ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

VOL. XXXIX. 1 FEBRUARY, 1933. PART 2.

Event and Comment.

Improvement of Dairy Cattle.

SO much interest has been displayed by dairy farmers in the provisions of the Dairy Cattle Improvement Act that the remarks of the Minister for Agriculture and Stock (Hon. Frank W. Bulcock), when introducing his measure, are just now of especial concern. Mr. Bulcock said:—

> For very many years there has been a definite opinion in our community that something more than is being done should be done to improve the standard of dairy cattle in the State. When we contrast what is being done in the other States with what is being done in Queensland, even allowing for the varying conditions, it must be obvious that there is scope for some activities that we have not engaged upon up to the present. These activities concern production, yield, and also the health of our dairy stock. It would be futile to suppose that we have reached the highest point of production. We have very definite indications in other countries and in other States of the capacity of the dairying industry to respond to a well-organised system of herd-testing, side by side with a survey of the diseases existent in the herds of the State.
>
> This is a simple Bill containing provisions that are incorporated in the dairy legislation of several other States in the Commonwealth. It provides for the establishment of a fund which will be materially under the dominance and guidance of representatives of the industry for the purpose of embarking upon a very definite production and disease survey of the herds of our State. On two occasions I have met the representatives of the dairying industry, and, after having discussed all phases of the question with them, the scheme which is embodied in this Bill has received their blessing. So late as Saturday last (26th November—Ed.) a conference was held at Gatton College, and the dairymen assembled there approved of the scheme.
>
> It must be apparent to everybody that there are two outstanding factors that require consideration in our dairy life. One is the quality of bulls; the other is the ramifications of disease in our herds. While we have given a good deal of care and attention to the cow, we have not given the same care and attention to the bull; and, while there have been many zealous citizens in the State who have given valuable assistance to the dairying industry, any unbiassed observer must be forced to the conclusion that some further effort is needed.

As I personally visualise this question, I see it in this perspective: We have an extraneous aid in the existing rate of exchange; but that is not always going to help us. We have certain other things in our dairying industry that act as a very substantial prop to the industry; but we cannot be blind to the fact that these aids may disappear at some date; and, if they should disappear, then we must make up for their loss by additional production; and now is the time to embark on that. Anybody who has given consideration to the disease side of the question knows that the spread of certain diseases is assuming alarming proportions in the dairy herds of the State. Because of that, it is necessary that we embark on some comprehensive scheme to achieve the desired objective.

I am not going to argue that this is an ambitious scheme. It is a modest scheme, and a modest beginning. It means, in effect, that we shall lay the foundations of a scheme whereby the State and the individual concerned will gain a good deal of benefit. It is obviously impossible to put it into operation forthwith. It is a scheme which essentially must be extended over a number of years; and that extension will yield very rapid results in the years that are to come. It is estimated that from a license fee of 5s. per bull we shall receive about £5,000 per annum, all of which will be applied in the direction of creating a board for the improvement of the dairying industry.

The dairy factories have agreed, in the main, to co-operate with this scheme; and I have assurances from quite a number of them that they are prepared to do all they can in the direction of extending the system of herd-testing. Obviously the officers employed by my department will be used in conjunction with this scheme. It is not proposed to add materially to that side of the subject; but it is proposed to appoint one or more veterinary officers for the purpose of embarking on any disease survey which is so necessary.

These are substantially the contents of the Bill. I believe that it marks the beginning of that comprehensive survey which is so necessary for our dairy herds.

Some Lessons from Denmark.

AT a ward conference of Local Producers' Associations at Gatton recently, it was suggested that some valuable lessons in rural organisation and scientific research could be learned from Denmark by Queensland farmers. There is no doubt that interesting little country can give the world some excellent lessons in rural education and organisation, but distant hills always look green, and, as a party of British farmers found out while on a mission of inquiry to that country some little time ago, Denmark cannot be regarded altogether as an agricultural Utopia.

Its soil, its climate, and even its markets are in no way exceptionally favourable to the farmer. As in Queensland, the year's returns are influenced greatly by economic conditions. One must not regard Danish agriculture as being invariably and necessarily very profitable, neither need one run away with the idea, so widely held, that the technical skill and organising abilities characteristic of the Danes secure for them immunity from the effects of adverse economic circumstances.

Denmark is a very small country, hardly bigger in area than a North Australian cattle station—something between 16,000 and 17,000 square miles. It is in the same latitude as the country situated between Newcastle in England and Inverness in Scotland, but its winter is colder and its spring later than in the corresponding parts of Britain, where the climate is tempered by the influence of the Gulf Stream.

An important factor in the development of agriculture in Denmark is the ownership of the land by the individual farmer—a system of peasant proprietorship that has proved so highly successful. This fact, probably more than anything else, has contributed to the high standard of Danish farming, and is to a large degree responsible for the success in the establishment of co-operative concerns.

It is an interesting historical fact that the movement for acknowledgment of the principle of ownership of the land by the man who uses it started in Denmark many years before it was even thought of in other countries. This movement has been developed gradually, until a few years ago compulsory legislation was passed for the cutting up of big estates in order that the rising generation should have a chance of securing land for farming in their own country. From that fact, it is quite obvious that Danish farmers have a big say in the Government of their country, a possibility laughed to scorn a generation or two ago when the suggestion that a farmer could be a member of Parliament was regarded as a stock joke.

It is also a little known fact that Denmark was the first European country to get a free constitution, with every man having the right to a vote. That measure of democracy was accomplished without revolution or bloodshed, and came as a natural consequence of an excellent education system that had been in force since

1814. The present sound position, comparatively, of the Danish farmer is due largely to the educational advantages he possesses, and through which he has been able to develop a high standard of leadership in all his co-operative enterprises.

In modelling their school system, both in respect to juvenile and adult scholars, the Danes have evidently observed the dangers of a narrow technical training. They have apparently discovered that real technical education is as much a matter of mental and spiritual development as anything else. They seemingly believe that technical education involves much more than just shaping material in a workshop, that a training along lines leading only to profit-making ends cannot produce the highest results, either in the education of the rank and file or in the education of their leaders. The result is that in their co-operative and legislative undertakings trained minds and developed thought are brought to bear, and in their public life, be it merely local or national, there is no lack of well-informed and genuinely patriotic leadership.

The practical efficiency of the Danish farmer is, however, mainly due to a fairly long apprenticeship on a good farm followed by a term in an Agricultural School. The school gives a general training in agriculture to young men who have already had three or four years field experience on a farm and have also attended the cultural courses at the People's High Schools. It is in these schools that dairy supervisors, cream testers, and assistants in local co-operative undertakings are trained. At the apex of the whole scheme is the College of Agriculture at Copenhagen, an institution of the same standing as a University. This college is remarkably well equipped, and has a staff of about fifty professors. It offers advanced courses in Agriculture, Veterinary Science, and all the allied branches of rural industry to students who have passed through the recognised general educational courses, and have had at least two years' experience on a farm.

The college has been fortunate in the men, who, from time to time, have held the chairs in the several faculties and some of them have won a world-wide reputation. Complete confidence of the farmers in the college is enjoyed, and that confidence has never been lost, and to-day the co-operation between the University and the farm in Denmark is complete, natural, and mutually loyal.

By its publications, by its research work at experiment stations, by its educational tours, by its output of trained agricultural scientists and economists the College of Agriculture in Copenhagen is the centre of effort and attainment, from which radiates the force that in the world of agriculture has made the name of Denmark great. Of course, the law of averages operates in Denmark the same as elsewhere, and this is so in respect to the personal equation—the human element. It would be wrong, however, to think of Danish farmers as all highly trained specialists in agricultural science; but to a good elementary schooling they have added a sound practical apprenticeship, on which again has been imposed the stimulation to industry and cultural thought gained from the courses in the People's High School and Agricultural School.

Their co-operative societies keep them well up in the collar by applying pressure on them to adopt improved methods and to observe most scrupulously the rules prescribed in the interests of all engaged in the industry.

The inspiration and direction towards scientific farming and efficient business methods come from the technical advisors appointed by the co-operative societies and the State, the scientists engaged in research work, the professors of the Agricultural College, and very capable and highly trained business men who control the co-operative export associations and other branches of the commercial side of rural industry.

Like farmers the world over, the Dane has little scope for reducing the costs of production, but he has eliminated waste wherever possible and tuned up the efficiency of his system and, in dairying particularly, the capacity of his cows.

The chief lessons, then, that we may learn from Denmark are contained in these salient points:—Danish farmers work, not as isolated units, but as members of big highly co-ordinated industry. Intensive methods of cultivation and selection of crops on a nationally accepted plan. Stock breeding and stock feeding on lines scientifically proved to be the most profitable. Supervisory work designed to help any backward farmers and keep them familiar, on their own holdings, with technical progress. Encouragement of and insistence upon a uniformly high standard of dairy and other produce. Generous credits and technical direction for new settlers—an extension of co-operative marketing. Labour-saving mechanical equipment.

Whether these points are practicable in Queensland or not, it must be admitted that there is something very impressive in the example of a country which calls science to its aid from the growing of the very grass that feeds the cow to the manufacture and packing of butter for export.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

THE GREYBACK CANE BEETLE.

By EDMUND JARVIS.

It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.—EDITOR.

FEBRUARY.

1. End of egg and beetle periods of the greyback cockchafer.
2. Infestation of cane land by first and second stage grubs.

THE beetle and egg phases in the life cycle of our "greyback" cockchafer have now been completed, and during the present month its destructive grubs will dominate the field of activity. Although a few first-stage larvæ can still be found, the majority of grubs will either enter upon or complete the course of their second instar of growth, while about the end of February a small percentage of these may be expected to moult into the third stage, thereby assuming the voracious well-known form in which, during the next three months (March to May), they are known to cause wilting of the leaves or death of the infested cane stools.

The grub and its varied subterranean movements may lay claim, therefore, to our chief consideration during the month of February; its habits, structure, control, mode of injury to cane, and inter-relationships with both parasitic and predaceous insect enemies, presenting a wide and most interesting field for future scientific research.

The silent, though sinister, underground activities of this pest, although hidden from observation, should not be deemed less menacing on that account. Coming events have already cast their shadows before, but it is feared that many growers who, during the flighting season of the beetles, were unpleasantly reminded of what might befall their crops later on, are, nevertheless, too apt—while surveying their apparently flourishing cane during February—to ignore such warnings, and become unduly optimistic as to future harvesting results.

It should be borne in mind that even greyback grubs of the second instar of development when little more than an inch long are able at times to seriously injure young plant cane. On blocks, for instance, where early infestation chances to average twelve to fifteen such grubs per stool, the crop is sometimes fairly eaten out of the ground and totally ruined.

The Second Stage Grub.

External evidence of root damage caused by these grubs in February is not as a rule very noticeable during seasons of ordinary beetle infestation. Although acting the part of a good second, the most aggressive capabilities of second-stage grubs attain maximum force when united with those of grubs commencing the third instar of growth, which generally happens about the middle of March.

Habits and Movements of the Grubs.

Unfortunately the nature of damage to cane from larvæ of this cockchafer is too well known to need more than brief comment. After wet weather, small first-stage grubs will often move upwards to within about 4 in. from the surface to feed upon succulent young upper roots; and during the following fortnight or three

weeks, while increasing slowly in size, sometimes penetrate to a depth of 6 or 7 in., and after moulting into the second instar start to feed more voraciously upon larger roots.

Ultimately, when entering upon the third stage of development (which often occurs about the end of February), they are usually found feeding in company with grubs of the second stage; turning their attention, however, to the large cord-like cane roots, the function of which is to furnish a constant supply of water to the sticks and leaves, while serving also to anchor and maintain the stools in rigid upright position.

During February, however, greyback grubs of the second stage may be said to predominate, and have now attained sufficient size to attract notice from cane farmers and cause more or less anxiety.

Shape and Colour of Grub.

The familiar doubled up appearance of grubs of the greyback (a form common to that of most scarabæid beetles) remains practically the same throughout the long period passed in its larval condition. During the course of the second instar of growth, the head, as before pointed out ("Queensland Agricultural Journal," vol. xxxviii., p. 6), is always a quarter of an inch wide, the general colour of the body being creamy white, but somewhat bluish and translucent just after moulting. The large anal or last body segment is plainly suffused with dark grey, blue, or brown, due to the internal presence and varying colour of the kind of soil being ingested by the grub showing through its thin semi-transparent skin. On the lower surface of this terminal segment are two parallel rows of short, reddish spine-like hairs, about twenty-four in each row, surrounded on either side by numerous longer scattered bristles (see illustration). This curious arrangement of hairs, which is invariably present on first, second, and third stage larvæ, affords an easy and certain way of distinguishing grubs of our greyback from those of other closely related cane beetles.

How to Destroy Cane Grubs.

Combating the notorious cane beetle during its larval condition has been found to yield best results, since this life cycle stage occupies a period of about five months of the year. Recent successes achieved against its grubs by the practice of soil fumigation have definitely established this control measure on a firm basis; the practical value of both carbon bisulphide and paradichlorobenzene having been demonstrated by field experiments carried out at the Greenhills estate and by many of our growers in the Northern districts. In view of the fact that secondary emergences have occurred this season in certain localities about the middle of December last, and fumigation work is likely to start in these areas about the end of February, it becomes advisable to briefly describe the method usually adopted when injecting soil fumigants. Before doing so, however, the table below giving correct dates on which to start such work should be consulted, bearing in mind that the periods shown thereon (from date of commencement of flighting season to that of injection of the cane) apply to the last emergence of cane beetles noticed by the farmer concerned.

When to Fumigate Grub-infested Cane Land.

Beetles Emerge.	Time to Fumigate.	Beetles Emerge.	Time to Fumigate.	Beetles Emerge.	Time to Fumigate.
Nov. 18	Jan. 27	Dec. 3	Feb. 11	Dec. 18	Feb. 26
Nov. 19	Jan. 28	Dec. 4	Feb. 12	Dec. 19	Feb. 27
Nov. 20	Jan. 29	Dec. 5	Feb. 13	Dec. 20	Feb. 28
Nov. 21	Jan. 30	Dec. 6	Feb. 14	Dec. 21	Mar. 1
Nov. 22	Jan. 31	Dec. 7	Feb. 15	Dec. 22	Mar. 2
Nov. 23	Feb. 1	Dec. 8	Feb. 16	Dec. 23	Mar. 3
Nov. 24	Feb. 2	Dec. 9	Feb. 17	Dec. 24	Mar. 4
Nov. 25	Feb. 3	Dec. 10	Feb. 18	Dec. 25	Mar. 5
Nov. 26	Feb. 4	Dec. 11	Feb. 19	Dec. 26	Mar. 6
Nov. 27	Feb. 5	Dec. 12	Feb. 20	Dec. 27	Mar. 7
Nov. 28	Feb. 6	Dec. 13	Feb. 21	Dec. 28	Mar. 8
Nov. 29	Feb. 7	Dec. 14	Feb. 22	Dec. 29	Mar. 9
Nov. 30	Feb. 8	Dec. 15	Feb. 23	Dec. 30	Mar. 10
Dec. 1	Feb. 9	Dec. 16	Feb. 24	Dec. 31	Mar. 11
Dec. 2	Feb. 10	Dec. 17	Feb. 25	Jan. 1	Mar. 12

Determining Degree of Grub Infestation.

Commence your examination in the middle of any block of cane thought likely to be grub infested by removing the soil from around the base of a stool. Should grubs occur amongst the side roots in numbers of four to eight or more, such stools need not be dug out. After recording the results obtained, a second stool, about a chain further on in the same row, should be treated in similar manner, and followed up by successive examinations of others in the same row at intervals of 66 ft. apart. Every fourteenth row in the block to right and left of the one examined should then receive similar inspection. If obtaining an average of three or more grubs per stool the area should be fumigated.

