poisonous properties of the beans are due. In the extraction of the oil the poisonous principle is left in the residue, which makes it unsafe for the manufacture of cattle-cakes. The symptoms of poisoning are vomiting, gastric pain, diarrhœa, and dullness of vision.

Shade Trees Suitable for the Helidon Area.

"Inquirer" (Helidon)—

Following is a selection of shade trees suitable for Helidon. The list could, no doubt, be extended, but we have confined it to species more or less readiiy obtainable:—

Magnolia grandiflora.
Flacourtia cataphracta. Cataphracta Plum—edible fruit.
Pittosporum undulatum.
Lagunaria Patersoni. Pyramid Tree.
Sterculia trichosiphon. Broad-leaved Bottle Tree.
Calodendron capense. Cape Chesnut.
Flindersia australis. Crow's Ash. One of the best shade trees, we should say, for your locality.
Nephelium tomentosum.
Harpullia pendula. Tulip Tree.
Schinus teretinthifolius. Broad-leaved Pepper Tree.
Harpephyllum caffrum. Kaffir Plum.
Ceratonia siliqua. Carob Bean.
Gleditschia triacanthus. Honey Locust.
Ligustrum lucidum. Privet.
Jacaranda mimosæfolia.
Grevillea robusta. Silky Oak.
Stenocarpus salignus. Wheel of Fire.
Celtis australis.
Celtis sinensis.

(Both species of Celtis are deciduous and called Portuguese Elm. They would do well with you, and the foliage has some value as a stock food.)

Ficus platypoda. Small-leaved Moreton Bay Fig.
Ficus macrophylla. Common Moreton Bay Fig.
Platanus occidentalis. Plane Tree.
Pinus longifolia. Chir Pine.
Araucaria Cunninghamii. Hoop Pine.
Araucaria Bidwilli. Bunya Pine.
Washingtonia filifera. Cotton Plant.

Saltbush.

F.L.P. (Brixton, Central Queensland)—

Reference your two specimens of saltbush—The one with smaller fruits ("seeds") is *Atriplex Muelleri*—perhaps the commonest saltbush in Western Queensland. The one with larger, spongy fruits is not a freak but a distinct species—*Atriplex halimoides.* It is fairly common in some places, particularly in the south-western parts of the State. It is very common about Quilpie and westward to Windorah. We have also received specimens from the neighbourhood of Longreach, but we do not know if it is common there.

Plants Identified.

"INQUIRER" (Townsville)—

1. *Corchorus hygrophilus.* A fairly common plant in the Gilliatt country, but for which I have not heard a common name. It is not poisonous or harmful in any way.

2. *Euphorbia eremophila.* Caustic Plant. This occurs in all the mainland States, both on the coast and inland. It is generally regarded as very poisonous, and as it belongs to a dangerous group the suspicion attaching to it is probably based on fact. No feeding experiments, so far as I know, have been carried out with it.

The smaller plants contained in the same bundle belong to *Andrachne Decaisnei*—a very common plant over the Central and Northern downs. It is not known to be poisonous in any way.

The Peanut.

S.F.R. (Kawl Kawl)—

In reply to your queries regarding the Peanut:—

Botanical Name.—Arachis hypogæa. Family, Leguminosæ.

Country of Origin.—South America (Brazil and Peru).

When Introduced into Civilisation.—A great deal has been written about this, but De Candolle, in his "Origin of Cultivated Plants," says he is inclined to the belief that the first slave ship carried it from Brazil to Guinea, and the Portuguese from Brazil into the Islands to the south of Asia in the end of the fifteenth century. It has been variously stated to have originally been a native of Tropical Africa, China, &c., but the foregoing are the now generally accepted facts.

Principal Kinds.—Six other species of Arachis are known from Brazil, but only *Arachis hypogæa* is the one in cultivation. The United States is one of the biggest growers of peanuts, and about ten varieties are generally recognised:—Virginia Runner, Virginia Bunch, Spanish, Small Spanish, Improved Spanish, North Carolina, African, Valencia, Tennessee Red, Georgia Red.

In addition to the above one often sees a particularly large one, two or three times the size of the ordinary peanut, and known as "Chinese Giant." It was imported by and grown at the State Nursery, Kamerunga, but for some reason or other it never took on.

PIG RAISING.

Selected from the outward mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.

Impaction in Pigs.

T.G. (Laidley)—

In our opinion the pig referred to died of constipation. This trouble affects pigs of all ages, and is especially severe on breeding sows approaching the farrowing stage. In fact, many sows die each year as a result of bowel troubles, others have trouble in farrowing, while others develop milk fever and similar ailments, which usually terminate in the loss of milk and the death of the young pigs. We recently investigated a case at Kingaroy, in which a farmer there lost several good quality pigs approaching bacon age. He was of opinion that the pigs had swine fever or some such disease, but was quite convinced it was constipation when a search of the yards in which the pigs were kept resulted in but a few small pebbles of hard, dry dung being found, with no indication at all that the pigs had any motion of the bowels for several days and were evidently in great pain, straining and endeavouring to rid themselves of dry, fibrous dung, the accumulation of many days.