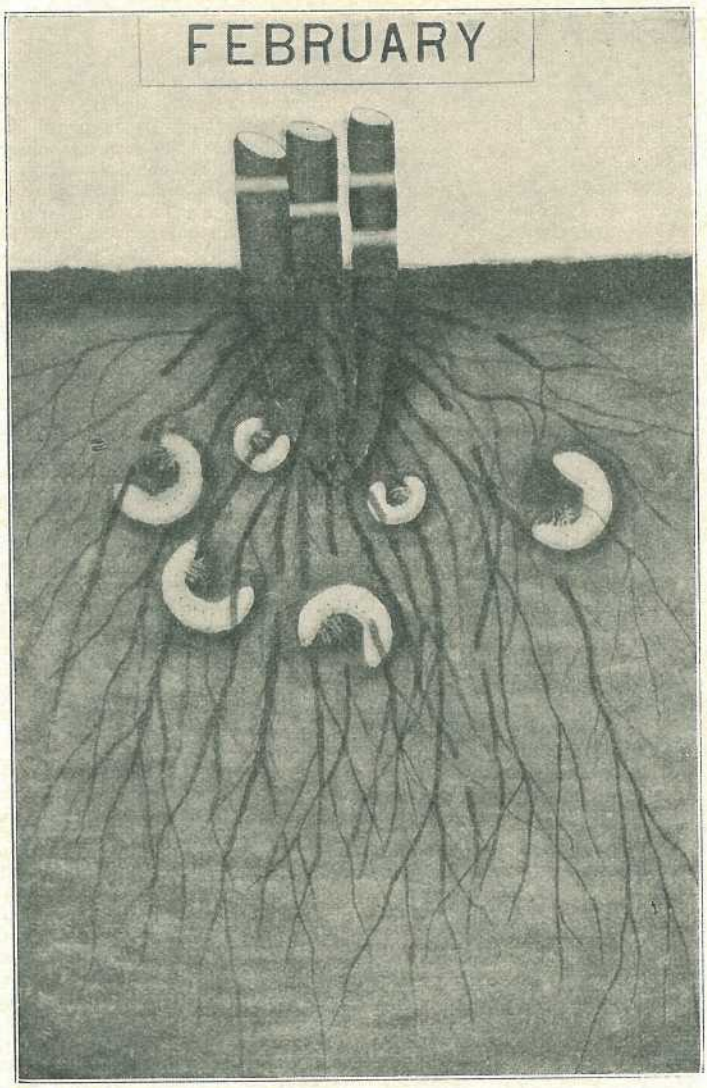

PLATE 15.

Activities of the Second-stage Grubs of our "Greyback" Cockchafer Beetle during February.

In years when the final emergence of beetles chances to take place about the middle of December, scouting is usually commenced a couple of months later.

How to Use the Hand-Injector.

Before fumigating be sure to see that the soil is in a favourable state at the time of application, in order that the volatile fumes may be able to permeate freely between the tiny soil particles. In other words, it must on no account be water-logged or in a semi-saturated condition, such as often prevails for a day or so following a heavy downpour. The land must not be too dry or too wet, but in a state in which it could, if desired, be cultivated with the best results. Naturally, well-drained lands of a light nature attain this desirable state of aeration in two or three days, while clay-loams might take four days, or even longer in the case of poorly drained low-lying areas.

Plate 16.
Typical Shape of Grub of Greyback Cane-Beetle.

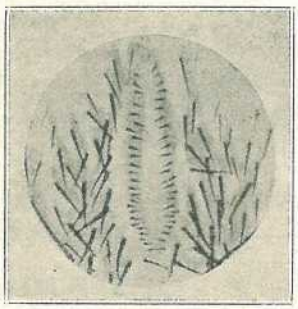

Plate 17.
Arrangement of the Central Bristles on Anal Segment of Grub.

Familiarity with the construction of the hand-injector will be found helpful when something happens to go wrong with the mechanism; in such cases, however, advice can always be obtained from the Cane Inspector, or the Entomologist.

Before starting, see that the foot-rest on injector is in correct position for administration of the fumigant just above the level at which grubs chance to be feeding at the time. The usual dosage for carbon bisulphide is $\frac{1}{4}$th oz., equivalent to about $4\frac{1}{2}$ cc.; a similar dosage being the 1 drachm 20 minims, which represents about 4 cc., and is the quantity discharged by Danks injector when set at No. 5.

Injections are made about 1 ft. apart on both sides of a cane row, 3 in. from stools and 4 to $4\frac{1}{2}$ in. deep. The number of stabs given will depend to some extent on the age of the crop being treated, on the size of the stools, and existing soil porosity. In some instances, it has been found advisable to give five or even six injections to certain large stools in order to ensure best results.

If mixing paradichlorobenzene with carbon bisulphide 60 lb. of the former are generally dissolved in about 5 gallons of the liquid carrier. This should be stirred well, and when completely dissolved filtered through copper gauze before pouring into the injector. During the course of fumigation examine a few of the treated stools at intervals of a day or so to note nature of results. Test the pumps above ground occasionally to make sure the dose is being discharged in uniform and correct quantity, and at each stroke of the plunger.

Fuller information regarding hand-injectors, &c., will be given later on, at the time of year when orders for same, together with amounts of fumigants required by individual growers, are usually placed with the managers of our various sugar-mills.

The February plate shows the commencement of damage of a material nature to roots of sugar-cane by second-stage grubs of the "greyback" cockchafer; external indications of which, however, are not usually apparent until next month.

Farm Fertility Trials

and

REVIEW OF THE WORK OF EXPERIMENT STATIONS.

RESULTS FOR THE 1932 SEASON.

In presenting the results of the Farm Fertility Trials harvested during 1932, advantage is taken of the opportunity to review also the work of the past year on the Northern, Central, and Southern Experiment Stations. The results of plot experiments harvested on these Stations have already been recorded in the Annual Report of the Director, but as certain of them are of special interest, a detailed discussion of their more valuable features is again presented. Attention is directed particularly to those trials which aimed at determining the manurial value of molasses, and the possibilities of irrigation in those areas which are at present dependent on natural rainfall.

EXPERIMENT STATION RESULTS.

THE work of the Stations during the past year has provided us with some valuable and interesting results. This is particularly true of the trials harvested at South Johnstone.

Fertilizer Trials.

At that Station the recent results confirm our previous conclusions regarding the differential response to the three plant foods applied—Nitrogen (N), phosphoric acid (P), and potash (K), and have also provided further information regarding the amount of fertilizer per acre which may be applied profitably. We may summarise these results as follows:—

Plant crops show consistently good response to superphosphate applied in the drill with the cane plants. The response to potash on this soil is very slight, although a small amount added with the superphosphate does appear to have a definite influence on the c.c.s. of the cane. At the present juncture it appears that potash is instrumental in hastening maturity, even on soils of this nature which are fairly well supplied with this plant food in an available condition. This is an important point, which should be clearly appreciated by those growers who are in the habit of using "straight" superphosphate and dispensing with potash for both plant and ratoon crops, and it is of special significance in the case of cane crops which will be harvested early in the season.

As regards nitrogen, it has been demonstrated repeatedly that little increase in crop yield is experienced by the use of sulphate of ammonia on plant cane, provided a heavy leguminous crop has been ploughed under prior to planting. Where the land has been bare-fallowed this does not hold, and it is imperative that nitrogenous fertilizer be applied for maximum returns under these conditions.

For ratoons, the situation is rather similar to that observed with plant cane. The pronounced response to superphosphate is again recorded, while potash is also important only in its influence on maturity of the crop. With respect to nitrogen, the position demands special attention, for the response to this plant food is particularly marked. Even where green manuring has been practised, the influence of the bean crop has practically disappeared by ratooning time, and the use of sulphate of ammonia is essential for heavy crops. With second and subsequent ratoons the need for sulphate of ammonia becomes even more acute, and any deficiency in the supply of this material is accompanied by a serious reduction in crop yield.

With respect to the maximum economic application of fertilizer under these conditions, our data are as yet incomplete. The heaviest application of superphosphate at South Johnstone during the past season was 900 lb. per acre, and the fact that this dressing showed an increased yield of $3\frac{3}{4}$ tons of cane over that following a 600 lb. application, indicates that the heavier dressing may be given to advantage. So far we have failed to obtain any marked improvement from applications in excess of 100 lb. per acre of muriate of potash, even where heavy treatments with nitrogen and phosphates were applied. To date, the heaviest application of sulphate of ammonia has been 400 lb. per acre, and this dressing indicated clearly that increased applications of this material might well be applied to ratoons.

Bearing in mind that we are dealing *exclusively* with the acid alluvial loams of the Babinda-Innisfail-Tully areas, the following may be taken tentatively, as general fertilizer recommendations for soils of this type:—

Plant Cane.

(1) Drill Application.—500 lb. superphosphate and 100 lb. potash per acre.

(2) Top Dressing.—Following a heavy green manure crop, no further nitrogen need be applied. Where bare-fallowing is practised, 200 to 300 lb. per acre of sulphate of ammonia should be given; with a poor green manure crop 150 to 200 lb. per acre will show a profitable return.

Ratoon Cane.

(1) Ratooning Mixture.—100 lb. sulphate of ammonia, 500 lb. superphosphate, and 100 lb. potash per acre, applied in a furrow alongside the row of stools at ratooning time.

(2) Top Dressing.—On all blocks, from 400 to 600 lb. per acre of sulphate of ammonia should be applied. This should be given in two or three dressings, at three to four-week intervals.

Liming.

The profitable and marked increase in crop yield following the use of lime on these soils, suggests that 1 ton of burnt lime or 2 tons of crushed limestone (or earth lime) should be applied per acre, every time the land is in fallow. If in doubt regarding the need for lime, a soil sample should be forwarded to the Brisbane or South Johnstone laboratory, when definite advice will be given.

Value of Irrigation.

A small scale trial was carried out at South Johnstone to determine the maximum crop yield under conditions as nearly as possible ideal for cane growth. The results of this experiment were recorded in the January (1933) number of the "Queensland Agricultural Journal," to which growers should refer for full details. It should be clearly understood that the phenomenal crop yield obtained in this trial—144 tons of cane per acre—could not be realised under farm conditions; but there are many valuable deductions to be drawn from the investigation. The most important point is, that under the growing conditions normally experienced in our wettest districts, the crop suffers very appreciably from the dry conditions which occur between rainy spells; and the judicious application of irrigation water to maintain continuous growth is responsible for a very pronounced increase in cane yield. It appeared that December, with its long, hot days, was the month during which cane was produced at its maximum rate, but of course the crop could only take advantage of these conditions if it had reached its peak of leaf development and had commenced to make cane.

The marked superiority of April-planted cane over that planted in August was outstanding, and the reduction in crop yield due to the later planting leaves no doubt as to the advantages presented by the former practice. An interesting sidelight, which should appeal to growers in those localities where Top Rot incidence is acute, is the experience that the autumn-planted cane was not attacked, while the adjacent spring-plant was seriously injured. This is in complete confirmation of the advice of our Pathologists that, where possible, autumn planting offers one of the best means of control for this disease.

The whole of the evidence which this small trial presents is strongly in favour of the development of irrigation wherever facilities exist; and this is true for both the humid tropical areas and for the drier Central and Southern districts of uncertain rainfall. In these times of reduced crop values, the exploration of every avenue whereby costs of production may be reduced must be carefully considered, and it is felt that means for improving the supply of soil moisture offer the best prospects in this respect.

Varietal Trial.

The first competitive trial of Badila against P.O.J. 2878 ("Wonder Cane") was harvested during the past season. Present indications are that, though this variety may have a definite value on the poorer soils of the North, it possesses certain features which suggest that on first-class land, Badila is the superior cane. One objection which should be emphasised is the decided susceptibility of P.O.J. 2878 to Top Rot disease. In the trial blocks under discussion, the cane was seriously infected with this disease, and a heavy percentage of dead shoots was recorded. The Badila was also moderately damaged. The cane out-yielded Badila, however, but the sugar content was decidedly inferior. The following is a summary of the returns:—

Variety.	Tons Cane Per Acre.	C.C.S. Per Cent.	Tons C.C.S. Per Acre.
Badila	34·2	15·85	5·44
P.O.J. 2878	39·9	14·0	5·60

A further trial with these varieties was planted during 1932, and the supplies of this cane which will be available in all areas this year, will afford an early opportunity of gauging the true worth of the "Wonder Cane" under the wide range of Queensland conditions.

Molasses as a Fertilizer.

Two years ago we presented the results obtained from the Bundaberg Station, following an application of molasses at the rate of 10 tons per acre on the red volcanic soil. The crop returns were as follows:—

Treatment.	Tons Cane Per Acre.	
	Plant Crop.	1st Ratoon Crop.
No treatment	22·7	15·7
10 tons molasses per acre	37·1	33·2

The total increase for the two crops was practically 32 tons of cane per acre, which demonstrates very clearly the definite manurial value of this by-product.

It is well known that the red volcanic soils of this State respond freely to heavy applications of potash-rich fertilizer; and as the chief manurial constituent of molasses is potash, it was thought that our alluvial soils might not show such flattering returns. An attempt was made to verify these suggestions during the past year. Trials were set out both at South Johnstone and at Mackay, and in each case molasses was applied at the rate of 10 tons per acre. A further comparative treatment was introduced by applying the same quantity of plant food in the form of common fertilizer constituents—sulphate of ammonia, superphosphate, and sulphate of potash. The object of this treatment was to determine whether molasses possessed any further virtues which contributed to the increased crop yields. The following are the results for the plant crops:—

Station.	No Treatment.	10 Tons Molasses per Acre.	Plant Food Equivalent to 10 Tons Molasses.
	Tons.	Tons.	Tons.
Mackay	17·7	23·7	25·6
South Johnstone	28·4	41·3	38·3

The results demonstrate conclusively that molasses is of value as a manure on a wide range of soils. On the South Johnstone alluvial, an increased yield of 13 tons per acre was recorded, and with an indifferent season at Mackay the yield was improved to the extent of 6 tons of cane per acre. The comparison with the fertilizer treatment is indefinite, and the ratoon crop results will be looked for with interest.

There can be no question that the application of molasses to the soil is the best available method of disposing of our surplus production of this by-product. Certainly the material has a definite fuel value, and though the furnace ash obtained in this way contains much of the

phosphate and potash derived from the molasses, the valuable nitrogen is entirely lost, and the average content of this plant food confers upon the molasses a manurial value of about 10s. per ton. With the improved methods of transportation and spreading of the material on the field, it is anticipated that in the very near future the demand for this by-product will far exceed the supply. The results obtained from our experiments would certainly justify such a conclusion.

Central and Southern Stations.

It is regretted that the results from field trials at Mackay and Bundaberg during the past year have been disappointing. At Mackay, the unfavourable season, coupled with a heavy infestation of Pentodon beetles, nullified most of our efforts; while at Bundaberg all crops were practically a complete failure due to the unprecedented drought conditions which prevailed throughout the year.

FARM FERTILITY EXPERIMENTS.

The trials harvested during 1932 provide the third series since the inauguration of the farm plot scheme. A continuation of favourable conditions in the Far North enabled us to secure further valuable data; our knowledge of the general needs of the main soil types of those parts is now fairly definite, and we are able to offer advice regarding fertilizer treatments with a high degree of confidence. It was pointed out in earlier discussions of this work that our first aim was to determine the relative importance of the three plant foods—Nitrogen (N), phosphoric acid (P), and potash (K) on the major soil types. The early trials might then be called *qualitative* experiments. Having determined the relative need for these constituents we must consider the amount of each which may be applied profitably. This leads to the so-called *quantitative* trials, two of which were harvested in the Northern districts last year. In the future, the bulk of the trials will be of this nature.

The results from the Mackay area were again disappointing, due in a large measure to the unfavourable season experienced. This is not preferred as an excuse for the failure of the applied fertilizer to show conclusive results. Unquestionably, good and bad years must be considered in evolving an economic manuring programme; but the seasonal conditions of the past three years have been so adverse that many of the trials set out have failed to show payable results, and the grower is susceptible to the deduction that fertilizing is not necessary. This reasoning is, of course, quite incorrect. The fact is, that under the conditions of the experiment inadequate soil moisture is the most serious factor limiting crop production; as a consequence, it frequently happens that the available plant food supply of the soil is sufficient for the modest needs of the small crop, and the added manure has but slight influence. The ratoons during a poor season, following a light plant crop of the previous adverse year, are practically devoid of vitality, and the crop is frequently a failure.