Most pigs are subject to intestinal parasites at one or other stage of their existence, and the fact that you found one large, round white worm in the pig that died would not indicate any serious trouble. If you had collected fifty such worms, then you would have been justified in blaming these parasites for the mortality.

In cases of severe constipation, the most effective remedy is the enema. Enemas of warm, soapy water to which has been added one tablespoonful of olive oil or glycerine, are helpful in relieving the bowels. Follow this up with a dose of two packets of Epsom salts dissolved in half a pint of warm water and given as a drench, compelling the animal to take liberal exercise about three hours after dosing. Complete change of food is then advised. For the pigs not yet suffering, reduce the amount of corn and sweet potato vines and feed on skim milk, pumpkins, and green lucerne, compelling them also to take regular exercise in a good roomy pig run. There should be no need for medicine if pigs are kept in good sized runs and are given liberal supplies of green lucerne, &c. Sweet potato vines are not poisonous, but pigs consuming too many vines are liable to suffer from serious digestive disorders.

Preparing Pigs for Show.

W.V. (Boonah)—

The preparation of pigs for exhibition is largely a matter of care and attention in feeding and handling, having due regard to the classes in which the animals are to be exhibited. Size and condition count for much in classes in which age is a condition of entry. That is to say, a pig entered in a class for boar or sow twelve months and under needs to be as near to twelve months old as is possible. A pig three months old or thereabouts in a twelve months old class stands a very poor chance. Colour markings and breed characteristics vary with the different breeds. Keeping the skin and hair in good condition by frequent oiling either with petroleum jelly, cocoanut oil, or some other preparation, also counts for a great deal, while having the animals accustomed to handling and moving about at will is a very great help when it comes to their exhibition. It really pays to exhibit and sell the best of the pigs only. All others should be promptly prepared either as porkers or baconers and be disposed of. To those who hope to make a success of the stud pig business, the exhibition of stock at shows, advertising the stock for sale in suitable journals and papers, and prompt attention to correspondence and the supply of pedigree, &c., are features well worth note. There is no royal road to success, but there is no reason why with careful attention to the business aspect and regular and judicious handling of the stock, plus having good stock, you should not succeed.

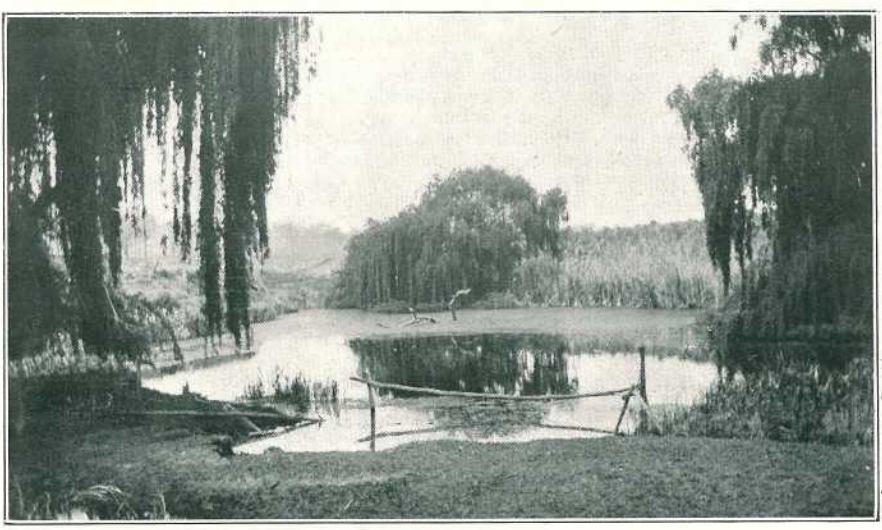


Photo.: Miss J. Easton.]

PLATE 11.—"WHERE THE HORSES COME TO WATER AT THE RISING OF THE MOON." THE WILLOW-SHADED POND ON COOCHIN COOCHIN STATION, NEAR BOONAH.

General Notes.

Broom Millet Board Election.

The recent election for the appointment of two members to the Broom Millet Board resulted as follows:—

Hans Niemeyer, Hatton Vale, Laidley	78 votes
Erich Max Schneider, Binjour Plateau	76 votes
George William Harberger, Coalstoun Lakes	30 votes
Informal	2 votes

Messrs. Niemeyer and Schneider, together with the Director of Marketing, will therefore be appointed to the Board and will hold office for a term of one year as from the 18th May last.

Regulation Announcements.

Proclamation No. 5 under the Diseases in Plants Acts, dealing with the introduction of grapes from New South Wales and Victoria, has been rescinded, and a new Proclamation has been issued in lieu thereof.

This is practically identical with the old one, with the additional condition that grapes (fruit) from the Murrumbidgee Irrigation Area of New South Wales entering Queensland *via* Wallangarra must be branded with the word "Grapes" on one end of each case in letters of not less than 2 inches in height.

A regulation has been issued under the Diseases in Plants Acts, which provides that all tomato and potato plants must be sprayed or dusted with Bordeaux or Burgundy Mixture as follows:—

In the case of tomato plants—Firstly, in the seed bed; secondly, on being planted out; thirdly, thirteen days after being planted out; and fourthly, when the fruit is setting; and at any other such time as an inspector may direct.

In the case of potato plants—When the plants are 6 to 8 inches in height, and subsequently every seven to fourteen days, as weather conditions may warrant; and at any other such time as an inspector may direct.

Any person who does not comply with this regulation is liable to a penalty of £5 for a first offence, and not exceeding £20 nor less than £5 for a subsequent offence.

Wheat Pool.

A Proclamation has been issued to extend the Wheat Pool for a further period of five years after the 1927-28 season.

Provision is made for the taking of a poll upon the question of the extension of the pool. Any petition for a poll must be signed by at least five hundred growers who delivered wheat to the State Wheat Board during the seasons 1926-27 and 1927-28, and must reach the Minister not later than the 1st June, 1928.

Sugar Assessment.

The assessment for the 1928-1929 season under the Regulation of Sugar Cane Prices Acts and the Sugar Experiment Stations Acts has been fixed at the rate of 1¼d. and ⅝d. respectively on every ton of sugar-cane delivered at sugar works during the season. Such assessment is payable by the owner of sugar works in the first instance.

The assessment for last season was ½d. per ton under both Acts.

Assessments have also been levied under the Sugar Experiment Stations Acts for the purpose of financing Cane Pest Boards. The assessment for the Tully and South Johnstone Boards has been fixed at 1½d. per ton, and for the Lower Burdekin and Plane Creek Boards ½d. per ton.

Wire and Wireless.

The Queensland Pastoral Supplies, Limited, announce important reductions in the price of fencing wire and netting. They have also perfected an excellent three-valve wireless set, which they are selling complete with all accessories and loud speaker. This set will bring in all main Australian Stations at reasonable loud speaker strength.

Cotton Board.

The Cotton Board has issued a notice requiring all growers of seed cotton to furnish a return showing the area under crop at the time of flood damage, the estimated quantity of cotton on bushes ready for harvesting destroyed by flood waters, and the estimated quantity of cotton harvested awaiting transport which has been destroyed by flood.

A Distinguished Visitor from South Africa.

Sir Arnold Theiler, K.C.M.G., of South Africa, in the course of a recent preliminary visit to Brisbane, prior to a tour of investigation in other States of the Commonwealth, met the members of the Commonwealth Tick Dip Committee at the office of the Department of Agriculture and Stock. Those present were Dr. W. A. N. Robertson (representing the Commonwealth Government), Messrs. J. C. Brunnich, A. H. Cory, and C. J. Pound (representing the Queensland Government), Messrs. M. Henry and C. J. Sanderson (representing the New South Wales Government), and Mr. R. P. M. Short, Secretary.

The investigations of the Committee were explained to the distinguished visitor, and advice given by him, as a result of his South African experiences, on the cattle tick will be of distinct benefit to the Committee in their operations. A visit was paid to the Samford Experimental Farm on the following morning.

It is the intention of Sir Arnold Theiler to visit this State for an extended period this month.

Wheat Board.

Regulation 3 under the Wheat Pool Acts has been rescinded, and a further Regulation approved, providing that representatives on the Board shall be elected by growers of wheat who delivered to the Board wheat harvested during either of the two previous seasons, by growers of wheat to whom seed wheat has been supplied by the Board for the year in which the election is held, and by other bona fide growers of wheat who may make application for and obtain a voting-paper.

Points in Citrus Marketing.

Production is only one-half of the business of profitable orcharding—the preparation of the crop for disposal is a matter of no less importance. The following points should be observed by the citrus grower in the marketing of his fruit:—

1. Exercise extreme care in handling.
2. Place fruit carefully in picking bags.
3. Carefully transfer fruit from picking bag to box.
4. See that the box has no protruding nails or splinters.
5. Do not jolt the fruit over rough roads.
6. Grade carefully for size and quality.
7. See that the sizing machine is functioning properly.
8. Use a clean case.
9. Pack neatly and tightly, but do not squeeze or jamb fruit into boxes.
10. Stack cases on sides.

The Orchard Ladder.

In many orchards one sees a huge, heavy ladder which one man shifts from tree to tree with difficulty, and it is so constructed that it cannot be conveniently placed to enable the operator to carry out his work expeditiously. Such a type of ladder often damages fruit spurs and fruit when being placed in position. Some ladders are in the last stages of decrepitude, some have lost steps, others are so rickety that if the ground is a little uneven they require to be supported while the operator is picking or pruning. Orchardists should take stock of their ladders, and, if they have not done so already, they should secure a strong, light, serviceable ladder, the use of which will economise time and labour.