It is important that these facts be kept clearly in mind, for our knowledge of the old lands of this area tells us that they are essentially very poorly supplied with the necessary plant foods, and even the light crops which are harvested will still further deplete the supply, if fertilizers are not applied. At the same time, the financial difficulties frequently involved under these conditions are definitely appreciated; but there is no side-stepping the fact that these lands cannot continue

to remain under cane unless careful attention is paid to the maintenance of soil fertility. The obvious solution to the problem is the provision of an adequate water supply to the crop, to enable it to maintain steady growth through dry seasons, when the benefits of manurial applications would be outstanding.

Similar remarks apply to many of the lands of the Bundaberg area. The drought conditions experienced there during 1932 were such as to render all trials worthless and none were harvested as a consequence.

GENERAL DEDUCTIONS FROM FARM PLOT RESULTS.

(1) *Northern Districts.*

For those areas where our results have been adequately substantiated, we are now in a position to offer tentative suggestions regarding suitable fertilizer treatments. These are purely of a general nature, but should serve to indicate whether growers farming the respective soil types are employing fertilizer mixtures which conform with the demands of the soil, as demonstrated by our field experiments.

Under the discussion of Experiment Station results, definite recommendations were laid down for the *acid alluvial* soils of the Far North. These constitute some of the most productive lands of those areas, but heavy fertilization is essential to high crop yields and the maintenance of fertility.

The *red volcanic* lands which occur in these parts are characterised by a marked deficiency in their supply of available potash. This fact has been amply demonstrated by results recorded both here and in previous bulletins. During the past season, a quantitative potash trial was harvested from the farm of Mr. H. J. Thomas, Bartle Frere, the results of which will be found on page 74. The yields indicate that up to 400 lb. per acre of muriate of potash may be applied with profitable results. This is of interest in connection with so-called potash-rich fertilizer used by growers on this soil type. Even employing a mixture with 12 per cent. potash, it would be necessary to apply practically 1,600 lb. per acre to provide potash equivalent to the above. A suitable drill or ratoon mixture for these conditions is 300 lb. meatworks and 300 lb. muriate of potash per acre; or, alternatively, a mixture of similar proportions of potash and superphosphate. The latter mixture would not carry or store well, but would be quite satisfactory if prepared immediately before use.

These soils will also require subsequent top dressings of sulphate of ammonia as was emphasised when discussing the alluvial soils; that is, from 100 to 400 lb. per acre for plant and ratoons, applying particularly heavy dressings to old ratoons.

In passing, it might be mentioned that we have very definite indications that adequate potash dressings will result in improved c.c.s. returns from crops grown on these red volcanic loams. This is of special interest, for crops from these lands show consistently low sugar content. The problem will be studied more intensively during the coming season, when it is hoped that conclusive evidence will be forthcoming.

The *red and brown schist* soils are the third important series in the Northern areas, and these do not present the same consistent results which characterise our trials on the types already discussed. Sometimes

we find pronounced response to phosphate, while again potash is more seriously lacking. Until definite conclusions can be drawn, it is suggested that in general, the following mixture may be employed as a drill or ratoon application:—300 lb. superphosphate and 150 lb. muriate of potash per acre. Again subsequent top dressings with sulphate of ammonia are needed, and we have recorded several instances where in the absence of nitrogenous manures, ratoon crops have been practically failures. Evidence of the value of added nitrogen is presented in the summary of results found on pages 72 and 73. These returns suggest that 400 lb. per acre of sulphate of ammonia would be a satisfactory top dressing for ratoons. This would, of course, be spread in two applications at four to six week intervals.

The fourth important soil type of the Northern districts is the *gravelly loam* of the Tully-Babinda areas. These soils must be regarded as decidedly deficient in plant-food content; yet it is found that where the soil is properly treated, it is capable of yielding 45-ton ratoon crops of Badila. In Tully, it has been the practice to fertilize these lands almost from the first crop, and the wisdom of the policy is clearly evident. It is obvious that this soil type is practically devoid of humus, and, therefore, of the essential plant-food nitrogen. This is borne out by the outstanding response to applications of this plant food. Of the fields so far submitted to plot trial, none is more than a few years old, and in every instance the land has just been brought under the plough. This probably explains the fact that phosphates and potash produce but slight influence on the cane yields as yet; but it is certain that these foods will shortly enter as limiting factors; and growers are advised to forestall the problem by the consistent use of adequate mixed fertilizer. The following drill or ratoon dressing may be taken as suitable:—400 lb. superphosphate and 100 lb. muriate of potash per acre.

As regards the weight per acre of sulphate of ammonia, which should be applied for maximum economic yields, the results from the plot on Messrs. Spencer Brothers' farm (see page 78) should be examined. They show that an application of 400 lb. of sulphate of ammonia increased the yield by 2·66 tons of cane per acre over that from the 200-lb. dressing; and when it is remembered that this particular block is but little removed from the virgin state, 400 to 500 lb. per acre of this fertilizer might be regarded as a reasonable dressing for ratoon crops on soils of this type. For the plant, from 200 to 400 lb. are recommended, if green manuring has not been practised. Where beans or peas have been ploughed under, this dressing would be reduced accordingly.

(2) *Burdekin Area.*

The results of trials harvested in this area during the past year confirm our previous conclusions. The increased returns from sulphate of ammonia have been outstanding, and it is now conceded by experienced growers that the use of nitrogenous manures has done much towards solving the ratooning problems in that area. We are unable to base recommendations for mixed fertilizer on the results of our field trials to date, but it is suggested that a balanced mixture of phosphate and potash, applied at the rate of 300 to 400 lb. per acre, will help to maintain the fertility of these lands. The subsequent dressings of sulphate of ammonia are all-important, and for successful ratoons, several light dressings early in the lifetime of the crop are absolutely essential. Observation trials indicate that three dressings, each from 150 to 200 lb. per acre, will provide the nitrogen for a heavy ratoon crop.

Basis for Calculation of Value of Crop Returns.

It is as yet too early to determine the net value of the sugar for the past year's crop, but present indications are that it will approximate £18 15s. per ton. This figure has, therefore, been taken as a basis for our calculations. Fertilizer costs are based on current quotations, and full allowance has been made for freight charges to the respective districts.

The cost of fertilizer application has again been reckoned at 10s. per acre.

NORTHERN DIVISION.

The results recorded for the Northern areas (Mossman to Tully) show outstanding benefits from the use of fertilizers. Considering the returns from the fourteen plots here recorded, we find the following average yields from the unfertilized plots and those receiving complete mixtures:—

	Per acre. Tons.
Unfertilized plots	23·9
"Complete fertilizer" plots	32·5
Average increase from fertilizer	8·6

There can be no doubt as to the value of fertilizers, judiciously employed, as an aid in reducing product costs; and, further, the rapid falling off in yields from plant to ratoon crop where fertilizer is not applied, makes it clearly evident that large additions of plant food are necessary for the maintenance of fertility.

Location.—**Messrs. Coulthard and Cox's farm, Saltwater, Mossmann.**

Soil Type.—Alluvial soil; very acid and of characteristic bleached colour.

Variety.—HQ 426. Age of crop—Ten months. Nature of crop—First ratoon.

RESULTS.

—	No Fertilizer.	280 lb. Sulphate of Ammonia + 400 lb. Superphosphate.	280 lb. Sulphate of Ammonia + 200 lb. Potash.	400 lb. Superphosphate + 200 lb. Potash.	280 lb. Sulphate of Ammonia + 400 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	12·0	16·4	19·7	11·3	18·8
C.C.S. in cane	16·5%	16·5%	16·2%	16·5%	15·9%
Value of crop	£25 16 0	£35 6 0	£41 8 0	£24 6 0	£38 11 0
Less harvesting costs	£4 18 0	£5 18 0	£7 1 0	£4 18 0	£6 15 0
Return	£20 18 0	£29 8 0	£34 7 0	£19 8 0	£31 16 0
Increased or decreased return due to fertilizer	..	Increased. £8 10 0	Increased. £13 9 0	Decreased. £1 10 0	Increased. £10 18 0
Cost of fertilizer and application	..	£3 2 0	£3 10 0	£3 6 0	£4 14 0
Profit or loss from fertilizer ..	..	Profit. £5 8 0	Profit. £9 19 0	Loss. £4 16 0	Profit. £6 4 0

The results from the ratoon crop follow those from the plant crop very closely. Sulphate of ammonia was again responsible for a marked increase in yield, and the returns also suggest a potash deficiency. Response to sulphate of ammonia has been observed consistently for all plot trials at Mossman, and these gains indicate the benefits to be derived from green manuring in this area.

Location.—**J. Rice's farm, Redlynch, Cairns.**

Soil Type.—Red schist soil on gentle slope.

Variety.—Badila. Age of crop—Thirteen months. Nature of crop —Plant cane.

RESULTS.

—	No Fertilizer.	250 lb. Sulphate of Ammonia + 300 lb. Superphosphate.	250 lb. Sulphate of Ammonia + 200 lb. Potash.	300 lb. Superphosphate + 200 lb. Potash.	250 lb. Sulphate of Ammonia + 300 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	23·5	28·1	23·6	26·8	26·1
Value of crop	£38 16 0	£46 7 0	£38 19 0	£44 4 0	£43 1 0
Less harvesting costs	£9 0 0	£10 16 0	£9 1 0	£10 6 0	£10 0 0
Return	£29 16 0	£35 11 0	£29 18 0	£33 18 0	£33 1 0
Increased return due to fertilizer	..	£5 15 0	£0 2 0	£4 2 0	£3 5 0
Cost of fertilizer and application	..	£2 13 0	£3 7 0	£3 0 0	£4 5 0
Profit or loss from fertilizer ..	..	Profit. £3 2 0	Loss. £3 5 0	Profit. £1 2 0	Loss. £1 0 0

Certain plots in this trial were, unfortunately, damaged by grubs. Until this time, undoubted response to superphosphate could be observed.

Location.—**W. W. Chapman's farm, Hambledon.**

Soil Type.—Red schist soil on gentle slope.

Variety.—Badila. Age of crop—Thirteen months. Nature of crop —First ratoon.

RESULTS.

—	No Fertilizer.	360 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	360 lb. Sulphate of Ammonia + 200 lb. Potash.	360 lb. Superphosphate + 200 lb. Potash.	360 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	12·9	23·3	28·8	14·9	27·6
Value of crop	£21 6 0	£38 9 0	£47 10 0	£24 12 0	£45 11 0
Less harvesting costs	£5 12 0	£8 19 0	£11 1 0	£5 18 0	£10 12 0
Return	£15 14 0	£29 10 0	£36 9 0	£18 14 0	£34 19 0
Increased return due to fertilizer	..	£13 16 0	£20 15 0	£3 0 0	£19 5 0
Cost of fertilizer and application	..	£3 8 0	£3 18 0	£3 4 0	£5 0 0
Profit or loss from fertilizer ..	..	Profit. £10 8 0	Profit. £16 17 0	Loss. £0 4 0	Profit. £14 5 0

The increased yield on all plots receiving sulphate of ammonia is very striking. There was also a definite response to potash, but not to superphosphate. This trial is being continued to the second ratoon crop, and it will be of interest to follow the yields on those plots where nitrogen is withheld.

Location.—**G. Cole's farm, Edmonton.**

Soil Type.—Schist soil.

Variety.—Q 813. Age of crop—Twelve months. Nature of crop—First ratoon.

RESULTS.

—	No Fertilizer.	240 lb. Sulphate of Ammonia + 450 lb. Superphosphate.	240 lb. Sulphate of Ammonia + 200 lb. Potash.	450 lb. Superphosphate + 200 lb. Potash.	240 lb. Sulphate of Ammonia + 450 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	13·3	22·8	18·4	19·6	23·1
Value of crop	£21 19 0	£37 12 0	£30 7 0	£32 7 0	£38 2 0
Less harvesting costs	£5 9 0	£8 15 0	£7 1 0	£7 10 0	£8 17 0
Return	£16 10 0	£28 17 0	£23 6 0	£24 17 0	£29 5 0
Increased return due to fertilizer	..	£12 7 0	£6 16 0	£8 7 0	£12 15 0
Cost of fertilizer and application	..	£3 1 0	£3 6 0	£3 9 0	£4 13 0
Profit from fertilizer	..	£9 6 0	£3 10 0	£4 18 0	£8 2 0

This trial was commenced with the first ratoons, and the consistent response to sulphate of ammonia on the schist soil is again most definite. On this block superphosphate showed an increased yield, with little response to potash.

Location.—**M. Feldman's farm, McDonnell Creek, Babinda.**

Soil Type.—Gravelly loam (granitic).

Variety.—Black Innis. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

—	No Fertilizer.	360 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	360 lb. Sulphate of Ammonia + 210 lb. Potash.	360 lb. Superphosphate + 210 lb. Potash.	360 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 210 lb. Potash.
Tons cane per acre	17·2	22·2	22·9	18·1	22·4
C.C.S. in cane	12·8%	11·8%	11·6%	12·8%	11·5%
Value of crop	£26 4 0	£30 2 0	£30 6 0	£27 11 0	£29 5 0
Less harvesting costs	£6 12 0	£8 10 0	£8 16 0	£6 19 0	£8 12 0
Return	£19 12 0	£21 12 0	£21 10 0	£20 12 0	£20 13 0
Increased return due to fertilizer	..	£2 0 0	£1 18 0	£1 0 0	£1 1 0
Cost of fertilizer and application	..	£2 18 0	£3 18 0	£3 5 0	£5 1 0
Loss from fertilizer	..	£0 18 0	£2 0 0	£2 5 0	£4 0 0

Though a definite increase in crop yield was effected by fertilizer, the block was harvested so early in the season that the manured cane was quite immature, and therefore losses were shown for all treatments. The need for heavy dressings of sulphate of ammonia on the gravelly loams of the North was again demonstrated on this trial block.

Location.—**J. H. Jackson's farm, Babinda.**

Soil Type.—Gravelly loam (granitic).

Variety.—Badila. Age of crop—Thirteen months. Nature of crop—First ratoon.

RESULTS.

—	No Fertilizer.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	240 lb. Sulphate of Ammonia + 140 lb. Potash.	360 lb. Superphosphate + 140 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 140 lb. Potash.
Tons cane per acre	29·6	35·4	36·8	29·1	38·0
C.C.S. in cane	16·2%	17·1%	16·4%	15·8%	16·4%
Value of crop	£62 3 0	£79 13 0	£78 11 0	£59 2 0	£81 2 0
Less harvesting costs	£11 7 0	£13 12 0	£14 2 0	£11 3 0	£14 11 0
Return	£50 16 0	£66 1 0	£64 9 0	£47 19 0	£66 11 0
Increased or decreased return due to fertilizer	..	Increased. £15 5 0	Increased. £13 13 0	Decreased. £2 17 0	Increased. £15 15 0
Cost of fertilizer and application	..	£2 16 0	£2 16 0	£2 15 0	£3 18 0
Profit or loss from fertilizer	..	Profit. £12 9 0	Profit. £10 17 0	Loss. £5 12 0	Profit. £11 17 0

On the plant crop sulphate of ammonia produced an increased yield of 5 tons of cane per acre; on the subsequent first ratoons the increase was 9 tons per acre. It is interesting to note that the plots receiving a complete manure averaged 40·4 tons of cane for the plant crop, and 38·0 tons for the ratoons. These results clearly demonstrate the value of manures in maintaining the productive capacity of land of this soil type.

Location.—**H. J. Thomas's farm, Bartle Frere, Babinda**

Soil Type.—Red volcanic loam.

Variety.—Badila. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

—	All Plots received {300 lb. Sulphate of Ammonia, 300 lb. Superphosphate} plus—				
	No Potash.	100 lb. Muriate of Potash.	200 lb. Muriate of Potash.	300 lb. Muriate of Potash.	400 lb. Muriate of Potash.
Tons cane per acre	27·7	31·5	33·4	34·5	35·5
C.C.S. in cane	13·9%	14·2%	14·0%	14·2%	13·9%
Value of crop	£47 8 0	£55 11 0	£57 15 0	£60 16 0	£60 16 0
Less harvesting costs	£10 12 0	£12 2 0	£12 16 0	£13 5 0	£13 12 0
Return	£36 16 0	£43 9 0	£44 19 0	£47 11 0	£47 4 0
Increased return due to fertilizer	..	£6 13 0	£8 3 0	£10 15 0	£10 8 0
Cost of fertilizer and application	..	£1 6 0	£2 2 0	£2 18 0	£3 14 0
Profit from fertilizer	..	£5 7 0	£6 1 0	£7 17 0	£6 14 0

This trial marks the first attempt at a "quantitative" experiment on the red volcanic loam. The potash dressings showed progressively increasing profits up to the 300 lb. per acre application. It was found also that the crop was over-mature at harvesting—particularly with the heavier potash dressings. In all probability a very definite improvement in the c.c.s. value of the cane would have been experienced had the crop been harvested earlier. This influence will be studied in detail on the ratoons.