It is not necessary to use sawn timber in making an orchard ladder. Anyone who is handy with tools can make a good ladder from the round bush timber which is very often easily obtainable.

Staff Changes and Appointments.

Messrs. A. L. M. Wilson, W. A. Douglas, B. Hart, A. C. Wishart, and Dr. G. Croll (of the Royal Queensland Yacht Club), and Mr. W. A. Winchester (Manager of Queen's Theatre, Bundaberg), have been appointed Officers under the Animals and Birds Acts. Constable W. H. Ewin, of Tallebudgera, has been appointed an Inspector of Slaughter-houses.

The resignation of Mr. J. Smith as Millowners' Representative on the Central Sugar Cane Prices Board has been accepted.

Messrs. F. M. B. Little, A. H. Biggs, H. Goodson, and R. Johnston, of the Southport District, and Mr. R. McCowan, of Brisbane, have been appointed officers under and for the purposes of the Animals and Birds Acts.

It has been approved that Mr. L. P. Doyle, Inspector of Stock, be attached to Cloncurry, and that Mr. J. Bishop, Inspector of Stock, be transferred from the Helidon to the Kingaroy District.

Mr. W. B. Christie, of Cooran, has been appointed Honorary Inspector under the Diseases in Plants Acts.

Mr. E. B. L. Filer, Assistant, Fruit Branch, has been appointed Temporary Inspector under the Diseases in Plants Acts as from 1st June, 1928.

The appointments of Miss N. Walsh and G. Becker as Assistant Cane Testers at Millaquin and Pleystowe Mills, respectively, have been rescinded, and Miss Walsh has been appointed Assistant Cane Tester at the Pleystowe Mill.

The following appointments of Cane Testers and Assistant Cane Testers for the 1928 crushing season have been made:—

Cane Testers—T. D. Cullen, Bingera; Miss I. McGill, Fairymead; C. H. Jorgensen, Gin Gin; Miss I. Palmer, Isis; Mrs. Kate Dunton, Maryborough; C. J. Boast, Millaquin; Miss A. L. Levy, Moreton; Mr. T. V. Breen, Mossman; L. G. H. Helbach, Pleystowe; Miss M. T. Smith, Plane Creek; Miss D. Marles, Qunaba; V. F. Worthington, Racecourse; J. Howard, Rocky Point; W. Ahern, Cattle Creek; L. McCready, Farleigh; T. P. Brown, Marian.

Assistant Cane Testers—Miss M. Orr, Bingera; Miss O. Knight, Farleigh; Miss M. A. Lyle, Marian; Mr. H. T. Whitcher, Maryborough; Miss N. Walsh, Millaquin; Mr. G. Becker, Pleystowe; Miss E. Rowe, Pleystowe; Miss M. Morris, Plane Creek.

Mr. J. Carew, Assistant Instructor in Sheep and Wool, has been appointed Acting Instructor in Sheep and Wool, Department of Agriculture and Stock, as from 24th May, 1928, and until 31st December, 1928.

The following transfers have been approved, of Inspectors under the Diseases in Plants Acts:—

Mr. T. Lowry, at present attached to Stanthorpe, to be attached to Brisbane;

Mr. F. A. L. Jardine, at present attached to Nambour, to be attached to Stanthorpe;

Mr. E. J. Lorraine, at present engaged on wharf and market inspections, to be transferred to outside field inspections.

It has also been approved that Mr. H. St. J. Pratt, Assistant Instructor in Fruit Culture, undertake the supervision of the inspectors in the Stanthorpe District.

Mr. L. A. Downey, of Hawkesbury Agricultural College, Richmond, New South Wales, has been appointed Assistant Instructor in Pig Raising.

Mr. W. H. Bechtel, Manager of Warren State Farm, has been appointed Acting Assistant Instructor in Agriculture at Rockhampton.

The resignation has been accepted of Mr. H. J. Campbell, Inspector of Slaughter-houses.

Mr. H. Jensen, Miss E. Christsen, and Messrs. P. H. Compton and T. Herbert have been appointed Cane Testers at the Babinda, Pioneer, South Johnstone, and Tully Mills, respectively, and Miss M. Bennett has been appointed Assistant to Cane Tester at the Tully Mill.

Constable R. G. Kinnane, of Dalby, has been appointed Inspector of Slaughter-houses.

Constable J. S. Harper, of South Kolan, has been appointed Inspector of Slaughter-houses.

Mr. J. C. Pryde, of Spring Bluff, has been appointed Temporary Inspector of Stock at Rockhampton until the 4th July, 1928.

Messrs. M. Wilshire, S. R. Scott, B. B. Loel, E. L. Carpenter, J. Wilson, H. Middleton, V. I. Spalding, S. O. D. Arthur, John Newlands, W. J. Newlands, and C. D. Thompson (Inspectors under the New South Wales Diseases in Stock Act) have been appointed Inspectors of Stock, to operate in the Stock District of Warwick.

The appointment of Mr. H. H. Jennings, of Texas, as Acting Inspector of Stock has been cancelled.

The Officer in Charge of Police, Jondaryan, has been appointed Acting Inspector of Stock as from 26th May, 1928, and Mr. P. J. Short, Temporary Inspector of Stock at Goondiwindi, until the 31st July, 1928, during the absence on leave of Mr. Singh.

Mr. J. Macfie has been appointed Inspector of Cane Testers, with headquarters at Bundaberg.

Constable B. M. Howard, Stewart's Creek, has been appointed Inspector of Stock and Brands, and Constable E. Brown, Ewan, Inspector of Brands.

Mr. J. D. W. Ogilvie, Dairy Instructor, Ipswich, has been appointed Grading Inspector, Dairy Branch, Department of Agriculture and Stock.

Mr. E. S. Smith has been appointed Millowners' Representative on the Central Sugar Cane Prices Board, vice Mr. J. Smith, resigned.

Constable W. Lafferty, of Jericho, has been appointed Inspector of Slaughter-houses.

Dr. N. M. Gutteridge, of Toowoomba, has been appointed an Officer under the Animals and Birds Acts.

The appointments of Messrs. N. James and W. Broome as Honorary Inspectors under the Diseases in Plants Acts have been cancelled.

Mr. F. R. Pearce, of Kolijo, N.C.L., has been appointed Canegrowers' Representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. J. McIntyre, resigned.

The Royal Society of Queensland.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 28th May, 1928.

The President, Professor T. Parnell, was in the chair, and fourteen members were present.

Messrs. W. J. Chamberlain, M.Sc., Inigo Jones, and T. Rimmer, M.Sc., were elected ordinary members of the Society.

Mr. F. W. Moorhouse, B.Sc., was nominated for ordinary membership by Mr. D. A. Herbert, and Mr. R. C. Cowley by Dr. J. V. Duhig.

Mr. A. P. Dodd, in a few introductory remarks, tabled a paper on the "Revision of Four Genera of Scelionidæ."

Mr. A. P. Dodd also delivered a very interesting lecture on "Prickly-pear Insects." In outlining the subject he pointed out that the prickly-pears (*Opuntia* spp.) had been introduced into Australia without their natural enemies. Owing to this, and to favourable climatic conditions, they had spread rapidly and become a pest. In their native habitats, Southern North America and South America, the various forms of prickly-pear were kept in check by natural enemies in the shape of insect pests.

The Prickly-pear Board has concentrated its activities on investigating insects adversely affecting the pear and on introducing those found the most effective. On arrival they are carefully tested by laboratory and field experiments, to ascertain whether they will attack economic or other plants as well as members of the Opuntia family.

Mr. Dodd gave an interesting review of the introduction, breeding, testing, and liberation of insects, and he stated that so far the Indian cochineal and cactoblastus had proved the most effective, and with the aid of these insects the prickly-pear was now held in check from spreading, and there is every probability of its gradual extermination.

Mr. C. T. White, in proposing a vote of thanks to the lecturer, paid a tribute to the good work being carried on by Mr. Dodd and his staff. Mr. J. B. Henderson, in seconding the motion, outlined the events leading to the formation of the Prickly-pear Board, and gave instances of the very effective work of pear destruction.

Clean up the Packing Shed.

A thorough clean-up of the packing shed should be made before closing it down at the end of the packing season.

All cases or other receptacles that have held fruit should be dipped under boiling water for not less than three minutes, and any sacking used on packing benches should be similarly dipped, or if valueless, burned. All cracks and holes in benches or other packing-house appointments should be probed, and any lurking codling or other injurious insect larvæ killed. At all times the sweepings from a packing shed should be thrown on to a fierce fire. Codling moth bandages are best left on the trees till well into the winter.

Pruning operations offer the best opportunity for a close tree-to-tree scrutiny for pests such as San Jose scale. Affected trees should be marked for future treatment.

Scab in Potatoes.

There are three common causes of scab in potatoes; two distinct types result from the action of fungous parasites and the third is caused by eelworms.

Rhizoctonia scab (the form perhaps most frequently found) receives its name from the fungus (*Rhizoctonia solani*) which is the cause of the disease. This fungus is readily recognised on affected tubers in the form of small black masses or lumps, which vary greatly in size and shape. On account of this feature the disease is sometimes called "black speck scab" or "black scurf." The fungus structures at first sight appear like lumps of soil, but they show up distinctly black when wetted and they do not wash off. The superficial position of the fungus sometimes leads growers to think that the disease is of little importance. The black bodies, however, represent the resting stage of the fungus, which is able to develop rapidly under favourable conditions.