Location.—**L. Grima's farm, Mundoo, Innisfail.**

Soil Type.—Highly leached mixed soil—alluvial and volcanic.

Variety.—Pompey. Age of crop—Fifteen months. Nature of crop—Plant cane.

RESULTS.

—	No Fertilizer.	300 lb. Sulphate of Ammonia + 500 lb. Super-phosphate.	300 lb. Sulphate of Ammonia + 250 lb. Potash.	500 lb. Super-phosphate + 250 lb. Potash.	300 lb. Sulphate of Ammonia + 500 lb. Super-phosphate + 250 lb. Potash.
Tons cane per acre	20·5	31·6	29·0	33·7	35·3
Value of crop	£33 17 0	£52 3 0	£47 17 0	£55 12 0	£58 5 0
Less harvesting costs	£7 17 0	£12 2 0	£11 2 0	£12 18 0	£13 11 0
Return	£26 0 0	£40 1 0	£36 15 0	£42 14 0	£44 14 0
Increased return due to fertilizer	..	£14 1 0	£10 15 0	£16 14 0	£18 14 0
Cost of fertilizer and application	..	£3 10 0	£4 0 0	£4 0 0	£4 10 0
Profit from fertilizer	..	£10 11 0	£6 15 0	£12 14 0	£14 4 0

The selected block is typical of much of the Mundoo area—a highly leached soil of markedly low productivity. This trial demonstrates conclusively the nature of this deficiency, and heavy applications of phosphate and potash produced very definite results. A crop of legumes was ploughed under prior to the planting of the cane; this probably accounts for the slight increase in yield from sulphate of ammonia.

Location.—**B. B. Ross's farm, Mourilyan.**

Soil Type.—Acid alluvial soil of Johnstone River.

Variety.—Badila. Age of crop—Fourteen months. Nature of crop—Plant cane.

RESULTS.

—	No Fertilizer.	240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate.	240 lb. Sulphate of Ammonia + 120 lb. Potash.	360 lb. Super-phosphate + 120 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Super-phosphate + 120 lb. Potash.
Tons cane per acre	38·4	44·2	41·3	42·4	45·1
C.C.S. in cane	12·7%	12·7%	12·7%	13·2%	13·4%
Value of crop	£57 17 0	£66 11 0	£62 4 0	£63 17 0	£67 18 0
Less harvesting costs	£14 15 0	£16 19 0	£15 17 0	£16 5 0	£17 6 0
Return	£43 2 0	£49 12 0	£46 7 0	£47 12 0	£50 12 0
Increased return due to fertilizer	..	£6 10 0	£3 5 0	£4 10 0	£7 10 0
Cost of fertilizer and application	..	£2 16 0	£2 13 0	£2 12 0	£3 16 0
Profit from fertilizer	..	£3 14 0	£0 12 0	£1 18 0	£3 14 0

This typical alluvial soil had been green-manured and limed prior to planting. Superphosphate was responsible for a yield increase of 3·8 tons of cane per acre, and, in spite of the green manure, sulphate of ammonia produced an added 2·7 tons. The influence of the potash appears to be confined to earlier maturity, as shown by the improved c.c.s. values recorded in the last two treatments.

Location.—**G. Marano's farm, Mourilyan.**

Soil Type.—Grey, sandy soil.

Variety.—Badila. Age of crop—Sixteen months. Nature of crop—Plant cane.

RESULTS.

—	No Fertilizer.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	240 lb. Sulphate of Ammonia + 210 lb. Potash.	360 lb. Superphosphate + 210 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 210 lb. Potash.
Tons cane per acre	22·2	29·9	26·7	23·6	28·7
Value of crop	£39 19 0	£53 16 0	£48 1 0	£42 10 0	£51 13 0
Less harvesting costs	£8 10 0	£11 9 0	£10 5 0	£9 1 0	£11 0 0
Return	£31 9 0	£42 7 0	£37 16 0	£33 9 0	£40 13 0
Increased return due to fertilizer	..	£10 18 0	£6 7 0	£2 0 0	£9 4 0
Cost of fertilizer and application	..	£2 16 0	£3 7 0	£3 6 0	£5 0 0
Profit or loss from fertilizer	..	Profit. £8 2 0	Profit. £3 0 0	Loss. £1 6 0	Profit. £4 4 0

The soil type of this block is the characteristic sand which is cultivated in parts of the area. The particular field had just been brought under the plough. As would be expected on a soil so deficient in humus, nitrogenous fertilizer produced good results; superphosphate showed a gain of 2 tons of cane per acre, but potash was without influence. The ratoon crop might be expected to furnish very interesting results; this is certainly a soil on which heavy fertilizer dressings must be applied consistently to maintain its productivity.

Location.—**H. E. and M. P. Lever's farm, South Johnstone (late Adams Bros.).**

Soil Type.—Red schist soil, gentle slope.

Variety.—Badila. Age of crop—Fifteen months. Nature of crop—Plant cane.

RESULTS.

—	No Fertilizer.	300 lb. Sulphate of Ammonia + 400 lb. Superphosphate.	300 lb. Sulphate of Ammonia + 200 lb. Potash.	400 lb. Superphosphate + 200 lb. Potash.	300 lb. Sulphate of Ammonia + 400 lb. Superphosphate + 200 lb. Potash.
Tons cane per acre	19·8	30·3	24·1	31·2	34·2
C.C.S. in cane	15·4%	14·7%	15·6%	14·8%	15·0%
Value of crop	£38 18 0	£56 0 0	£48 3 0	£58 3 0	£64 17 0
Less harvesting costs	£7 12 0	£11 12 0	£9 5 0	£11 19 0	£13 2 0
Return	£31 6 0	£44 8 0	£38 18 0	£46 4 0	£51 15 0
Increased return due to fertilizer	..	£13 2 0	£7 12 0	£14 8 0	£20 9 0
Cost of fertilizer and application	..	£3 4 0	£3 12 0	£3 6 0	£4 16 0
Profit from fertilizer	..	£9 18 0	£4 0 0	£11 2 0	£15 13 0

The soil of this block furnishes an excellent example of the schist soil highly deficient in available phosphates. The increase in yield due to superphosphate was 10 tons per acre, while potash was responsible for further 4 tons of cane, and sulphate of ammonia for 3 tons. This is undoubtedly a soil on which consistently heavy fertilizer applications are needed to build up its fertility.

Location.—**F. N. King's farm, Jaffa.**

Soil Type.—Gravelly loam (granitic).

Variety.—Badila. Age of crop—Thirteen months. Nature of crop—First ratoon.

RESULTS.

—	No Fertilizer.	250 lb. Sulphate of Ammonia + 375 lb. Superphosphate.	250 lb. Sulphate of Ammonia + 175 lb. Potash.	375 lb. Superphosphate + 175 lb. Potash.	250 lb. Sulphate of Ammonia + 375 lb. Superphosphate + 175 lb. Potash.
Tons cane per acre	34·4	42·1	37·8	37·7	44·2
C.C.S. in cane	16·6%	15·8%	16·5%	16·4%	16·3%
Value of crop	£74 12 0	£85 11 0	£81 6 0	£80 9 0	£93 12 0
Less harvesting costs	£13 4 0	£16 3 0	£14 10 0	£14 9 0	£16 19 0
Return	£61 8 0	£69 8 0	£66 16 0	£66 0 0	£76 13 0
Increased return due to fertilizer	..	£8 0 0	£5 8 0	£4 12 0	£15 5 0
Cost of fertilizer and application	..	£2 17 0	£3 3 0	£3 1 0	£4 5 0
Profit from fertilizer	..	£5 3 0	£2 5 0	£1 11 0	£11 0 0

The plant crop from this block followed immediately after "stumping"; each treatment failed to show a profitable increase on that crop, but the position is decidedly different for the first ratoons. Both superphosphate and sulphate of ammonia contributed equally to the increase, and these results demonstrate very clearly the rapid rate at which the plant-food supply of this soil type is depleted. It is interesting to note that the first ratoon plots receiving complete fertilizer actually outyielded those of the plant crop.

Location.—**A. Cousin's farm, Feluga, Tully.**

Soil Type.—Gravelly loam (granitic).

Variety.—Badila. Age of crop—Eleven and a-half months. Nature of crop—First ratoon.

RESULTS.

—	No Fertilizer.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate.	240 lb. Sulphate of Ammonia + 180 lb. Potash.	360 lb. Superphosphate + 180 lb. Potash.	240 lb. Sulphate of Ammonia + 360 lb. Superphosphate + 180 lb. Potash.
Tons cane per acre	25·6	34·8	29·9	34·3	31·6
C.C.S. in cane	15·7%	15·2%	15·4%	15·3%	15·3%
Value of crop	£51 11 0	£67 3 0	£58 14 0	£66 16 0	£61 11 0
Less harvesting costs	£9 16 0	£13 7 0	£11 9 0	£13 3 0	£12 2 0
Return	£41 15 0	£53 16 0	£47 5 0	£53 13 0	£49 9 0
Increased return due to fertilizer	..	£12 1 0	£5 10 0	£11 18 0	£7 14 0
Cost of fertilizer and application	..	£2 16 0	£3 3 0	£3 2 0	£4 5 0
Profit from fertilizer	..	£9 5 0	£2 7 0	£8 16 0	£3 9 0

The influence of soil variability again entered to vitiate the results of this trial, but there is a definite over-all increase from fertilizer.

Location.—**H. Spencer's farm, Feluga, Tully.**

Soil Type.—Gravelly loam (granitic).

Variety.—Badila. Age of crop—Twelve months. Nature of crop—Plant cane.

RESULTS.

—	All Plots received 100 lb. potash: in addition—				
	No Further Fertilizer.	200 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	200 lb. Sulphate of Ammonia + 500 lb. Super-phosphate.	400 lb. Sulphate of Ammonia + 250 lb. Super-phosphate.	400 lb. Sulphate of Ammonia + 500 lb. Super-phosphate.
Tons cane per acre	36·8	41·1	41·7	43·8	44·4
C.C.S. in cane	14·3%	14·6%	14·7%	14·2%	14·1%
Value of crop	£65 10 0	£75 5 0	£77 1 0	£77 4 0	£77 10 0
Less harvesting costs	£14 2 0	£15 15 0	£16 0 0	£16 16 0	£17 0 0
Return	£51 8 0	£59 10 0	£61 1 0	£60 8 0	£60 10 0
Increased return due to fertilizer	..	£8 2 0	£9 13 0	£9 0 0	£9 2 0
Cost of fertilizer and application	..	£2 5 0	£3 0 0	£3 4 0	£3 19 0
Profit from fertilizer	..	£5 17 0	£6 13 0	£5 16 0	£5 3 0

This "quantitative" trial on the gravelly loam has provided very interesting data. The extra 200 lb. of sulphate of ammonia and 250 lb. of superphosphate have produced increased yields of 2·7 and 0·6 tons of cane respectively. The results suggest that the double dressing of sulphate of ammonia is warranted, but that 250 lb. of superphosphate approximates to the optimum application of this manure. The results of the second ratoons may be expected to supply further valuable information on this point.

[TO BE CONTINUED.]

LIQUID MANURE.

To make liquid manure, soak a sugar bag of fresh poultry, cow, or pig manure for a week in a cask with the head knocked in—one holding 40 to 50 gallons is the most handy. Use the resulting solution at the rate of one part to three parts of fresh water. Fill the cask again, and when the manure has soaked for a week use the solution at the rate of one part to one part of fresh water. The cask may then be filled up a third time, and after the liquid has been allowed to stand for a week it may be used neat.

Do not apply liquid manure to plants if the soil is at all dry. Dry soil should first be watered.

The Grape Phylloxera.

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

LATE in 1910 the grape phylloxera (*Phylloxera vitifoliæ* Fitch) was recorded for the first time in Queensland, the infested district on that occasion being Enoggera. Adequate measures were adopted for dealing with the outbreak and nothing further was heard of this serious pest until November, 1932. During that month some vines in a Pinkenba vineyard were considered by their owner to be in an unhealthy condition and a field inspection and laboratory examination revealed the fact that phylloxera was well established in the vineyard. Phylloxera had probably been present for some considerable time in this particular Pinkenba vineyard, but it does not necessarily follow that it was the first centre of infestation in the district.

In view of the recurrence of phylloxera in this State it has been considered desirable to prepare a short illustrated account of this serious pest and of the measures that may be adopted in combating its ravages.

Economic Status.

The insect commonly known as the grape phylloxera is an aphid or plant louse and is without doubt a serious enemy of the grape vine. It is a native of the eastern United States whence it has spread to other parts of the North American continent, as well as to Europe, Africa, Asia, South America, and Australasia.

It was responsible for tremendous losses following its introduction to Europe some time prior to 1863, and is recorded as having destroyed about one-third of the vineyards of France within twenty-five years of its introduction from the United States. It was accidentally introduced to Victoria in 1875 and, as already mentioned, it occurred in a small district in this State in 1910.

While in no way desiring to minimise the seriousness of this pest, it may be said that it is now regarded with much less concern than was the case in the years immediately following its migration to Europe. This should not be interpreted as a suggestion that the presence of phylloxera in Queensland can be lightly regarded. On the contrary, every possible precaution should be taken to restrict phylloxera to the small area at present known to be infested.

Nature of Infestation.

An examination of the root system of infested vines at Pinkenba disclosed the presence of large colonies in quite a number of cases.

On the older roots many colonies were found in slight depressions on the root surface (Plate 18, fig. 6). These colonies frequently comprised very considerable numbers of eggs and other stages of the phylloxera aphid, and to the naked eye appeared as small yellowish patches of dust particles not unlike aggregations of curry powder. The effect of the feeding on the older roots is the production of swellings known as tuberosities. These tuberosities eventually decay, the breakdown commencing at, or near, the centre of the tuberosities where the tissue was first pierced by the aphids. The decay of these swellings is hastened by the presence of moist soil conditions.

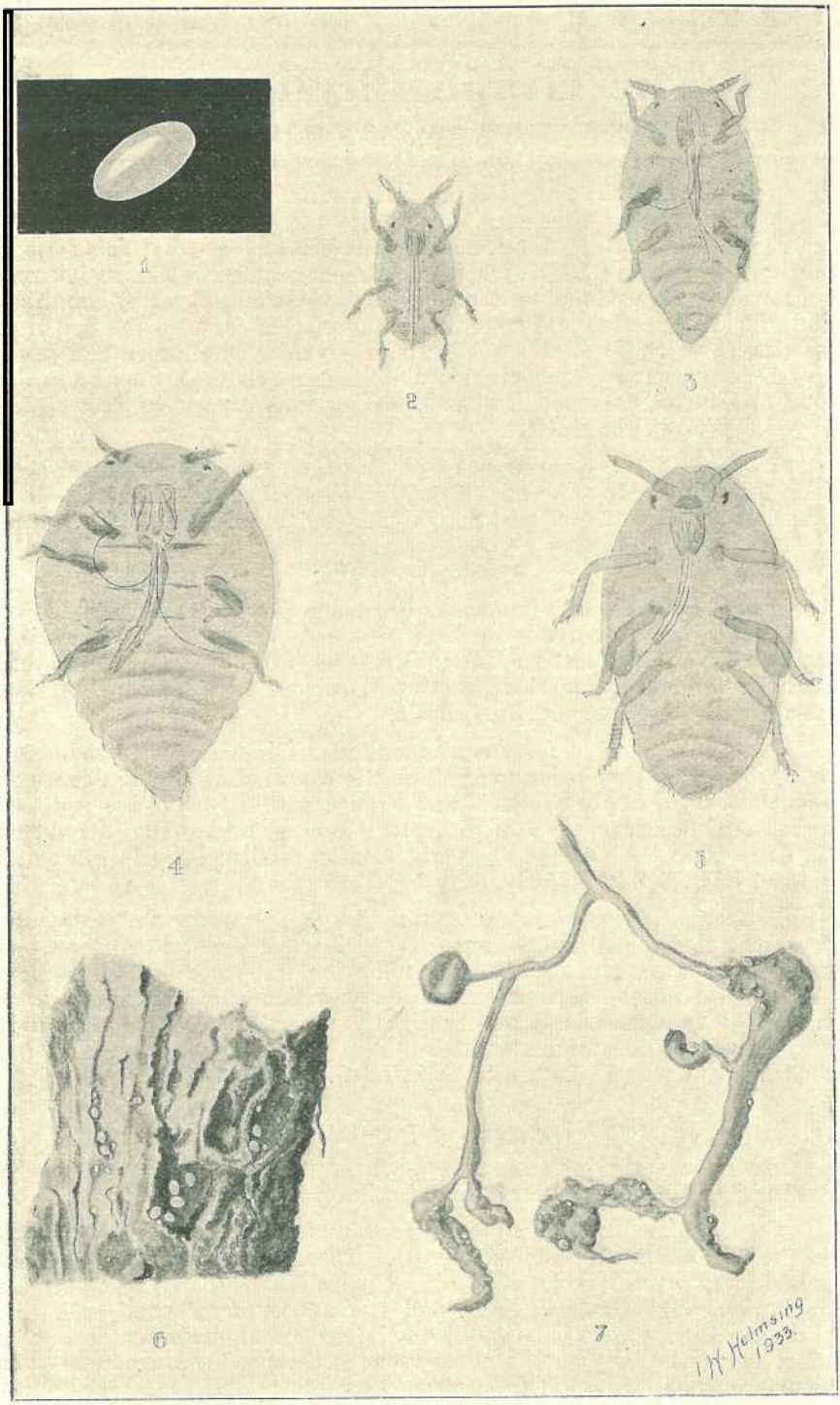

PLATE 18.—THE GRAPE PHYLLOXERA (*Phylloxera vitifoliæ* Fitch).