Generally speaking the disease results in most damage under cool moist conditions. It may attack any of the underground portions of the plant. The young growing shoots may be entirely destroyed. In other cases the disease may develop on the underground stem, stolons, or roots, where it is readily recognised in the form of brown discoloured areas. When the stem is severely attacked, or when the stolons are girdled, a number of small tubers may be produced on the stem and in axils of the leaves. Frequently also the leaves become bunched in the form of a rosette.

Unfortunately the fungus is able to live in the soil in the absence of the potato plant and it may grow on a number of other root crops and grasses. Once a soil becomes heavily infested little can be done to exterminate the disease. In most instances, however, the disease arises from the use of untreated, diseased tubers.

Every care should be taken that the disease is not introduced at the time of planting. Clean selected seed should be used whenever possible. This, however, is not always practicable, but effective control may still be obtained by seed treatment in a fungicidal solution of either corrosive sublimate (mercuric chloride) or formaldehyde. Dipping the seed before sowing should be adopted as a general practice and, generally speaking, corrosive sublimate is more effective than formaldehyde for this purpose.

A caution is necessary. Corrosive sublimate is a deadly poison if taken internally by stock or by human beings. The solution, however, is quite harmless on the hands. Treated potatoes are unfit for domestic use or for feeding to stock.

The solution is made up of corrosive sublimate (mercuric chloride) 1 oz. and water 6¼ gallons. The corrosive sublimate should be dissolved in about a quart of warm water and then diluted to the required amount. A wooden vessel should be used since the chemical will attack metal and thus lose its strength.

The seed potatoes should be immersed for from 1½ to 2 hours. It is inadvisable to dip the potatoes in bags, since this weakens the solution. It is far better to place the tubers directly in the solution or else to use a small wooden crate. The solution should not be used for more than three batches at a time. This is particularly necessary if there is much dirt adhering to the tubers, as there is then a tendency for the solution to weaken very rapidly. The tubers should not be cut and preferably should not be sprouted. If they have sprouted slightly every care should be taken not to injure the sprouts and the time of dipping should be shortened.

It is a good plan to keep the tubers moist for twenty-four hours before treatment to loosen the dirt and soften the fungous material, which is then more readily killed by the fungicidal treatment.

Objectionable Flavours in Cream.

Although it is most desirable from many points of view that cows should have a plentiful supply of good, clean drinking water, sometimes the water is blamed for second-quality cream, when in reality it has nothing whatever to do with it. Although tainted drinking water can, and does, impart certain flavours to cream, it rarely happens that such flavours cause the cream to be graded second quality. Whatever flavour the water may impart is absorbed from the body of the cow before and during the secretion of the milk, and it does not become worse as the cream is kept, but sometimes gradually disappears. In any case, it can usually be partially or wholly removed by the ordinary treatment at the factory. This class of flavour is not so important for that reason.

Bacterial flavours, for instance, gradually become worse and worse as the cream is kept, but absorbed flavours imparted by water do not. Where cows wade in muddy pools or waterholes, it is the contamination they carry out on their legs, flanks, tails, and udders which causes trouble later on. This is one of the commonest causes of ropy milk or cream. The bacteria responsible find their way into the bucket during milking, and from there into other utensils or separator parts, where they may exist for some considerable time, unless proper precautions are taken. The boiling water treatment will kill the bacteria responsible for ropy cream.

A Bad Practice.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a "junkety" condition may be brought about. All these defects may result in the cream being graded second quality.

Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. "Junkety" cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the tub in a can of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

Five Functions of Food for Milch Cows.

Improper feeding of dairy cows is one of the chief causes of unprofitable dairying. This is evidenced if the butter production in a good year be compared with that in a bad year. Proper feeding alone does not suffice to secure the greatest productivity, points out a departmental pamphlet, but must be accompanied by good care and management. It has been demonstrated that the production of some poorly-kept cows can be increased as much as 50 per cent. by improved methods of feeding and care.

It must not be forgotten that a cow may use a feed for five different purposes:—

1. Growth.—Since cows do not mature until they are four or five years old allowance must be made for growth requirements.

2. Maintenance.—A certain amount of the feed is used simply to maintain the body without gain or loss in weight.

3. Production of Milk.—Necessitating feed in addition to that used for maintenance.

4. Increase in Weight.—Cows normally increase in weight during the latter part of their lactation period and during the rest period. This increase requires feed.

5. Production of Offspring.—The fifth purpose for which a cow requires feed; the amount, however, is relatively small.

It is evident that in feeding for milk production, the various functions which feed fulfils must be considered with regard to the future development of the cow as well as to her immediate needs. Liberal feeding usually proves much more profitable in the long run than scanty feeding.

Points in Maize Seed Selection.

1. Select seed in the field only from those plants which produce good ears under normal or adverse conditions of space, &c.

2. Do not select for two or more ears on the stalk unless the first is up to standard size and quality.

3. Select ears which are at a medium height on the stalk, neither too high nor too low.

4. Select only those ears which are well covered and protected by the husk. Only such ears remain free from weevil infestation in susceptible districts.

5. Select ears which droop when approaching maturity for increased resistance of the variety to weather damage. Erect ears are usually found on short, thick shanks.

6. Select ears from those plants which produce a large ear for a limited growth of stalk for economy in grain production.

7. Avoid the selection of those ears from plants which are blown down or broken down, no matter how good the ears may appear. Root and stalk rot diseases are transmitted readily through the seed. With regard to the diseases just referred to take care also (*a*) to avoid ears from prematurely ripened stalks, (*b*) to regard brace-rooted stalks with suspicion, (*c*) to select seed early to more largely prevent mycelium of the fungus penetrating the seed by systematic infection, (*d*) to dry seed ears quickly by storing in a dry, warm, well-ventilated place in an endeavour to prevent the fungus (if any) making further growth from the core into the seed.

8. Maintain a special seed plot of field-selected seed.

Milking Machines and Cleanliness.

The secret of getting good milk and cream where milking machines are used is absolute cleanliness from the start. Once the rubber parts get contaminated they cannot be cleaned—to throw them away and get new ones is the only course.

A thorough cleaning once a week is not going to result in choicest grade at the factory. All parts of the machine must be cleaned carefully every day, and between milkings the inflations and tubes should be soaked in lime water, renewing the lime water often, as it soon becomes stale and smelly.

When removing cups from one cow to another care should be taken to see that they are held so as to fall over and break the suction. If they are carried face towards the ground all the dust and manure on the floor is sucked into the tube and thence into the buckets and vat.

Milking machines require a good deal of attention and punctilious care in cleaning if they are to prove satisfactory.

Roughage for Dairy Cows.

Roughage is often the cheapest form of digestible nutrients, and cows should be allowed all the roughage they can consume. Maize silage and lucerne hay are probably the ideal roughage for a dairy cow. They should be fed at the rate of 3 lb. of silage and 1 lb. of hay for each 100 lb. of live weight. Lucerne hay being a legume is much superior to non-leguminous hay for cows in milk. The non-leguminous hays are low in digestibility, tend to be constipating, and are low in protein and mineral matter. They are often useful in limited amounts when fed with some high quality lucerne hay.

The remarkable qualities of maize silage and lucerne hay as a ration for milk production have been demonstrated in the Jersey herd at Hawkesbury Agricultural College, New South Wales. Recent figures show that the average amount of feed consumed per head daily by cows under test was 30 lb. of silage and 10 lb. of lucerne hay, while the average production of milk during the same period was 26.24 lb. per head daily. For the above reason alone, lucerne can be described as the best fodder crop grown for the purpose of feeding cows. It is particularly useful in balancing all rations, especially where green maize is grown. Lucerne should be grown on all dairy farms where the object is to feed for milk production.

For providing fodder in the winter, farmers cannot be too strongly advised to grow a green cereal crop, such as green oats or green barley. These can be mixed with either vetches or field peas. They should be chaffed for preference with the ration, but good results are also obtained by grazing.

The Home and the Garden.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size, when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil, and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

ANIMAL MANURES.

Farmyard manures are solid and liquid excreta from animals, and form one of the universal manures used by most gardeners—complete for all purposes in horticulture. It must, however, be used with care and intelligence. In some places where large and cheap supplies are available, the soil is saturated with manure.

The greater the quantity of manure incorporated with the soil, the greater the necessity for plenty of fresh air to bring about decomposition and ultimately humus. Now, if a soil has not been deeply dug or trenched, and it happens to be of a heavy nature, it is possible that the rains will not pass away readily; then the manure begins to get sour, fresh air, with its oxygen is driven out, carbonic acid gas develops too freely, and the beneficial bacteria are suffocated or annihilated by their enemies, which come into being owing to the lack of fresh air.

To avoid these troubles the soil should be well and deeply dug, and whenever extra large quantities of manure are used, the soil should be afterwards dressed with lime to keep it in a sweet condition.

FLOWERING SHRUBS.

Lagerstræmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana*, the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20ft.

The plant stands severe trimming, in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken

from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia, now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and have not the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the north. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madona," Carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before re-bagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes from time to time respecting the handling and marketing of citrus fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the spring growth. All heavy pruning should be completed previous to the rise in the sap; and where winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur, or Bordeaux paste.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during spring. This is a very important matter, as spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root-pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, papaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You want only one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. The spraying of vines for downy mildew is not compulsory, but an application eliminates black spot.

Fruit fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvæ, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit flies early in the season is the surest way of checking this serious pest.

Keep a careful lookout for orange-sucking bugs, and destroy every mature or immature insect or egg that is seen. If this work is done thoroughly by all citrus growers there will be far fewer bugs to deal with later on, and the damage caused by this pest will be materially reduced. Destroy all elephant beetles seen on young citrus trees, and see that the stems and main forks of the trees are "painted" with a strong solution of lime sulphur.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the Granite Belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphis, as, if the insects which have survived the winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphis should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the Granite Belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

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.