Fig. 1, Egg x 60. Fig. 2, First Stage Radicicole x 60. Fig. 3, Later Stage Radicicole x 60. Fig. 4, Adult Radicicole x 60. Fig. 5, Nymph, ventral view, x 60. Fig. 6, Portion of Grape Vine Root showing Radicicoles and Eggs *in situ* x 4. Fig. 7, Nodosities on Rootlets x 4.

On the younger white fleshy roots the infestation had quite a different appearance (Plate 18, fig. 7); the illustration of this type of attack shows the presence of scattered specimens of phylloxeræ, and it will be noted that when the phylloxeræ are feeding on the fleshy rootlets, swellings occur which are somewhat similar in appearance to those produced by nematode infestation. These swellings on the young roots are known as nodosities and are rapidly formed as a reaction to the puncturing of the root tissue by the phylloxeræ. Rootlets on which nodosities form generally cease to grow or are greatly retarded in growth and the nodosities themselves decay in a few weeks, the rapidity with which decay takes place being dependent upon temperature and moisture.

The presence of large numbers of phylloxeræ on the roots producing the tuberosities and nodosities just referred to must obviously have a very prejudicial effect on the welfare of the vine. When infestation first occurs it is indicated by a shortening of the canes and a premature yellowing of the leaves. The vines subsequently become more stunted and, where the conditions are favourable for the spread of phylloxera, they eventually die. During the progress of the infestation the vines may produce an unusually abundant crop of grapes, but these are generally small and sour.

In discussing the nature of the infestation attention has so far been confined to the root-inhabiting or radicicole form. A second form, the gallicole or gall-making form, also occurs in some countries, but in this case it is found on the leaves instead of on the roots. This form was not found at Pinkenba and, indeed, although phylloxera has long been established in certain parts of Australia, the leaf gall-making form has been observed only on very rare occasions in this country.

Where the leaf gall-making form occurs the young aphids feed on the upper surface of the leaf, and wherever a puncture has been made the leaf tissue reacts in such a manner as to build a hollow gall within which the insect continues feeding.

Obviously the root-inhabiting form is the more important in so far as the welfare of the vine is concerned, but the leaf-inhabiting form is the more dangerous in so far as the spread of the pest by its own agency is concerned. As has already been indicated, the latter form fortunately has so far been of extremely rare occurrence in Australia.

Life History.

The life history of the grape phylloxera is distinctly complicated and varies appreciably in different countries. Variation occurs even as between the eastern and the western United States, both the root and leaf gall inhabiting forms occurring in the former, whereas the whole of the Californian infestation has been caused by the root-inhabiting form. Consequently, in view of the short duration of the present Queensland outbreak, little can be said about the life history under Queensland conditions.

The very minute oval yellowish eggs (Plate 18, fig. 1) have been found singly and in clusters on the roots of the vines. The adult root-inhabiting form (Plate 18, fig. 4) is about one twenty-fifth of an inch in length and is yellowish in colour.

Influence of Soil Type on Infestation.

Elsewhere it is generally considered that infestation rarely occurs in well drained, loose, sandy soil, and, indeed, it has been claimed that vines growing in such soils are almost immune to attack.

Infestation is frequently very severe in vineyards established on low-lying, poorly drained soil lying on a shallow and compact subsoil.

Control Measures.

In the case of such an outbreak as that under consideration, the first control measure generally undertaken is one ensuring that the pest will have little chance of spreading from the original infested area. The City of Brisbane has accordingly been declared a quarantine area and the Proclamation prohibits the removal "of all plants, or portions of plants, of all and every species of Vitis," excepting only the fruit thereof. Pinkenba is within the City of Brisbane area. The strict observance of this quarantine should materially assist in handling the problem.

Various measures have been adopted for combating the pest in infested districts elsewhere, the three most important of which are soil fumigation, flooding the vineyard, and the selection of suitable resistant root stocks.

Soil fumigation has been extensively employed for combating phylloxera infestation, but there are two important objections to its use in Australia. The first is that the actual cost of the fumigant and its application is distinctly high, and the second is that its efficiency is most pronounced in the sandy soils which, as has already been indicated, are by no means favourable to the development of phylloxera. In some other types of soil more favourable to phylloxera infestation, the results of carbon bisulphide fumigation are much less satisfactory. The use of this insecticide, therefore, cannot be recommended under Queensland conditions.

Paradichlorobenzene has more recently been the subject of experiments in Italian vineyards and promising results have been reported following the use of this soil fumigant. The cost factor would, however, be rather heavy in the case of vineyards, and no recommendation can at present be made in favour of the use of paradichlorobenzene for this purpose.

The flooding of vineyards has been extensively practised in Europe and California, but the application of this control measure is obviously restricted to certain areas in which the water supply is available and the nature of the land permits of safe flooding. In California the practice has been to flood the vineyard to a depth of 6 inches for seven to ten days in autumn, the effect of such treatment being to drown the phylloxeræ. This control measure is going out of favour in California, and greater attention is being paid to the use of resistant root stocks.

Mention has already been made of the fact that phylloxera is a native of the eastern United States, where wild vines have been growing in association with the pest for a very long time. Under these circumstances a number of native American vines have been evolved which show a high degree of resistance to phylloxera infestation. On such vines phylloxera does not increase rapidly in numbers, and even when present the swellings resulting from the feeding of the aphids are sufficiently unimportant to leave the root system in a healthy condition.

The existence of these native American vines has provided the vigneron with a very effective weapon for fighting phylloxera, and the use of resistant root stocks is now the favourite control measure employed against this pest.

The desired European variety is grafted on resistant root stocks, thereby obtaining the required quality of fruit while at the same time preserving the resistance conferred by the root stocks of resistant vines.

One point of importance must be mentioned in connection with the use of resistant root stocks, and that is their comparatively narrow range of adaptability. The European vine is capable of producing good crops on a very wide range of soil types, but such is not necessarily the case with the resistant root stocks. A suitable resistant stock must be one that will flourish under the conditions of soil and climate prevailing in the district in which it will be used and, furthermore, it must be sufficently strong to carry the grafted vine and enable it to produce a large crop of satisfactory quality. The selection of suitable root stocks is, therefore, a matter requiring good local knowledge and experience.

STRAWBERRY TRIALS.

The Secretary for Agriculture and Stock (Mr. F. W. Bulcock) has made available the following report by Mr. H. L. Prest, Instructor in Fruit Culture, upon the year's operations at the Strawberry Experiment Plot on the plantation of Mr. W. Mitchell at Chevallum, near Palmwoods:—

During the 1932 season the following varieties of strawberries have been under observation:—Aurie, Phenomenal, Frenchi, Marguerite-Phenomenal, Bribie Seedling, Cresswell, King Edward, and Wilbur.

Unfavourable seasonal conditions prior to planting caused a shortage of runners; as far as possible selected runners from the previous plot were planted. In order to fill the plot, these were augmented by specially selected runners from Montville, Buderim, Chevallum, and Eudlo.

Following a good strike, weather conditions were dry, and the plants appeared to remain stationary for a period. With more favourable conditions, their growth was rapid and most satisfactory.

Aurie.—As in the previous season this variety did remarkably well. Plants were large, healthy, and vigorous, and produced excellent crops. The berries were large, of good colour, and firm texture. The fruiting period was well extended, and an excellent crop of jam fruit was harvested after the main crop.

Phenomenal.—In addition to runners from the 1931 plot, it was necessary to obtain runners from Montville, Buderim, Chevallum, and Eudlo. The plants made good growth, budded freely, and an excellent crop set. The berries were large, of good colour and texture. An excellent crop was harvested. The runners from the plot appeared to be most satisfactory, closely followed by those from Montville, Buderim, and Chevallum. Eudlo runners did not appear to be so vigorous.

Frenchi.—This variety again proved to be a vigorous grower, fruited well, of good size, colour, and texture. The habit of growth, fruiting, and fruit very closely resemble that of the Phenomenal.

Marguerite-Phenomenal.—Selected runners were procured from Buderim. A vigorous grower, fruits well, and of good size, colour, and texture. This variety closely resembles the Phenomenal, and would suggest that the Marguerite strain has run out.

Bribie Seedling.—An extremely vigorous grower, with very large medium to dark foliage. Berries small globose conic, dark red in colour, with a rich fruity flavour.

Cresswell, King Edward, and Wilbur.—These varieties are strong vigorous growers, the fruit small and dark-red in colour.

Comments.—The Aurie and Phenomenals have again shown themselves to be the most suitable varieties for commercial plantings in the Palmwoods and surrounding districts.

The Phenomenal appears to set better fruit where a polleniser is provided. Cresswell and King Edward would appear to be satisfactory pollenisers. Frenchi and Marguerite-Phenomenal can be recommended, though observations to date suggest there is little if any difference between these two varieties and Phenomenal.

The External Parasites of Sheep.

By F. H. S. ROBERTS, M.Sc., Entomological Branch.

A PARASITE may be defined as an animal which lives in or on another animal and at its expense, the second animal being known as the host. Those parasites which live on the host are known as external parasites or ectoparasites, and are represented by lice and ticks, in contrast to the internal parasites or endoparasites, such as the various species of worms which are to be found infesting the different organs and tissues inside the animal.

External parasites are all arthopods or animals possessing six or eight legs. Those with six legs in the adult stage are insects, those with eight legs mites and ticks. In these notes only parasites which spend all or most of their life on the sheep are dealt with, as these are the most important forms and include the lice, mites, ticks, ked, and blowflies. Such parasites as the many species of biting flies are but temporary in their parasitism, visiting the animals only when food is required, and as, moreover, they are not by any means confined to the sheep as a host, they may be regarded as of little consequence.

The various species of blowflies which attack sheep in Queensland have already been dealt with in the October, 1931, issue of this Journal, to which the reader is referred.

Lice, mites, and keds cause itching and scratching. The subsequent loss of nervous energy and the interference with nutrition rapidly bring about a loss in condition. Infested sheep will not fatten, young sheep may remain stunted, and the vitality of the flock may be so decreased as to predispose it to more serious diseases. Biting at the irritation may cause the formation of sores with subsequent blowing by flies; whilst scratching and rubbing result in a serious loss of wool, the fleece being reduced in value as it becomes ragged, broken, and stained with the parasites' excreta.

Infestation with ticks may be regarded as being generally unimportant except in the case of the scrub tick which may be responsible for serious mortalities.

Although some of the external parasites are very minute in size, all, with the exception perhaps of the mites, are visible to the naked eye and can readily be detected on close examination. The poor condition of the sheep and the ragged and broken fleece is usually a sure sign of the presence of these parasites. In view, therefore, of the heavy losses caused through the presence of these pests, losses which in Queensland must be increasing every year, a knowledge of these various parasitic forms and of the methods for combating them is essential to the pastoralist who wishes to protect his flocks from their depredations.

SHEEP LICE.

Two species of lice are known to be present among sheep in Queensland, the red-headed sheep louse, *Bovicola ovis* L. (*Trichodectes sphærocephalus* Nitzsch), and the foot louse (*Linognathus pedalis* Osborn). They belong to the order *Anoplura*. The red-headed sheep louse is a member of the suborder *Mallophaga*, which includes all those species of lice known as biting lice. Biting lice have the mouth parts formed for feeding upon hair, feathers, skin, scales, and scabby or scurvy

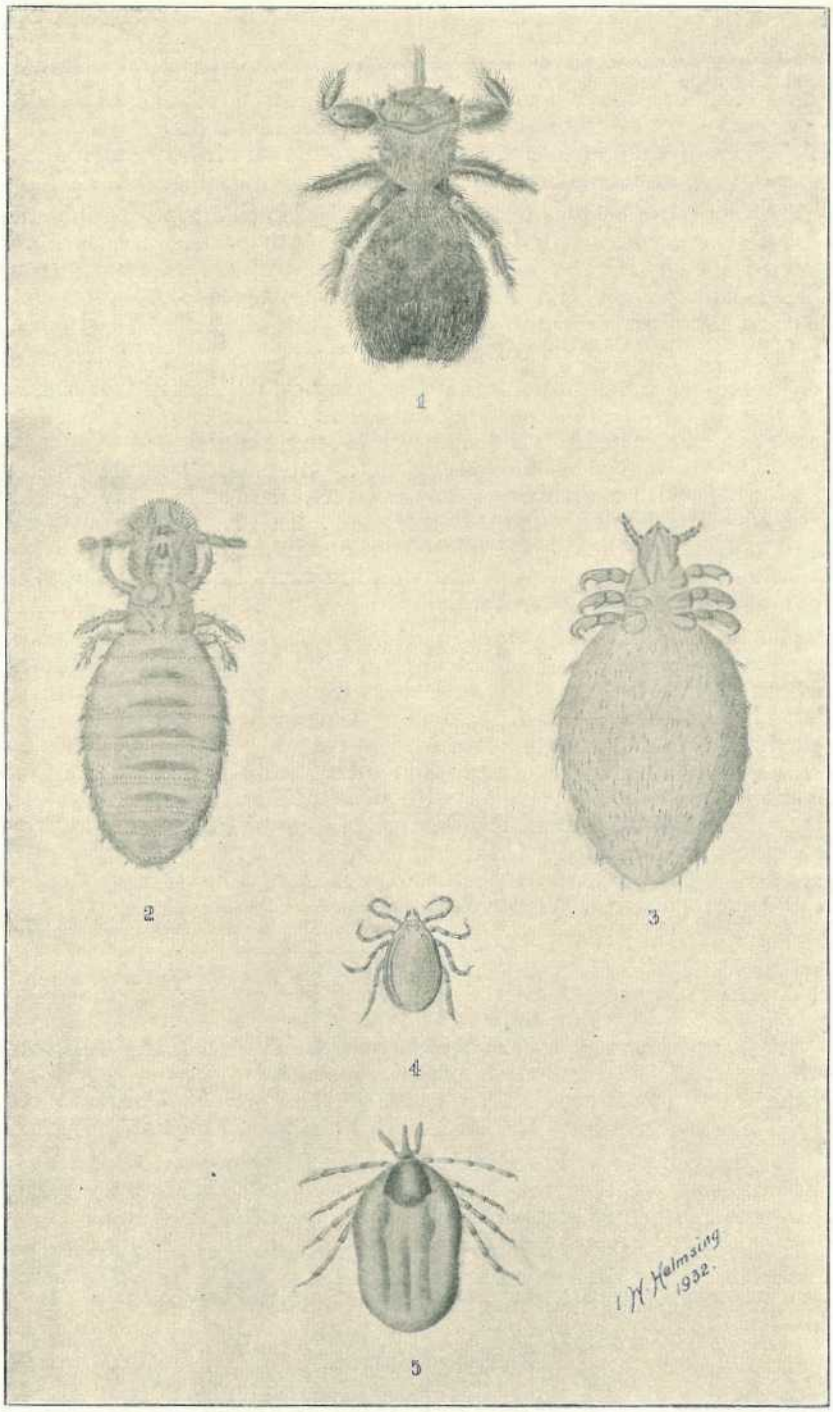

Plate 19.—External Parasites of Sheep.

Fig. 1—Sheep "Tick" or Ked, *Melophagus ovinus* Linn., × 7.
Fig. 2—Red-headed Sheep Louse, *Bovicola ovis* Linn., × 23.
Fig. 3—Foot Louse, *Linognathus pedalis* Osborn, × 23.
Fig. 4—Scrub Tick, *Ixodes holocyclus* Neumann (Male), × 5.
Fig. 5—Scrub Tick, *Ixodes holocyclus* Neumann (Female), × 5.

material found amongst the hair and feathers of their hosts. They do not suck blood or live on blood in any way except when it occurs scattered on the skin surface through the infested animal biting or scratching itself. These lice are most commonly to be found on birds, though nearly all domesticated animals harbour some species of the suborder.

The foot louse belongs to the suborder *Siphunculata,* which includes the true blood suckers. In this group the mouth parts are formed for piercing the skin and sucking up the blood and fluids. They are to be found on mammals only, and no species of sucking louse occurs among birds.

Description.

The red-headed sheep louse has been long established in Queensland and is a small flattened insect about one twenty-fifth of an inch in length (Plate 19, fig. 2). The head is broader than long, reddish in colour, with prominent eyes and short three-segmented antennæ. The abdomen is pale brownish with a number of darker transverse bands. The legs are short and yellowish with one terminal claw. This is the more common sheep louse, and is to be found close to the skin among the wool of the neck, shoulders, back, and thighs, though in cases of severe infestation it may occur on all parts of the body.

The foot louse has appeared among Queensland sheep only within recent years, and as yet does not appear to be by any means common. This louse (Plate 19, fig. 3) has a short bluntly pointed head about as wide as it is long. It is much longer and broader than the biting louse, measuring up to one-twelfth of an inch in length. The mouth parts are formed for piercing and sucking. The antennæ are prominent and five-segmented, the terminal segment with three or four bristles. Eyes are absent. The legs are strong, terminating in a powerful claw. The front pair of legs are the smallest, the hind pair the largest. As in all lice, wings are absent. As its name infers, it is to be found about the feet and undersides of the legs towards the belly.

Life History.*

The life histories of all the species of lice are very similar, that for each species differing only in detail. The eggs, commonly known as "nits," are fastened by the female to the hair, wool, or feathers of the host. After an incubation period of several days the eggs hatch and the young lice appear. They resemble their parents except in size, and reach sexual maturity by a series of moults or castings of the skin.

The eggs of the red-headed louse hatch in from six to eight days, though in cold weather they may take as long as ten days. Sexual maturity is reached in sixteen to eighteen days after hatching.

In the case of the foot louse the eggs hatch in ten to eighteen days, the average period of incubation being about twelve days. The young lice begin to lay eggs when they are eleven to twelve days old.

Means of Spread.

Once present in a flock lice spread very rapidly. Most cases of lice infestation occur from direct contact, but it should not be forgotten

* The life history figures given in these notes are taken from records made in other Australian States and in the United States of America, but it is not thought that Queensland conditions would induce any great degree of variation in the respective periods.

that it is possible for clean sheep to become infested from yards, sheds, and paddocks which have previously housed lousy sheep.

The lice spend the whole of their life on the sheep and can live only a short time off the host. When removed from the sheep, sucking lice live about three or four days, and biting lice six to eight days. Under such conditions the lice do not ordinarily continue to lay eggs, but eggs attached to wool may continue to hatch for three weeks or longer when detached from the sheep and kept in a warm place. Young lice will live only three or four days off the sheep. Thus it will be seen that paddocks and yards containing scraps of wool detached from the sheep when rubbing and biting themselves may remain infective for at least twenty-five days. Shearing sheds in which lousy sheep have been shorn are probably one of the greatest sources of infestation. During the process of shearing and handling the fleeces some of the parasites become detached and tags of wool containing lice and eggs are scattered throughout the shed. During cold weather dislodged lice and eggs are usually not a source of danger, as the lice become inactive and the eggs fail to hatch. This also applies to infested yards and paddocks. During warm weather, as previously mentioned, the shed may, however, be a source of infestation for twenty-five days or more.

Control and Eradication.

As lice are the cause of a fairly heavy economic loss to the sheep industry, it should be the aim of any grazier possessing lousy sheep not only to control them but to eradicate them altogether. If clean sheep are to be introduced into an infested property, they should be placed in a paddock which has been spelled at least thirty days. By a system of paddock rotation and, of course, dipping, the eradication of lice is by no means a difficult matter. Particular attention to cleanliness in the shearing shed is essential. If clean sheep are to follow infested sheep after shearing, there should be an interval of thirty days between shearings. If this is not practicable the shed should be thoroughly cleaned out, all loose wool gathered and burnt, to be followed up by a liberal washing out with boiling water and a good disinfectant.

For biting lice two dippings at an interval of fourteen to sixteen days are considered sufficient to eradicate them from a flock. With the foot louse, on the other hand, owing to the extended incubation period of ten to eighteen days, and to the comparatively short maturity period of eleven to twelve days, it is necessary to dip three times at ten-day intervals. Should this be impracticable with large numbers of sheep, a second dipping after the interval recommended for the biting louse will be found to give good results.

THE SHEEP "TICK."

The sheep "tick" or ked, *Melophagus ovinus*, is not really a tick but a wingless fly. Ticks have eight legs, an inconspicuous head, and a fused thorax and abdomen, while the ked has only six legs and a distinct head, thorax, and abdomen. This parasite belongs to the Dipterous family Hippoboscidæ, members of which, generally known as spider or louse flies, occur on a great variety of animals, especially birds. In colour the ked is reddish or grey brown and may measure up to one-quarter of an inch in length (Plate 19, fig. 1). The head is small and sunk into the thorax. The abdomen is comparatively large, especially when the insect has just fed. The mouth parts are constructed for

piercing and sucking, and the insect lives on blood. It is capable of moving fairly rapidly among the wool, and its movements forwards and sideways are distinctly crab-like. Keds appear to be most numerous among the wool of the neck, breast, shoulders, belly, and thighs.

Life History.

The female sheep tick is curious in that instead of an egg it lays a fully matured larva which is enclosed in a soft white membrane. This is, strictly speaking, a pupa, but is commonly known as the "egg." The true egg, however, is retained within the body of the female and hatches there. Seven to ten days after the egg hatches the pupa is laid and is attached to the wool by a glue-like substance. In about twelve hours the white membrane hardens and turns brown. After a period varying from nineteen to twenty-four days, depending upon the season of the year, the adult fly emerges from the pupa. In thirteen to twenty-three days after emergence the female lays her first pupa. The life cycle is, therefore, egg and larval stage within the female insect, seven to ten days; pupal period nineteen to twenty-four days; and laying of first pupa thirteen to twenty-three days after emergence. The female deposits her pupæ, for a while at least, at the rate of one every nine days, but the total number she is capable of laying is not known.

Control.

Like the lice, the ked spends the whole of its life upon the sheep and is incapable of breeding elsewhere as is frequently thought. The adult insect, however, has been known to live as long as eighteen days when detached from the sheep, though usually the survival period rarely extends beyond four or five days. The pupæ have been known to remain viable for as long as forty-six days in tags of wool which have become removed from the sheep by biting and scratching. Here again, as in the case of lice, sheep may become infested in two ways—either by contact with other infested sheep, which no doubt is the chief method of spread, or from yards, sheds, and paddocks which have housed infested sheep. In order, therefore, to make sure that such yards, sheds, and paddocks are clean, it would be necessary to spell them during the warmer months for a period of about two months. During the winter, however, if the temperature drops to freezing at any period during the day or night, adult ticks will not survive longer than about five days, and as pupæ are readily killed by frosts, such infested yards, &c., need not be spelled longer than a week. Shearing-shed sanitation is again stressed.

In order to get the best results from dipping it is necessary to dip twice. The second dipping is required as, although the first dipping will probably kill all the adult ticks, many of the pupæ will survive and form a nucleus of reinfestation. This second dipping is recommended twenty-one to twenty-five days after the first.

THE SCRUB TICK.

Four species of ticks have been recorded as attacking sheep in Queensland—namely, the cattle tick, *Boophilus australis;* the brown dog tick, *Rhipicephalus sanguineus;* the Indian dog tick, *Hyalomma ægyptium;* and the scrub tick, *Ixodes holocyclus.* Of these the scrub tick (Plate 19, figs. 4 and 5) is the only one of importance, and at times may be responsible for heavy losses among flocks in ticky areas. *Ixodes holocyclus* is confined practically to the scrubs of the eastern coast, and

not only is it regarded as a serious pest of sheep in these areas, but may also cause fatalities among dogs, cats, foals, calves, and even man. On sheep it is usually to be found on those parts of the body not covered by wool, but when very numerous may be located anywhere on the skin surface.

Life History.

The natural hosts of this tick are the native marsupials which are to be found in the scrubs. The tick is known as a three-host tick, which means that it drops from the host in order to undergo the moults which terminate one stage in the life cycle and commence another, reattaching itself to another host at the completion of the moult. The female when replete drops from the host on which she has been feeding, and after a period of about eleven to twenty days commences to lay her eggs, as many as 2,500 eggs being deposited. In warm weather the eggs hatch in forty-nine to sixty-one days. The tiny larva or seed tick which emerges has only six legs (adults have eight), and, after remaining quiescent for about seven days, attaches itself to the first suitable animal that comes along and commences to feed. In four to six days the larva is fully fed, drops from the host, and seeks some sheltered spot, remaining there for nineteen to forty-one days, when it moults, and this time the first eight-legged stage appears—the nymph. The nymph in its turn attaches itself to another animal, and, after feeding for four to seven days, drops to the ground and moults again at the end of another twenty-one to seventy-one days. This time the moult produces the adult tick, which in another seven days commences seeking for the final host.

Injury.

The danger of scrub tick attack lies in the possibility of the inducement of a condition of paralysis. Such a condition is produced by the mature female tick and possibly also by the nymph, and apparently requires at least five days of attachment. The actual cause of this paralysis is unknown, but it is thought to be due to a toxin which is secreted either in the salivary glands or in the ovaries. Recovery may be possible providing the condition is not too far advanced and the ticks removed, but, generally speaking, once paralysis becomes evident the animal dies.

Control.

Scrub ticks appear to be abundant mainly during the spring months, and during these months short-interval dippings may be found advantageous when small flocks are concerned. The trypan blue treatment which is recommended by the Chief Inspector of Stock is successful if treatment is not left too late. His recommendations are as follows:—

"A 2 per cent. solution (about nine grains to a fluid ounce of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The solution is used. The hypodermic syringe and needle before being used should be placed in a dish containing water, then placed over the fire and boiled for ten minutes. This is now ready for use when the solution has cooled.

"The injection can be made anywhere under the skin, and in the case of sheep under the arm where the skin is free from wool is the most suitable spot. A fold of skin is caught up with the fingers of the left hand and the needle manipulated with the right hand.

"The dose for sheep is one to five tablespoonsful dependent upon the age of the sheep. A second dose may be given twelve hours after the first should it be deemed necessary."

SCAB.

This disease is caused by a tiny mite which burrows into the skin tissues and causes the formation of crusts or scales. It is a very serious disease in various parts of the world, but is as yet unknown in Queensland.

Dipping.

Several good proprietary dips are on the market, the arsenical dips giving, perhaps, the best results. Sheep should be dipped as soon as they have recovered from the shock and knocking about of shearing, and when the wool is long enough to hold the dip—say, about four to six weeks off shears. Since lice, keds, and ticks live on the skin surface and in the fleece, the infested animals need not be held in the dip longer than is necessary to wet the fleece and exposed surfaces. About one minute in the dip is usually considered long enough to wet the animals thoroughly. The heads of all the sheep should be pushed or ducked under the surface long enough to ensure complete wetting. Sheep should not be rushed through the dip.

The number of gallons required to charge a dip may be computed in the following manner:—Add together the length at the dip line and the length of the bottom and divide by two. This gives the average length. Obtain the average width in the same manner, and multiply the average length by the average width in inches, and the product by the depth. Divide this by 231, and the result will be the approximate number of gallons required. As each sheep when freshly shorn will carry out about two quarts of dip, the quantity carried out and retained by the animals plus the quantity required to charge the dip will be a fair estimate of the total quantity of dip required.

Adverse conditions at the time of dipping can and do have a detrimental effect on the result. They are, however, sometimes beyond control, but by using a dip of unvarying and guaranteed consistency good results will be obtained. The care and condition of sheep before and after dipping are matters which should not be overlooked.

Sheep should not be dipped during extremes of heat and cold, when thirsty, or when in a heated state from driving. They should be yarded overnight and dipped early next day so that they may have abundant time to dry before nightfall. When ewes and sucking lambs have been dipped the lambs should be kept apart for some time after dipping. Dipping on cloudy days is not advisable as the sheep take a long time to dry and are exposed to the risk of rain which would decrease the efficacy of the treatment to a large extent.

In conclusion, it may be pointed out that failure to maintain a flock free from external parasites in spite of regular dippings and spelling of yards, &c., may be due to (1) carelessness in mixing the dip; each maker supplies certain instructions with his dip which should be followed implicitly; (2) rushing the sheep through the dip so that each animal fails to get thoroughly wet; (3) failure to make a complete muster; (4) failure to ascertain whether sheep bought between dippings and mixed with the flock are clean or otherwise; and (5) the admission of strangers among the flock through broken boundary fences, &c.

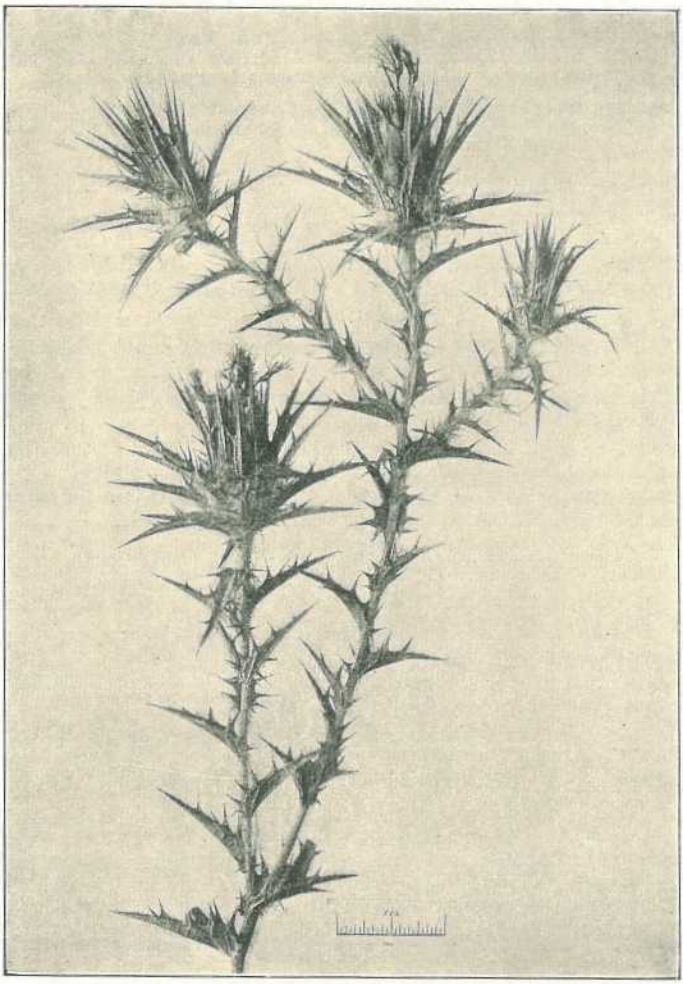

PLATE 20.