	July, 1928.		August, 1928.		MOONRISE. July, 1928.	Aug, 1928.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6.46	5.6	6.35	5.21	3.29	4.50
2	6 46	5.6	6.34	5 22	4.15	5.50
3	6.46	5.6	6.34	5.22	5.6	6.52
4	6.46	5.6	6.33	5.23	6 1	7.53
5	6.46	5.7	6.33	5 23	6 56	8.55
6	6.46	5.7	6.32	5.23	8.0	9 55
7	6 46	5.8	6.31	5 24	9.1	10.57
8	6.45	5.8	6 31	5.24	10.1	11.59
9	6.45	5.9	6 30	5.24	11 1	...
						a.m.
10	6 45	5.10	6.29	5 25	...	1.7
					a.m.	
11	6.44	5.11	6.28	5.26	12 3	2 15
12	6.44	5.12	6.27	5.27	1.4	3.19
13	6 44	5.12	6.26	5 28	2 19	4.22
14	6 44	5.12	6 25	5.29	3.23	5.20
15	6 43	5.12	6.25	5.29	4.36	6.12
16	6.43	5.13	6.24	5.30	5.33	6.53
17	6 43	5.13	6 23	5.30	6.34	7.35
18	6 43	5.13	6.22	5.31	7 32	8.5
19	6 43	5.13	6 21	5.31	8.31	8.36
20	6.42	5 14	6 21	5.31	9.0	9.6
21	6.42	5.14	6.20	5.32	9.37	9.37
22	6.42	5.15	6 20	5.32	10.9	10.10
23	6.41	5.15	6 19	5.32	10.37	10.42
24	6.41	5.16	6.18	5.32	11.17	11.19
						noon
25	6.40	5.17	6.16	5.33	11.37	12.0
					p.m.	p.m.
26	6 40	5.17	6.14	5.33	12.5	12.49
27	6.39	5.18	6.13	5.34	12.44	1.42
28	6.38	5.18	6.11	5.34	1.23	2.38
29	6 37	5.19	6.10	5.35	2.8	3.38
30	6.37	5.20	6.9	5.35	2.59	4 40
31	6.36	5.20	6·7	5.36	3.53	5.43

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

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

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

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Phases of the Moon, Occultations, &c.

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

3 July	○	Full Moon	Midnight.
10 „	☽	Last Quarter	10 0 p.m.
17 „	●	New Moon	2 0 p.m.
25 „	☾	First Quarter	12 38 a.m.

Perigee, 15th July at 1 6 a.m.
Apogee, 26th July at 10 6 p.m.

Mars will be passing Jupiter from west to east on the 3rd. The two planets will seem to be very near to one another for several nights, before and afterwards. A distance equal to the width of the Moon will apparently separate them a fortnight later. The constellation Aries will form the background till the end of the month.

The earth will be in aphelion on the 4th, when it will be three million miles further from the Sun than it was on 4th January.

Mars will be occulted by the Moon on the 12th about 1 p.m. at places a little south of Townsville, but somewhat earlier in Southern Queensland. The nearness of the Sun will prevent them from being a good daylight spectacle.

The conjunction of Jupiter and the Moon at 5 o'clock in the morning of the 12th will form an interesting spectacle, with Hamal, the principle star of Aries, as the nearest and brightest star to the northward.

The conjunction of Mercury with the waning Moon on the 15th, about an hour and a-half before sunrise, will be interesting. The groups of the Hyades and Pleiades in Taurus will be higher up in the sky and more to the northward.

Mercury will be at its greatest western elongation, 20 degrees on the 21st, and will be favourably situated for observation after sunset.

The conjunction of Saturn and the Moon will take place at 1 p.m. on the 28th, when both are below the eastern horizon.

A small star in Sagittarius will be occulted about 10'45 p.m. at places a little south of Townsville, and somewhat earlier farther south.

2 Aug.	○	Full Moon	1 30 a.m.
9 „	☽	Last Quarter	3 24 a.m.
15 „	●	New Moon	11 49 p.m.
23 „	☾	First Quarter	6 21 p.m.
31 „	○	Full Moon	12 34 p.m.

Perigee, 11th August, at 2.54 a.m.
Apogee, 23rd August, at 4.42 a.m.

Epsilon Capricorni will be occulted on the 2nd about 8 p.m., and will form an interesting observation for those who have a telescope or binoculars, which will be required to see so small a star near the southern edge of the almost full moon.

About two-and-a-half hours later Kappa Capricornia will also be occulted, the exact time depending upon the position of the observer who may find it advisable to look for the star on the south-eastern side of the Moon ten or twenty minutes earlier.

The occultation of Jupiter on the 8th unfortunately will occur several hours before the planet will be seen above the eastern horizon.