SAFFRON THISTLE OR STAR THISTLE (CARTHAMUS LANATUS).

A spiny plant 2 to 3 feet high. Leaves placed alternately on the stem and not opposite to each other. Leaves placed on stem without a stalklet. Shape of leaves triangular or narrow, 1 to 2 inches long. Each leaf ends in a rigid spine and bears 2 to 4 rigid spines on each margin or side. The veins, of which there are two to three on each side of the midrib, are raised and prominent on the underside of the leaves. The flowers, which are yellow, occur at the ends of the branchlets. Each flower is surrounded by a fairly dense cluster of bracts which are similar to the leaves but are sometimes smaller. Including the spiny leaf-like bracts the flowers are 2 to 3 inches long and 3 to 4 inches across.

Distribution in the State.—Both coastal and inland localities are represented by the specimens in the Queensland Herbarium:—Brisbane, Kin Kin, Kingaroy, Mundubbera, Warwick, Roma, and Winton.

The species is a native of the Mediterranean region, and is a common weed in New South Wales.

It has now been declared a noxious weed throughout Queensland.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

ARRANGEMENTS have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd January, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers.

Following is a list, continued from the January Journal, of lectures arranged:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK. RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Thursday, 16th March, 1933—"Internal Parasites of Sheep." F. H. S. Roberts, M.Sc., Entomologist.

Tuesday, 21st March, 1933—"Hints to Beginners in Beekeeping." Henry Hacker, F.E.S., Entomologist.

Thursday, 23rd March, 1933—"Onion Cultivation in Central Queensland." C. S. Clydesdale, Senior Instructor in Agriculture, Rockhampton.

Tuesday, 28th March, 1933—"Marketing of Pigs" (A Review of the Markets). E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 30th March, 1933—"Profit and Loss in Pig Production." L A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 4th April, 1933—"Breeding Poultry Stock." P. Rumball, Poultry Expert.

Thursday, 6th April, 1933—"Feeding for Egg Production." J. J. McLachlan, Poultry Inspector.

Tuesday, 11th April, 1933—"Potato Diseases." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Thursday. 13th April—"Animal Health." D. Forsyth Stewart, B.V.Sc., Government Veterinary Surgeon.

Tuesday, 18th April, 1933—"Wool Classing for Marketing." J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 20th April, 1933—"Rain Forest Trees and Their Use" W D Francis, Assistant Botanist

Tuesday, 25th April, 1933—"Plants Poisonous to Live Stock in Queensland," Part I. C. T. White, Government Botanist.

Thursday, 27th April, 1933—"Plants Poisonous to Live Stock in Queensland," Part II. C. T. White, Government Botanist.

Tuesday, 2nd May, 1933—"Buffalo Fly Control Measures in North-west Queensland." A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon.

Thursday, 4th May, 1933—"Tuberculosis in Dairy Stock—Incidence, Eradication, and Control." A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon.

Tuesday, 9th May, 1933—"Some Present Problems in Wheat Production" R. E. Soutter, Wheat Breeder.

Thursday, 11th May, 1933—"White Ants." J. A. Weddell, Assistant Entomologist.

Tuesday, 16th May, 1933—"The Progress of Horticulture in Australia." H. J. Barnes, Instructor in Fruit Culture.

Thursday, 18th May, 1933—"Hereditary Unsoundness of Horses." A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon.

Tuesday, 23rd May, 1933—"Sheep Breeding and Selection." J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 25th May, 1933—"Sheep and Their Environment." J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, 30th May, 1933—"Soils and Soil Fertility." E. H. Gurney, Senior Analyst.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of Australian Illawarra Shorthorn Society, Jersey Cattle Society, and Friesian Cattle Society, production charts for which were completed during the month of November, 1932 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Cherry 7th of Rosemount	A. J. Bryce, Maleny	13,733	612·295	Bright Star of Cosey Camp
Dorothy of Penrhos	A. Sandilands, Wildash	10,893	463·477	Admiration of Strathdhu
Lyndith Betty 2nd	S. Teese, Veresdale	11,988·39	413·287	Redman
Rosebud II. of Wilga Vale	C. O'Sullivan, Greenmount	10,694·75	401·935	Reliance of Blackland
Model's Pride (240 days)	S. Teese, Veresdale	9,793	379·887	Bessie's Royal
Bella 7th of Fairlie	C. B. Mitchell, Fairlie	9,670	366·285	Kitchener of Burradale
Sheila of Penrhos	A. Sandilands, Wildash	8,258·75	363·106	Gentle Lad of Towans
Melba 6th of Rosemount	A. J. Bryce, Maleny	9,076·35	359·354	Bright Star of Cosey Camp
Perfect 2nd of Rosenthal (365 days	S. Mitchell, Warwick	12,902	576·497	Drummer
Rosebud 9th of Rosentha (365 days)	S. Mitchell, Warwick	12,467	550·214	Sunshine
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Princess 8th of Fairlie	C. B. Mitchell, Fairlie	7,560·5	334·515	Dividend of Rosentha
SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 390 LB.				
Pansy of Penrhos	A. Sandilands, Wildash	9,507·25	398·508	Admiration of Strathdhu
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Pet 10th of Thornleigh	C. O'Sullivan, Greenmount	9,360·75	334·219	Fussy's Pride of Fairfield
Countess of Mountain Home	M. C. Lester, Laidley Creek West	8,459·14	286·623	Headlight of Greyleigh
SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB.				
Roan Nellie of Alfavale	W. H. Thompson, Nanango	9,797·15	358·336	Essential of Greenfield
Fairlie Princess 12th	C. B. Mitchell, Fairlie	7,450·25	301·213	Auditor
Westbrook Home Ivy 12th	M. C. Lester, Laidley Creek West	7,633·23	269·577	Sunrise of Rosenthal

JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
Molly of Penrhos	A. Sandilands, Wildash	6,249	274·934	Bonnie Charmer of Coral Brae
Greylands Myrtle 2nd	Hemmings Bros., Murray's Bridge	6,403·75	242·768	Inspector of Greyleigh
JERSEY.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Lassie of Lightfield	J. Mollenhauer, Moffatdale	7,607·77	380·242	Laddie Palatine
Glengariffe Noble's Rozel 2nd	Cox Bros., Witta	5,839·55	350·095	Glengariffe Noble's Wellesby
JUNIOR, 4 YEARS OLD (BETWEEN 4 AND 4½ YEARS), STANDARD 310 LB.				
Golden Empress of Rosedale	Wakefield Bros., Atherton	6,567·35	328·925	Oxford Prince Palatine
Milklass of Rosedale	Wakefield Bros., Atherton	5,223·35	311·16	Oxford Prince Palatine
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Coronada (imp.)	J. Sinnamon, Moggill	6,576·78	370·047	Wonderful Volunteer
Seycombe Golden Grape	A. E. Trigger, Didcot	4,369·05	293·294	Oxford Northwood King
SENIOR, 2 YEARS OLD (BETWEEN 2½ AND 3 YEARS), STANDARD 250 LB.				
Boquet's Jubilee of Morago	D. R. Hutton, Cunningham	5,055·72	263·084	Goldfinder's Heir of Belleview
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
Seycombe Marie	A. E. Trigger, Didcot	4,571·5	293·454	Carnation Royal
Diana of Karoola	N. Alcorn, Maleny	5,150·6	286·337	Carnations Buttercup's Raleigh
Westward Ho Lady Melba	H. N. Thomason, Mount Mee	4,560	282·635	Ellerdale Nobility
Ringlet of Burnleigh	W. W. Mallett, Nambour	4,663·55	271·745	Trinity Darby
Seycombe Gardenia	A. E. Trigger, Didcot	4,207·5	269·888	Carnation Royal
Upwell Sunbeam	A. E. Trigger, Didcot	3,510·35	242·899	Carnation Prince Charles
Dewdrop 5th of Golden Hill	Chas. Klaus, Mundubbera	4,525·75	244·503	Pride's Hero of Bunleigh
Montrose Fern of Ellerslie	R. J. Crawford, Inverlaw	6,126·75	234·328	Montrose Gypsy of Glen Iris
Trecarne Milk Gir. III.	D. R. Hutton, Cunningham	5,606·67	324·636	Trecarne Golden King
Westwood Ho Lady Vale	H. N. Thomason, Mount Mee	4,940·8	247·416	Ellerdale Nobility
FRIESIAN.				
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
Oaklands Holly 6th	W. Richters, Tingoora	7,879·08	270·966	Pied Rock (imp.)
Oakland Beauty Rock III.	W. Richters, Tingoora	7,492·84	257·593	Pied Rock (imp.)

Answers to Correspondents.

BOTANY.

Bracken.

INQUIRER (Port Moresby)—

The common Bracken, *Pteridium aquilinum*, is very common in Australia. It has been thought several times to cause digestive troubles in stock, ultimately resulting in death. Bracken has long been regarded as a poisonous plant in the British Isles and on the Continent, and some years ago feeding tests were carried out by the British Ministry of Agriculture with a large quantity of Bracken, and the results are held to show conclusively that Bracken is poisonous—and fatally so—to cattle which may consume small quantities of it regularly, the poison being cumulative and ultimately causing death. Experiments conducted in British Columbia in 1917 showed that the ingestion of dried Bracken causes staggers in horses, and that in the hard winter of 1915-1916 the mortality among horses was very heavy. One instance is cited in which, out of twenty-four horses owned by eleven farmers, sixteen died of Bracken poisoning and two died from eating the green plant in a pasture where other vegetation was scarce. Bracken contains the poisonous Pteritannic acid, which is identical with the Filicic acid of the Male Fern (*Aspidium filix-mas*). In the cases of horses which died, Müller gives the symptoms as timidity, slower movement or action, loss of balance, dilated pupils, reddening followed by yellowing of the conjunctivæ, and slowing of the pulse. Pammell notes Bracken as an astringent and anthelmintic, and also says it causes enteritis, spasms, and paralysis. Thomson and Sifton indicate staggering, nervousness, constipation, and redness of the eyes, the two latter symptoms serving to distinguish Bracken poisoning from horsetail poisoning. Increasing weakness and great excitement preceded death. Most of these facts are taken from "Plants Poisonous to Live Stock," by H. C. Long, published by the University Press, Cambridge.

Salt Weed.

J.R.R. (Wooroolin)—

The specimen is *Atriplex semibaccata*, a native plant commonly known as Salt Weed. It is generally regarded as quite a useful fodder, and is not known to be poisonous or harmful to stock in any way. If a plant or plants caused the trouble referred to, it must have been some other than the one you forwarded.

Wild Lucerne or Emu Grass, Prickly Poppy, Cape Spinach, Molucca Balm.

W.C.H. (Aubigny)—

The specimens have been determined as follows:—

1. *Psoralea tenax*, a native plant popularly known as Wild Lucerne or Emu Grass, and one of the very best of our native fodders. It is not the same plant as the one that has come into prominence as a fodder in North Queensland under the name of Wild Lucerne. That plant is *Stylosanthes mucronata*, a native of the West Indies and tropical America, now naturalised in many warm countries. *Stylosanthes* established itself about Townsville some twenty years ago, and has gradually spread over most of the Northern coastal belt as far south as Rockhampton.
2. *Argemone mexicana* var. *ochroleuca* (Prickly Poppy or Mexican Poppy), a very common weed in parts of Queensland. It has been accused of poisoning stock, and possesses harmful properties. However, it is generally rejected by animals, and the only cases of trouble with it that have come under notice have been where the plant has been cut and allowed to wilt and stock have eaten the wilted plants, with fatal results.
3. *Emex australis* (Bull Head, Prickly Jack, or Cape Spinach), a very bad weed and a native of South Africa. This should certainly be destroyed as soon as possible.
4. *Moluccella lævis*, the Molucca Balm, a native of the Mediterranean region. It is found growing wild here and there on the Darling Downs, but we do not know that it is abundant in any one place. It was probably originally introduced as a garden plant. It is not known to possess any particular properties, harmful or otherwise.

General Notes.

Staff Changes and Appointments.

Messrs. J. W., R. J., and E. W. Grieve, of Glenhowden, Colinton, have been appointed Honorary Rangers under the Animals and Birds Acts.

Mr. Martin Shiels, Tallebudgera, via West Burleigh, and Mr. Edwin H. Crease, Upper Tallebudgera, have been appointed Honorary Rangers under "*The Animals and Birds Acts,* 1921 *to* 1924."

Constable H. H. Dunstall, of Richmond, has been appointed also an Inspector under "*The Slaughtering Act of* 1898."

Mr. Thomas Sharp, of Beechmont, via Canungra, has been appointed an Honorary Ranger under the Native Plants Protection Act.

Mr. Henry Flynn, Toll Gate Keeper, Tambourine, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Constable C. W. Greenhalgh (Ilfracombe) and Constable E. McKenzie (Theodore) have been appointed also Inspectors under the Slaughtering Act.

Mr. James Crouch, who holds the lease of Bishop Island, near the mouth of the Brisbane River, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. Henry G. Lamond, of the Holle Islands, Whitsunday Passage, has also been appointed an Honorary Ranger under the abovementioned Acts.

Constable Wm. Robinson, Officer in Charge of Police at Nebo, has been appointed also an Acting Stock Inspector.

Mr. O. L. Hassell, Instructor in Agriculture, Mareeba, has been appointed also an Honorary Ranger under the Animals and Birds Acts.

Papaw Levy.

Regulations under the Fruit Marketing Organisation Acts have been approved which will empower the Committee of Direction of Fruit Marketing to make a levy on all papaws marketed for the period from 14th December, 1932, to the 13th December, 1933. The levy is payable by growers on the basis of the quantity of papaws sold by them, and is at the rate of one penny for every four cases of papaws or part thereof. The sums raised by the levy shall be expended upon advertising in the interests of the growers concerned.

Banana Levy Extended.

Executive approval has been given to the issue of a Regulation under the Fruit Marketing Organisation Acts extending the Banana Levy Regulations for a further twelve months, from the 1st January, 1933, to the 31st December, 1933. These Regulations came into force in September, 1927, and have been extended each year since that date. Briefly, they empower the C.O.D. to make a levy on all bananas marketed in the State. The levy is payable by growers on the basis of the value of the bananas sold, and is at the rate of one penny for every £2 or part thereof of the net proceeds from sales. All sums raised by this levy are expended in the interests of the banana section of the fruit-growing industry of Queensland.

New Brands Regulations.

Regulations under "*The Brands Acts,* 1915 *to* 1932," have been approved which provide for the rescission of all existing Regulations passed in 1915 and subsequently, and for the substitution therefor of fresh Regulations in accordance with the provisions of the consolidated Acts, including the Amendment Act of 1932. The Regulations have not been altered to any great extent, except that the provisions of the Amendment Act passed this session have been given effect to therein.

Bee-keeping in Wide Bay and Burnett.

An Order in Council under "*The Apiaries Act of* 1931" has been issued which declares the Pastoral Districts of Wide Bay and Burnett to be a district for the purposes of the abovementioned Act. The provisions of the Act were applied to the Pastoral Districts of Moreton and Darling Downs in October, 1931.

Rural Topics.

A Profitable Piggery.

With a small but complete herd of breeding stock in the piggery at the Jubilee Sanatorium, Dalby, Queensland, good results have been obtained. The average number of sows kept is six with one purebred boar. Very few pigs are lost between birth and maturity and no disease of any type has been noted, the pigs growing and developing satisfactorily. During the past few years a Duroc Jersey boar has headed the stud, but he has been replaced by a Middle White, as the objective is principally porkers for use at the institution, the pigs not required as porkers being grown to baconer weight and then cured at the bacon factory, the hams and bacon being returned for use of those resident at the Sanitorium. The pig food consists of waste feed from the dining rooms and kitchen, spare vegetable matter, and milk, with grain as required to balance the ration. Matron Nutt is justly proud of her pigs, for they are a profitable investment.

Points on Poddies.

Always handle calves quietly and patiently. Feed at regular times each day and in regular quantities. Feed only clean sweet milk. Add some constituent to replace the feed value of the cream removed from the milk, and lime-water (see concluding paragraph) to assist digestion. Milk should be pasteurised if possible, and on no account should the froth be given to calves. Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place. Cleanse feeding buckets as carefully as you would all other dairy utensils. Keep the yard and its surroundings clean and free of harbour for flies, which are active carriers of disease. Provide shade in summer and shelter from winter wind and rain. Provide a suitable lick consisting of salt and bonemeal.

Lime-water of the requisite strength is easily made on the farm. There need be no fear of making it too strong, as water will only dissolve a certain limited amount of lime—½ grain to the ounce, or 10 grains to the pint. Add a bucketful (say 20 lb.) of lime to about 10 gallons of water in a wooden barrel, stir well, and allow to settle. The clear liquid resulting can be used, and water added and stirred daily until all the soluble portion of the lime has dissolved—the lack of alkaline flavour will indicate when this point has been reached, and a fresh supply of lime should be added to the barrel.

A Prolific and Profitable Sow.

Kingston Patricia, 1346, a Large White sow, bred and owned by the Kingston Pig Farm Company, has proved that the old adage, "there is money in pigs," still carries considerable weight and is as true to-day as ever. "Pat," as she is called, was farrowed on the 25th October, 1930, so is just a little over two years of age. At the age of eleven months (7th October, 1931) she farrowed her first litter of eleven, of which ten were tattooed for entry into the herd records. From this litter, two daughters in due course produced their first families of twelve piglings each. "Pat" farrowed again eight months later (16th June, 1932), producing fifteen pigs, which she won first prize with (sow and litter) at Brisbane Royal National Exhibition, August, 1932. Not content with this, she produced her next litter within five months (23rd October, 1932), and again brought forth fifteen pigs—a tally of forty-one pigs in all while still under two years of age. Such is the prolific nature of the world-renowned Large White breed—a breed noted for other commercial features as well as prolificacy.

Concrete Bath for Pigs.

An important aid to the health and comfort of swine is the provision of a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pigyards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area.

Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard it is to be found in just this place. Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE HOUSE FLY.

Measures for its Control.

A NUMBER of different species occur among the flies commonly referred to as "house-flies," but of those species that cause annoyance in dwellings the common house-fly (*Musca domestica*) is easily the most important and the most widely distributed. This fly is world-wide in distribution, and from its habit of crawling over food after frequenting filth, sick rooms, &c., and carrying with it injurious organisms of all kinds, has been definitely proved by medical men to be the carrier of many of our worst diseases, including typhoid, tuberculosis, dysentery, gastro-enteritis, &c. It is therefore a serious menace to public health, and no effort should be spared to exclude it from the house. If it were only realised that the flies which visit the dining-table may, but a few moments before, have been crawling over garbage or human fæcal matter, or frequenting the room of a person suffering from some disease, there would not be anything like the indifference that is frequently shown to the presence of this pest.

It may not be generally known that the house-fly passes through four stages, viz., the egg, the larva or maggot, the pupa, and the adult two-winged fly. The female lays her eggs chiefly in stable manure, or other fæcal or decaying organic matter. It has been said that a single female can lay from 600 to 900 eggs or more during her lifetime. The eggs hatch in about twenty-four hours, and in warm weather the insect passes quickly through its various stages, taking as little as fourteen days or even less under very favourable conditions, from the laying of the egg to the development of the adult stage. Several generations of flies may thus occur in the course of a season.

Destruction of Breeding-grounds.

As house-flies breed chiefly in stable manure, the basic principle in their control is the destruction of the breeding-grounds, which can best be carried out by municipal and shire councils. Already many councils have By-laws enabling the enforcement of the disposal or treatment of manure in such a manner as to render it impossible for flies to breed in it.

The methods generally recommended to prevent manure being a breeding-ground for flies are as follows:—

1. The floors of stables should be of concrete and watertight.

2. All manure should be collected, removed, and placed in fly-tight bins or pits at least twice a week.

3. Where this is not possible, especially in rural districts, the manure should be removed at least every two days, and scattered thinly over a field. The manure then dries quickly, and is unsuitable for the breeding of the flies.

4. If the manure is kept in heaps, the breeding of the flies can be prevented by treating the heap with borax at the rate of 1 lb. of borax to 16 cubic feet of manure. It may be applied in solution or the borax sprinkled over the heap and then watered.

The most effective means of keeping flies out of dwellings is to have all doors and windows screened with fly-proof gauze. If such fly-proof doors and windows are not employed, or should any flies gain access to the dwelling by carelessness in shutting them, the flies may be disposed of by spraying with fly sprays, such as pyrethrum-kerosene mixture, by the use of poisoned baits, or by trapping the flies with tanglefoot fly papers or house-fly traps.

An Effective Spray.

An effective fly spray may be made by mixing 1 lb. of pyrethrum powder with 1 gallon of kerosene; allow to stand over night and strain through a very fine cloth; add 3 oz. of oil of wintergreen to the liquid, which is then ready for use. Quite a large number of proprietary sprays are also available.

Numerous types of fly traps are available, but the old-fashioned glass bell traps or the more recent wire-gauze traps, baited with any substance attractive to the flies, are quite effective.

Poison baits may also be used, and of these formalin is perhaps the safest. The formalin bait is made by mixing two tablespoonfuls of 40 per cent. formalin, one heaped tablespoonful of sugar, ½ pint of clear limewater, and water to make 1 pint. Another formula is to add three teaspoonfuls of commercial formalin to a pint of milk or water sweetened with brown sugar. One method of using is to pour the liquid into a tin perforated with holes through which wicks are passed into the fluid. Another method of exposing the poison to the flies is to line a plate with white blotting-paper and place it over a glass partly filled with formalin solution. The whole is then quickly inverted. The liquid slowly flows out as the solution evaporates from the blotting-paper, and automatically keeps it wet. Yet another method is to pour the liquid into the plate and place in the centre a piece of bread on which the flies alight and feed.—A. and P. Notes, New South Wales Department of Agriculture.

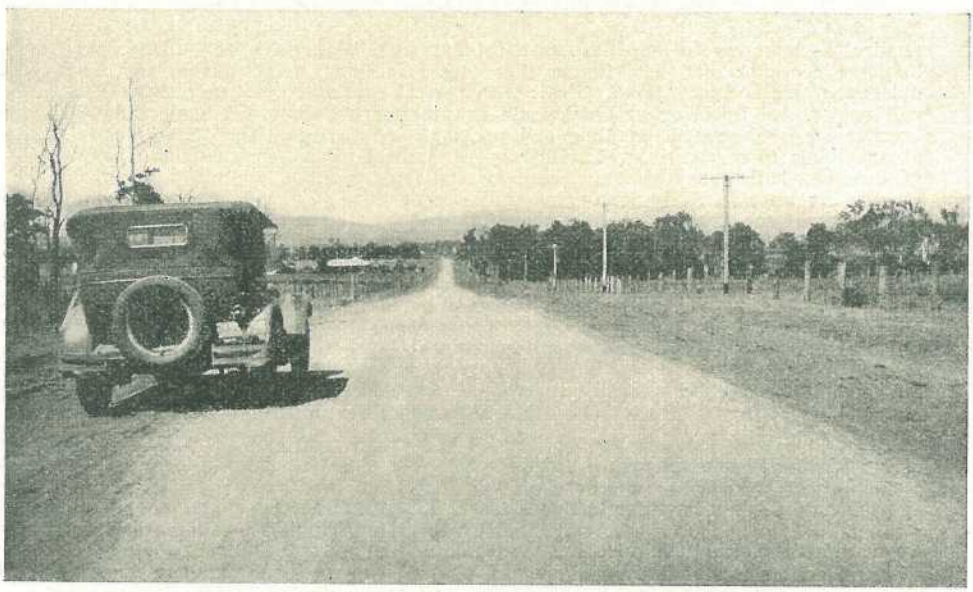

Plate 21.—Laidley Shire—Laidley-Plainlands Road.
An example of "C" class metal construction in a farming area by the Main Roads Commission.

Orchard Notes for March.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is

10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case of mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be fought systematically in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codling moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—i.e., spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full cave and held in position by means of weighted wires.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

CLIMATOLOGICAL TABLE—DECEMBER, 1932.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·81	89	75	98	9	71	17, 30	896	10
Herberton	..	85	63	96	7, 9	56	17	714	14
Rockhampton	29·85	89	70	104	8	66	2, 19	954	11
Brisbane	29·91	84	67	91	8, 24	62	11	249	7
Darling Downs.									
Dalby	29·87	87	62	96	7, 16	52	25	477	7
Stanthorpe	..	80	55	89	29	38	25	310	9
Toowoomba	..	81	59	90	7	47	25	369	8
Mid-interior.									
Georgetown	29·76	98	75	106	9	69	24	370	8
Longreach	29·74	103	75	114	7	62	25	6	2
Mitchell	29·82	93	66	104	7	52	26	192	6
Western.									
Burketown	29·77	96	78	105	10	73	28	106	7
Boulia	29·73	104	73	113	6, 7	59	26, 28	21	2
Thargomindah	29·78	98	72	106	6	59	25	11	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING DECEMBER, 1932, AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1932.	Dec., 1931.		Dec.	No. of Years' Records.	Dec., 1932.	Dec., 1931
North Coast.	In.		In.	In.	*South Coast*—continued—	In.		In.	In.
Atherton	7·53	31	9·62	9·39	Nambour	6·89	36	3·14	10·26
Cairns	8·93	50	15·49	23·95	Nanango	3·82	50	3·83	3·71
Cardwell	8·20	60	9·17	13·92	Rockhampton ..	4·77	45	9·54	7·66
Cooktown	6·80	56	8·96	10·25	Woodford	5·62	45	3·54	5·51
Herberton	5·87	46	7·17	7·89					
Ingham	6·82	40	11·43	7·47					
Innisfail	11·78	51	27·01	23·35	*Darling Downs.*				
Mossman Mill ..	11·03	19	14·84	11 69					
Townsville	5·49	61	8·63	8·31	Dalby	3·22	62	4·77	3·89
					Emu Vale	3·49	36	3·28	3·52
Central Coast.					Jimbour	3·22	44	2·98	2·76
					Miles	3·09	47	2·17	7·12
Ayr	4·13	45	4·80	15·50	Stanthorpe ..	3·52	59	3·10	3·74
Bowen	4·51	61	3·53	11·06	Toowoomba ..	4·43	60	3·69	11·50
Charters Towers ..	3·42	50	3·09	1·63	Warwick	3·39	67	3·40	3·18
Mackay	7·22	61	11·37	5·92					
Proserpine	8·22	29	8·35	15·81					
St. Lawrence ..	4·76	61	9·70	8·91					
					Maranoa.				
South Coast.									
					Roma	2·53	58	2·61	6·77
Biggenden	4·60	33	2·39	6·19					
Bundaberg	5·02	49	2·68	9·44					
Brisbane	4·89	81	2·49	9·11	*State Farms, &c.*				
Caboolture	5·22	45	1·31	7·80					
Childers	5·61	37	4·24	7·60	Bungeworgorai ..	3·08	18	1·88	6·40
Crohamhurst ..	7·05	39	1·82	7·71	Gatton College ..	3·70	33	1·46	8·99
Esk	4·74	45	2·49	4·09	Gindie	2·94	33	1·53	3·54
Gayndah	4·21	61	2·09	9·50	Hermitage ..	2·95	26	2·86	2·84
Gympie	6·04	62	2·67	8·85	Kairi	6·18	18	9·49	5·83
Kilkivan	4·51	53	2·21	4·68	Mackay Sugar Experiment Station	8·50	35	8·03	6·17
Maryborough ..	4·75	60	4·25	8·95					

GEORGE E. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February, 1933.		March, 1933.		Feb., 1933.	Mar., 1933.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					a.m.	a.m.
1	5·28	6·42	5·48	6·21	11·15	9·50
2	5·29	6·42	5·49	6·20	11·56	10·45
					p.m.	
3	5·29	6·41	5·49	6·19	12·57	11·32
						p.m.
4	5·30	6·41	5·50	6·18	1·50	12·33
5	5·31	6·40	5·51	6·17	2·44	1·27
6	5·31	6·40	5·51	6·16	3·27	2·19
7	5·32	6·39	5·52	6·15	4·28	3·8
8	5·33	6·39	5·52	6·14	5·17	3·53
9	5·33	6·38	5·53	6·13	6·0	4·32
10	5·34	6·37	5·53	6·12	6·37	5·8
11	5·35	6·36	5·54	6·11	7·11	5·51
12	5·36	6·36	5·55	6·9	7·42	6·13
13	5·36	6·35	5·55	6·8	8·13	6·45
14	5·37	6·34	5·56	6·7	8·46	7·19
15	5·38	6·33	5·56	6·6	9·22	7·56
16	5·39	6·33	5·57	6·5	10·1	8·41
17	5·39	6·32	5·57	6·4	10·45	9·34
18	5·40	6·31	5·58	6·3	11·40	10·33
19	5·41	6·31	5·59	6·2	..	11·37
20	5·42	6·30	5·59	6·0	12·40	..
					a.m.	a.m.
21	5·42	6·29	6·0	5·59	1·44	12·42
22	5·43	6·29	6·0	5·58	2·50	1·48
23	5·44	6·28	6·1	5·57	3·56	2·51
24	5·45	6·27	6·1	5·56	5·1	3·52
25	5·45	6·25	6·2	5·54	6·2	4·50
26	5·46	6·24	6·2	5·53	7·1	5·45
27	5·47	6·23	6·3	5·52	7·57	6·40
28	5·48	6·22	6·4	5·50	8·53	7·37
29	..	..	6·4	5·49	..	8·33
30	..	..	6·5	5·48	..	9·30
31	..	..	6·5	5·47	..	10·24

Phases of the Moon, Occultations, &c.

2 Feb.	☾ First Quarter	11 16	p.m.
10 ,,	○ Full Moon	11 0	p.m.
18 ,,	☽ Last Quarter	12 8	a.m.
24 ,,	● New Moon	10 44	p.m.

Apogee, 4th February, at 7.12 a.m.
Perigee, 18th February, at 8.42 p.m.

The planets Mercury and Saturn will be within 1½ degree of one another on the 1st of February but too near the sun to be observable. On the 7th Mercury will be passing from west to east of the Sun on the far side of its orbit, but instead of being directly behind the Sun, it will be about 2 degrees south of it.

When the Moon is passing from west to east of Mars, about 1 a.m. on the 13th, there will be a distance of 6 degrees (length of the Southern Cross) between them. Six hours later the Moon will be passing Jupiter, at half the distance given for Mars, in broad daylight.

In the middle of February it will be interesting to look for the rising of the planets Venus and Saturn, which will be in such remarkably close conjunction as to seem only one.

When the Moon overtakes Venus on the 23rd, about 7 p.m., there will be an occultation of that splendid planet, but unfortunately it will occur after they have set and when too near the Sun to be observable.

Of the two eclipses of the Sun which will occur in 1933 the first will be on the 24th instant. This belongs to the other side of the world and will be invisible in Queensland, which, however, will be more fortunate on the second occasion, 21st August.

The path of the Moon during the month will be—In Pisces on the 1st, in Aries on the 2nd and 3rd, in Taurus 4th, 5th, and 6th, in Gemini 7th and 8th, in Cancer 9th, in Leo 10th, 11th, and 12th, in Virgo 13th, 14th, and 15th, in Libra 16th and 17th, in Scorpio and Orphincus 18th and 19th, in Sagittarius 20th and 21st, in Capricornus 22nd and 23rd, in Aquarius 24th and 25th, and again in Pisces 26th, 27th, and 28th.

Mercury will rise only 24 minutes before the Sun on the 1st; it will be in superior conjunction on the 7th; on the 15th it will set 20 minutes after the Sun.

Venus rises at 3.55 a.m. on the 1st and at 4.20 a.m. on the 15th.

Mars rises at 8.52 p.m. on the 1st and at 7.53 p.m. on the 15th. Jupiter rises at 8.51 p.m. on the 1st and at 7.57 p.m. on the 15th. Saturn rises only 19 minutes before the Sun on the 1st; on the 15th it rises at 4.25 a.m

4 Mar.	☾ First Quarter	8 23	p.m.
12 ,,	○ Full Moon	12 46	p.m.
19 ,,	☽ Last Quarter	7 5	a.m.
26 ,,	● New Moon	1 20	p.m.

Apogee, 4th March, at 4.6 a.m.
Perigee, 16th March, at 2.30 a.m.
Apogee, 31st March, at 11.12 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

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

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